Human Activity Recognition

This project is to build a model that predicts the human activities such as Walking, Walking_Upstairs, Walking_Downstairs, Sitting, Standing or Laying.

This dataset is collected from 30 persons(referred as subjects in this dataset), performing different activities with a smartphone to their waists. The data is recorded with the help of sensors (accelerometer and Gyroscope) in that smartphone. This experiment was video recorded to label the data manually.

How data was recorded

By using the sensors(Gyroscope and accelerometer) in a smartphone, they have captured '3-axial linear acceleration'(*tAcc-XYZ*) from accelerometer and '3-axial angular velocity' (*tGyro-XYZ*) from Gyroscope with several variations.

> prefix 't' in those metrics denotes time.
>
> suffix 'XYZ' represents 3-axial signals in X , Y, and Z directions.

Feature names

1. These sensor signals are preprocessed by applying noise filters and then sampled in fixed-width windows(sliding windows) of 2.56 seconds each with 50% overlap. ie., each window has 128 readings.
2. From Each window, a feature vector was obtianed by calculating variables from the time and frequency domain.

> In our dataset, each datapoint represents a window with different readings

3. The accelertion signal was saperated into Body and Gravity acceleration signals(***tBodyAcc-XYZ*** and ***tGravityAcc-XYZ***) using some low pass filter with corner frequecy of 0.3Hz.
4. After that, the body linear acceleration and angular velocity were derived in time to obtian *jerk signals* (***tBodyAccJerk-XYZ*** and ***tBodyGyroJerk-XYZ***).
5. The magnitude of these 3-dimensional signals were calculated using the Euclidian norm. This magnitudes are represented as features with names like *tBodyAccMag*, *tGravityAccMag*, *tBodyAccJerkMag*, *tBodyGyroMag* and *tBodyGyroJerkMag*.

6. Finally, We've got frequency domain signals from some of the available signals by applying a FFT (Fast Fourier Transform). These signals obtained were labeled with **prefix 'f'** just like original signals with **prefix 't'**. These signals are labeled as **fBodyAcc-XYZ**, **fBodyGyroMag** etc.,.

7. These are the signals that we got so far.

   - tBodyAcc-XYZ
   - tGravityAcc-XYZ
   - tBodyAccJerk-XYZ
   - tBodyGyro-XYZ
   - tBodyGyroJerk-XYZ
   - tBodyAccMag
   - tGravityAccMag
   - tBodyAccJerkMag
   - tBodyGyroMag
   - tBodyGyroJerkMag
   - fBodyAcc-XYZ
   - fBodyAccJerk-XYZ
   - fBodyGyro-XYZ
   - fBodyAccMag
   - fBodyAccJerkMag
   - fBodyGyroMag
   - fBodyGyroJerkMag

8. We can esitmate some set of variables from the above signals. ie., We will estimate the following properties on each and every signal that we recoreded so far.

   - **mean()**: Mean value
   - **std()**: Standard deviation
   - **mad()**: Median absolute deviation
   - **max()**: Largest value in array
   - **min()**: Smallest value in array
   - **sma()**: Signal magnitude area
   - **energy()**: Energy measure. Sum of the squares divided by the number of values.
   - **iqr()**: Interquartile range
   - **entropy()**: Signal entropy
   - **arCoeff()**: Autorregresion coefficients with Burg order equal to 4
   - **correlation()**: correlation coefficient between two signals
   - **maxInds()**: index of the frequency component with largest magnitude
   - **meanFreq()**: Weighted average of the frequency components to obtain a mean frequency

- **skewness()**: skewness of the frequency domain signal
- **kurtosis()**: kurtosis of the frequency domain signal
- **bandsEnergy()**: Energy of a frequency interval within the 64 bins of the FFT of each window.
- **angle()**: Angle between to vectors.

9. We can obtain some other vectors by taking the average of signals in a single window sample. These are used on the angle() variable' `

- gravityMean
- tBodyAccMean
- tBodyAccJerkMean
- tBodyGyroMean
- tBodyGyroJerkMean

Y_Labels(Encoded)

- In the dataset, Y_labels are represented as numbers from 1 to 6 as their identifiers.
    - WALKING as **1**
    - WALKING_UPSTAIRS as **2**
    - WALKING_DOWNSTAIRS as **3**
    - SITTING as **4**
    - STANDING as **5**
    - LAYING as **6**

Train and test data were saperated

- The readings from **70%** of the volunteers were taken as **trianing data** and remaining **30%** subjects recordings were taken for **test data**

Data

- All the data is present in 'UCI_HAR_dataset/' folder in present working directory.
    - Feature names are present in 'UCI_HAR_dataset/features.txt'
    - **Train Data**
        - 'UCI_HAR_dataset/train/X_train.txt'
        - 'UCI_HAR_dataset/train/subject_train.txt'
        - 'UCI_HAR_dataset/train/y_train.txt'
    - **Test Data**
        - 'UCI_HAR_dataset/test/X_test.txt'
        - 'UCI_HAR_dataset/test/subject_test.txt'

- 'UCI_HAR_dataset/test/y_test.txt'

Data Size :

27 MB

Quick overview of the dataset :

- Accelerometer and Gyroscope readings are taken from 30 volunteers(referred as subjects) while performing the following 6 Activities.

  1. Walking
  2. WalkingUpstairs
  3. WalkingDownstairs
  4. Standing
  5. Sitting
  6. Lying.

- Readings are divided into a window of 2.56 seconds with 50% overlapping.
- Accelerometer readings are divided into gravity acceleration and body acceleration readings, which has x,y and z components each.
- Gyroscope readings are the measure of angular velocities which has x,y and z components.
- Jerk signals are calculated for BodyAcceleration readings.
- Fourier Transforms are made on the above time readings to obtain frequency readings.
- Now, on all the base signal readings., mean, max, mad, sma, arcoefficient, engerybands,entropy etc., are calculated for each window.
- We get a feature vector of 561 features and these features are given in the dataset.
- Each window of readings is a datapoint of 561 features.

Problem Framework

- 30 subjects(volunteers) data is randomly split to 70%(21) test and 30%(7) train data.
- Each datapoint corresponds one of the 6 Activities.

Problem Statement

- Given a new datapoint we have to predict the Activity

In [1]:
```python
import numpy as np
import pandas as pd
import warnings
warnings.filterwarnings("ignore")

# get the features from the file features.txt
features = list()
with open('UCI_HAR_Dataset/features.txt') as f:
    features = [line.split()[1] for line in f.readlines()]
print('No of Features: {}'.format(len(features)))
```

No of Features: 561

Obtain the train data

In [12]:
```python
# get the data from txt files to pandas dataffame
X_train = pd.read_csv('UCI_HAR_Dataset/train/X_train.txt', delim_whitespace=True, header=None, names=features
)

# add subject column to the dataframe
X_train['subject'] = pd.read_csv('UCI_HAR_Dataset/train/subject_train.txt', header=None, squeeze=True)

y_train = pd.read_csv('UCI_HAR_Dataset/train/y_train.txt', names=['Activity'], squeeze=True)
y_train_labels = y_train.map({1: 'WALKING', 2:'WALKING_UPSTAIRS',3:'WALKING_DOWNSTAIRS',\
                              4:'SITTING', 5:'STANDING',6:'LAYING'})

# put all columns in a single dataframe
train = X_train
train['Activity'] = y_train
train['ActivityName'] = y_train_labels
train.sample()
```

Out[12]:

	tBodyAcc-mean()-X	tBodyAcc-mean()-Y	tBodyAcc-mean()-Z	tBodyAcc-std()-X	tBodyAcc-std()-Y	tBodyAcc-std()-Z	tBodyAcc-mad()-X	tBodyAcc-mad()-Y	tBodyAcc-mad()-Z	tBodyAcc-max()-X	...	angle(tB
6212	0.380322	-0.009925	-0.172745	0.125378	-0.160388	-0.04863	0.076071	-0.115744	-0.016339	0.49712	...	

1 rows × 564 columns
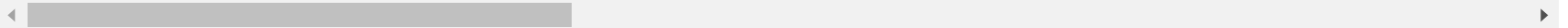
In [13]: `train.shape`

Out[13]: (7352, 564)

Obtain the test data

In [14]:
```python
# get the data from txt files to pandas dataffame
X_test = pd.read_csv('UCI_HAR_Dataset/test/X_test.txt', delim_whitespace=True, header=None, names=features)

# add subject column to the dataframe
X_test['subject'] = pd.read_csv('UCI_HAR_Dataset/test/subject_test.txt', header=None, squeeze=True)

# get y labels from the txt file
y_test = pd.read_csv('UCI_HAR_Dataset/test/y_test.txt', names=['Activity'], squeeze=True)
y_test_labels = y_test.map({1: 'WALKING', 2:'WALKING_UPSTAIRS',3:'WALKING_DOWNSTAIRS',\
                            4:'SITTING', 5:'STANDING',6:'LAYING'})


# put all columns in a single dataframe
test = X_test
test['Activity'] = y_test
test['ActivityName'] = y_test_labels
test.sample()
```

Out[14]:

	tBodyAcc-mean()-X	tBodyAcc-mean()-Y	tBodyAcc-mean()-Z	tBodyAcc-std()-X	tBodyAcc-std()-Y	tBodyAcc-std()-Z	tBodyAcc-mad()-X	tBodyAcc-mad()-Y	tBodyAcc-mad()-Z	tBodyAcc-max()-X	...	angle(tB
2376	0.142909	-0.022732	-0.077417	-0.300135	-0.087465	-0.268216	-0.379653	-0.077845	-0.291151	-0.016602	...	

1 rows × 564 columns
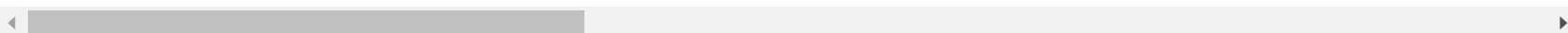
In [15]:
```python
test.shape
```

Out[15]: (2947, 564)

```
In [16]:  train.columns
```

```
Out[16]:  Index(['tBodyAcc-mean()-X', 'tBodyAcc-mean()-Y', 'tBodyAcc-mean()-Z',
                 'tBodyAcc-std()-X', 'tBodyAcc-std()-Y', 'tBodyAcc-std()-Z',
                 'tBodyAcc-mad()-X', 'tBodyAcc-mad()-Y', 'tBodyAcc-mad()-Z',
                 'tBodyAcc-max()-X',
                 ...
                 'angle(tBodyAccMean,gravity)', 'angle(tBodyAccJerkMean),gravityMean)',
                 'angle(tBodyGyroMean,gravityMean)',
                 'angle(tBodyGyroJerkMean,gravityMean)', 'angle(X,gravityMean)',
                 'angle(Y,gravityMean)', 'angle(Z,gravityMean)', 'subject', 'Activity',
                 'ActivityName'],
                dtype='object', length=564)
```

Data Cleaning

1. Check for Duplicates

```
In [17]:  print('No of duplicates in train: {}'.format(sum(train.duplicated())))
          print('No of duplicates in test : {}'.format(sum(test.duplicated())))

          No of duplicates in train: 0
          No of duplicates in test : 0
```

2. Checking for NaN/null values

In [18]:
```python
print('We have {} NaN/Null values in train'.format(train.isnull().values.sum()))
print('We have {} NaN/Null values in test'.format(test.isnull().values.sum()))
```

```
We have 0 NaN/Null values in train
We have 0 NaN/Null values in test
```

3. Check for data imbalance

In [20]:
```python
import matplotlib.pyplot as plt
import seaborn as sns

sns.set_style('whitegrid')
```

In [21]:
```python
plt.figure(figsize=(16,8))
plt.title('Data provided by each user', fontsize=20)
sns.countplot(x='subject',hue='ActivityName', data = train)
plt.show()
```


Data provided by each user
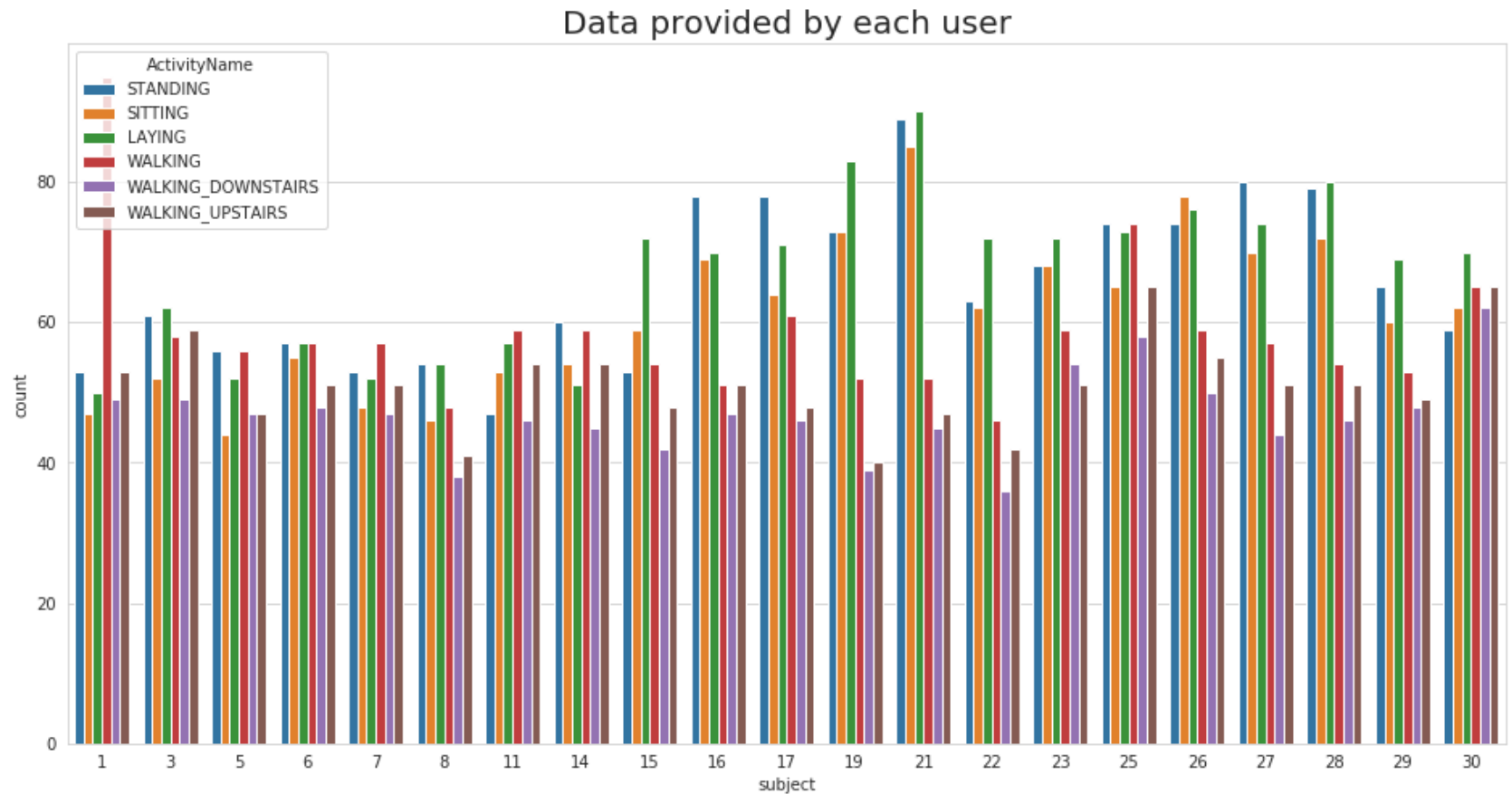
We have got almost same number of reading from all the subjects

In [22]:
```python
plt.title('No of Datapoints per Activity', fontsize=15)
sns.countplot(train.ActivityName)
plt.xticks(rotation=90)
plt.show()
```


No of Datapoints per Activity
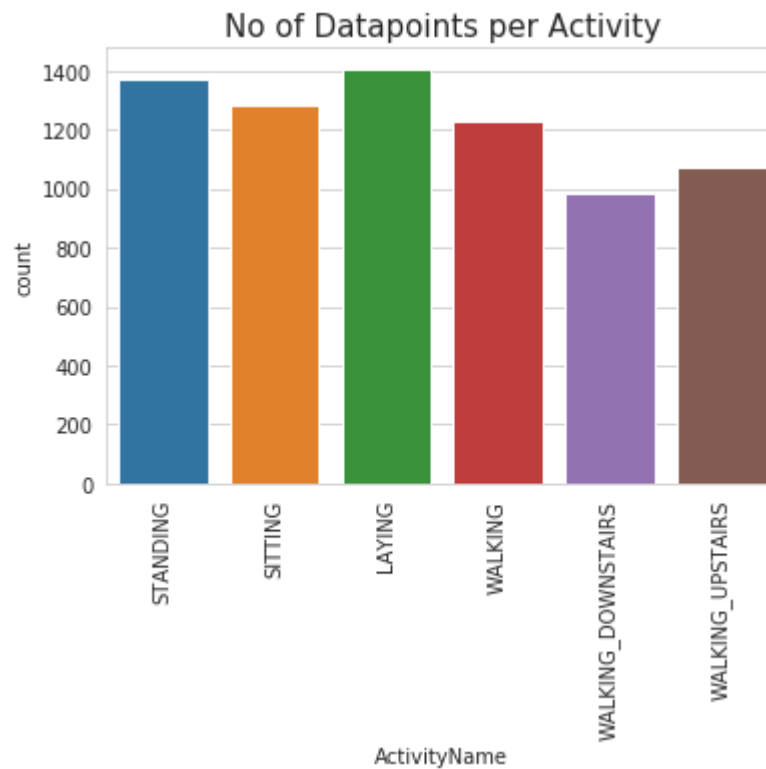
Observation

Our data is well balanced (almost)

4. Changing feature names

```
In [23]: columns = train.columns

         # Removing '()' from column names
         columns = columns.str.replace('[()]','')
         columns = columns.str.replace('[-]', '_')
         columns = columns.str.replace('[,]','')

         train.columns = columns
         test.columns = columns

         test.columns
```

```
Out[23]: Index(['tBodyAcc_mean_X', 'tBodyAcc_mean_Y', 'tBodyAcc_mean_Z',
                'tBodyAcc_std_X', 'tBodyAcc_std_Y', 'tBodyAcc_std_Z', 'tBodyAcc_mad_X',
                'tBodyAcc_mad_Y', 'tBodyAcc_mad_Z', 'tBodyAcc_max_X',
                ...
                'angletBodyAccMeangravity', 'angletBodyAccJerkMeangravityMean',
                'angletBodyGyroMeangravityMean', 'angletBodyGyroJerkMeangravityMean',
                'angleXgravityMean', 'angleYgravityMean', 'angleZgravityMean',
                'subject', 'Activity', 'ActivityName'],
               dtype='object', length=564)
```

5. Save this dataframe in a csv files

```
In [27]: train.to_csv('UCI_HAR_Dataset/csv_files/train.csv', index=False)
         test.to_csv('UCI_HAR_Dataset/csv_files/test.csv', index=False)
```

Exploratory Data Analysis

"*Without domain knowledge EDA has no meaning, without EDA a problem has no soul.*"

1. Featuring Engineering from Domain Knowledge

- **Static and Dynamic Activities**
    - In static activities (sit, stand, lie down) motion information will not be very useful.
    - In the dynamic activities (Walking, WalkingUpstairs,WalkingDownstairs) motion info will be significant.

2. Stationary and Moving activities are completely different

```
In [36]: sns.set_palette("Set1", desat=0.80)
         facetgrid = sns.FacetGrid(train, hue='ActivityName', size=6,aspect=2)
         facetgrid.map(sns.distplot,'tBodyAccMag_mean', hist=False)\
             .add_legend()
         plt.annotate("Stationary Activities", xy=(-0.956,14), xytext=(-0.9, 23), size=20,\
                     va='center', ha='left',\
                     arrowprops=dict(arrowstyle="simple",connectionstyle="arc3,rad=0.1"))

         plt.annotate("Moving Activities", xy=(0,3), xytext=(0.2, 9), size=20,\
                     va='center', ha='left',\
                     arrowprops=dict(arrowstyle="simple",connectionstyle="arc3,rad=0.1"))
         plt.show()
```
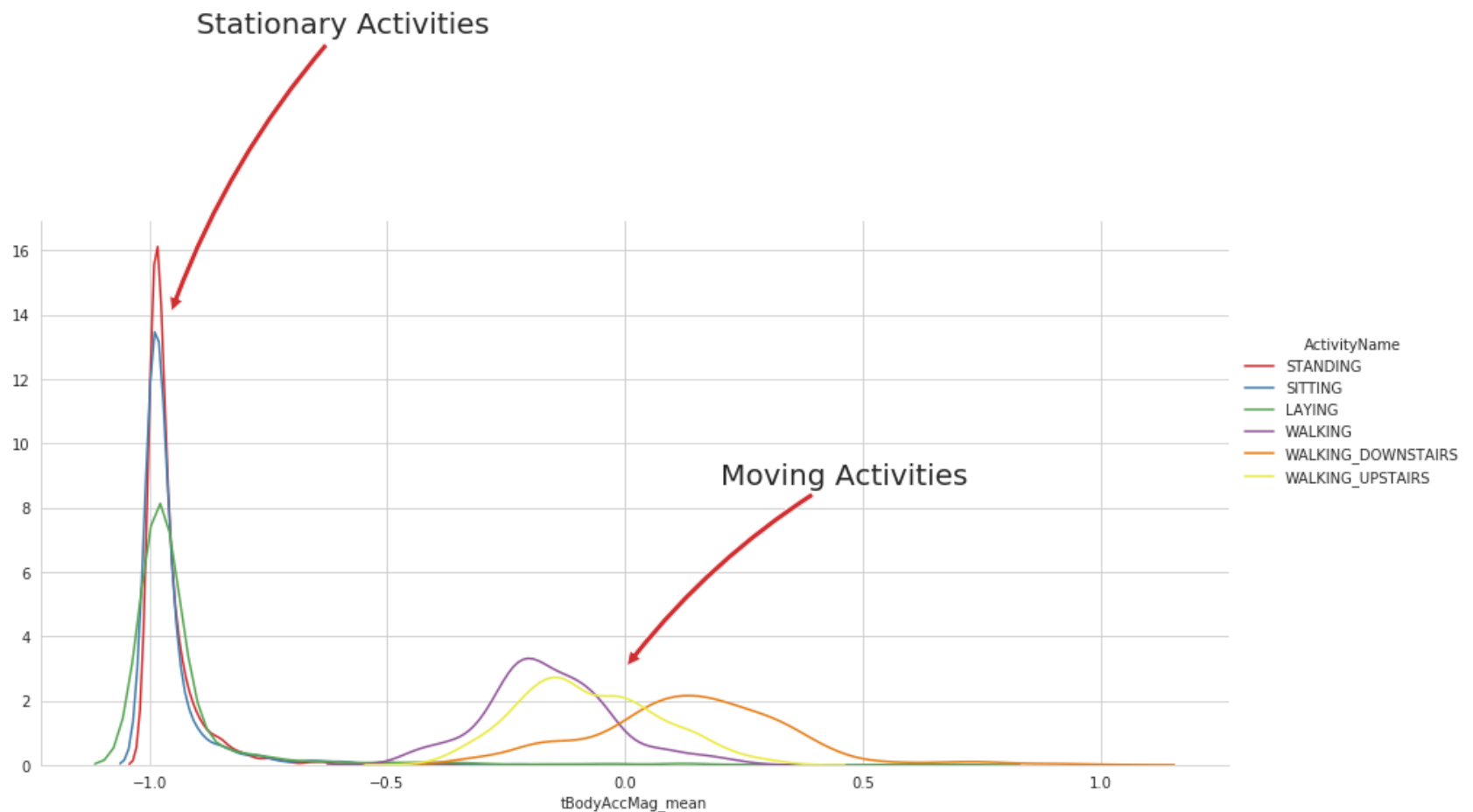
```python
# for plotting purposes taking datapoints of each activity to a different dataframe
df1 = train[train['Activity']==1]
df2 = train[train['Activity']==2]
df3 = train[train['Activity']==3]
df4 = train[train['Activity']==4]
df5 = train[train['Activity']==5]
df6 = train[train['Activity']==6]

plt.figure(figsize=(14,7))
plt.subplot(2,2,1)
plt.title('Stationary Activities(Zoomed in)')
sns.distplot(df4['tBodyAccMag_mean'],color = 'r',hist = False, label = 'Sitting')
sns.distplot(df5['tBodyAccMag_mean'],color = 'm',hist = False,label = 'Standing')
sns.distplot(df6['tBodyAccMag_mean'],color = 'c',hist = False, label = 'Laying')
plt.axis([-1.01, -0.5, 0, 35])
plt.legend(loc='center')

plt.subplot(2,2,2)
plt.title('Moving Activities')
sns.distplot(df1['tBodyAccMag_mean'],color = 'red',hist = False, label = 'Walking')
sns.distplot(df2['tBodyAccMag_mean'],color = 'blue',hist = False,label = 'Walking Up')
sns.distplot(df3['tBodyAccMag_mean'],color = 'green',hist = False, label = 'Walking down')
plt.legend(loc='center right')


plt.tight_layout()
plt.show()
```
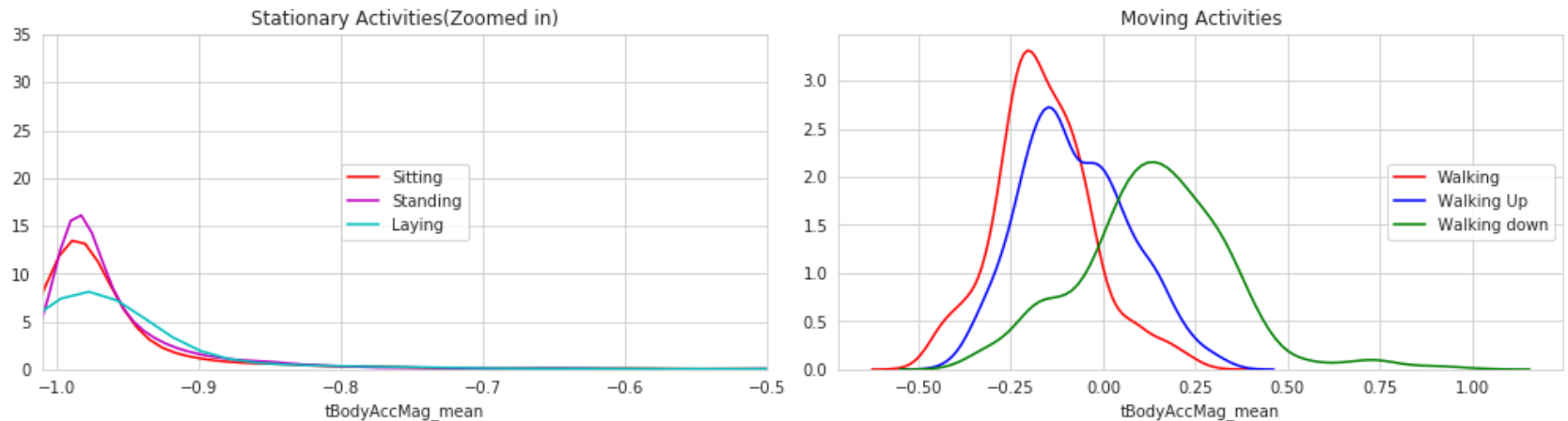
3. Magnitude of an acceleration can saperate it well

```
In [41]: plt.figure(figsize=(7,7))
         sns.boxplot(x='ActivityName', y='tBodyAccMag_mean',data=train, showfliers=False, saturation=1)
         plt.ylabel('Acceleration Magnitude mean')
         plt.axhline(y=-0.7, xmin=0.1, xmax=0.9,dashes=(5,5), c='g')
         plt.axhline(y=-0.05, xmin=0.4, dashes=(5,5), c='m')
         plt.xticks(rotation=90)
         plt.show()
```

<matplotlib.figure.Figure at 0x1471d613b5f8>
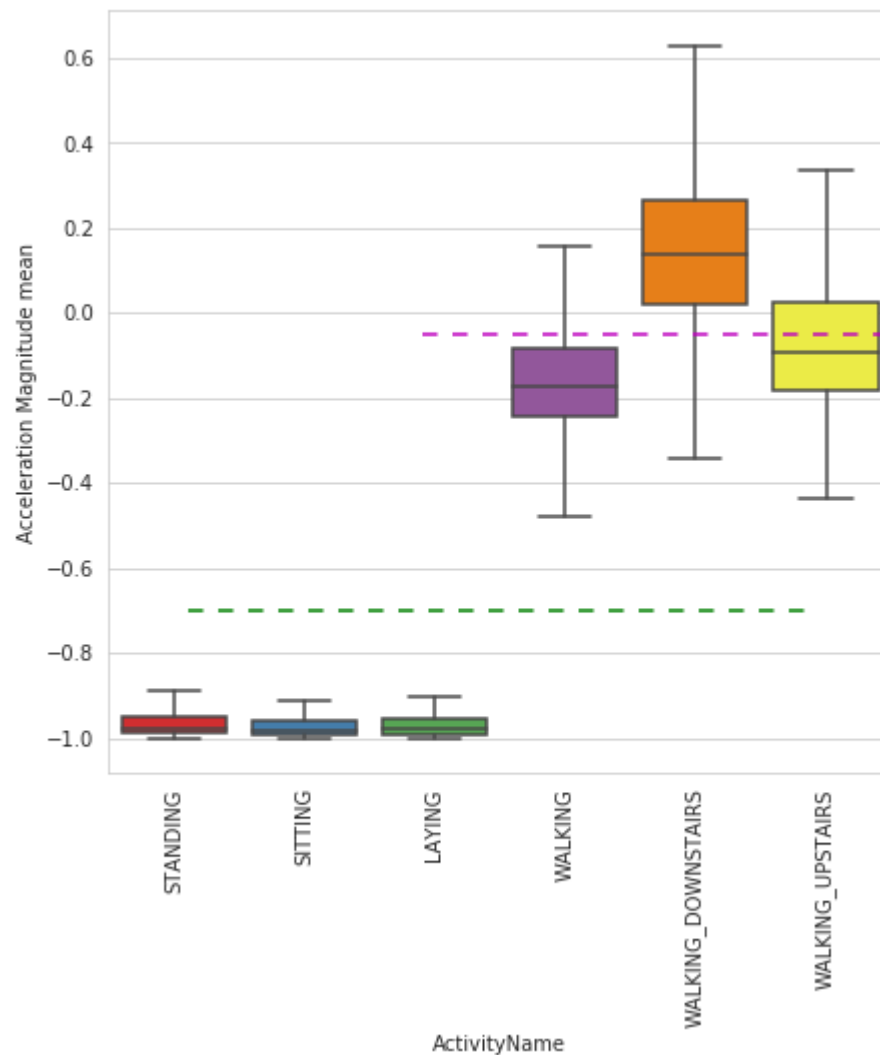
Observations:

- If tAccMean is < -0.8 then the Activities are either Standing or Sitting or Laying.
- If tAccMean is > -0.6 then the Activities are either Walking or WalkingDownstairs or WalkingUpstairs.
- If tAccMean > 0.0 then the Activity is WalkingDownstairs.
- We can classify 75% the Acitivity labels with some errors.

4. Position of GravityAccelerationComponants also matters

```
In [43]: sns.boxplot(x='ActivityName', y='angleXgravityMean', data=train)
         plt.axhline(y=0.08, xmin=0.1, xmax=0.9,c='m',dashes=(5,3))
         plt.title('Angle between X-axis and Gravity_mean', fontsize=15)
         plt.xticks(rotation = 40)
         plt.show()
```
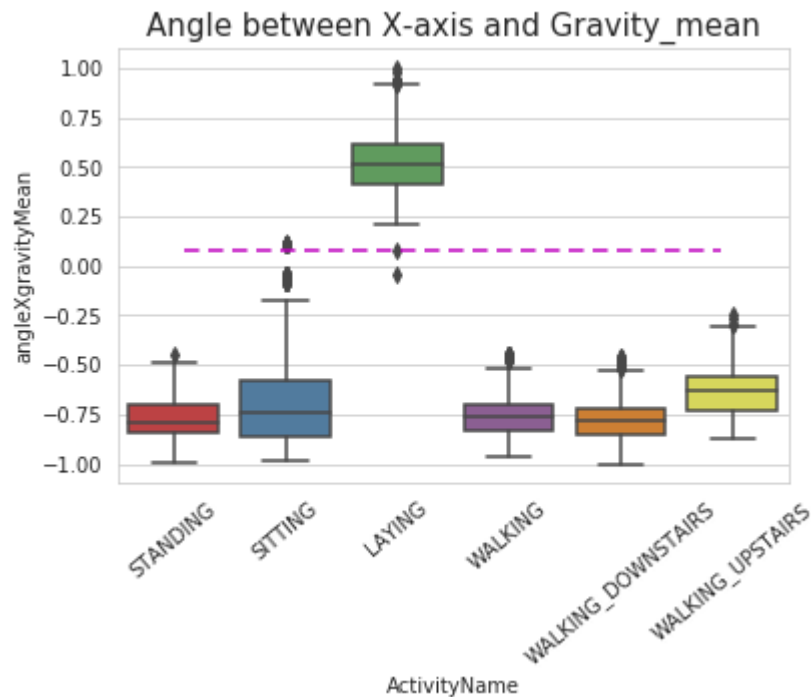
Observations:

- If angleX,gravityMean > 0 then Activity is Laying.
- We can classify all datapoints belonging to Laying activity with just a single if else statement.

```
In [44]:  sns.boxplot(x='ActivityName', y='angleYgravityMean', data = train, showfliers=False)
          plt.title('Angle between Y-axis and Gravity_mean', fontsize=15)
          plt.xticks(rotation = 40)
          plt.axhline(y=-0.22, xmin=0.1, xmax=0.8, dashes=(5,3), c='m')
          plt.show()
```
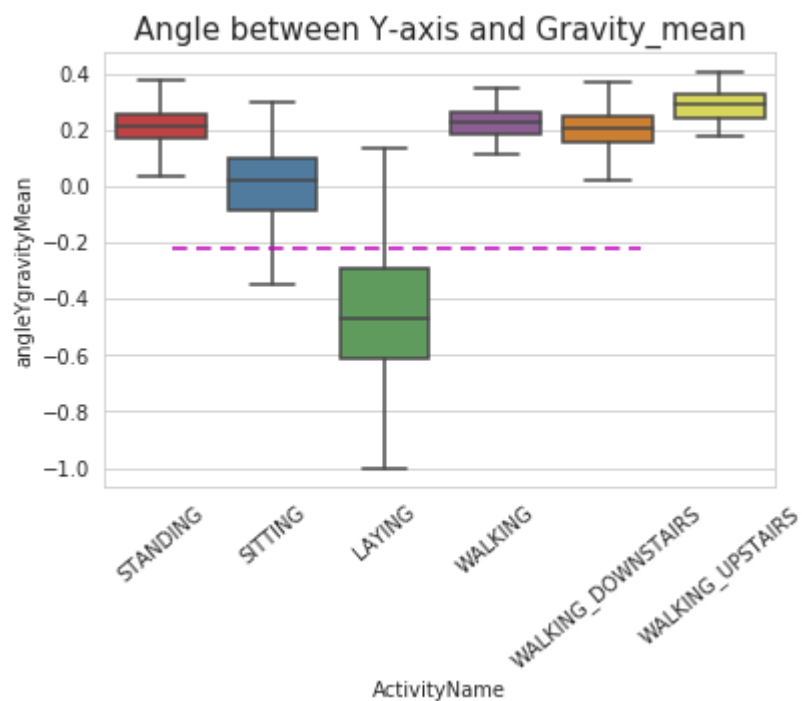
Apply t-sne on the data

```
In [45]: import numpy as np
         from sklearn.manifold import TSNE
         import matplotlib.pyplot as plt
         import seaborn as sns
```

```
In [46]: # performs t-sne with different perplexity values and their repective plots..

         def perform_tsne(X_data, y_data, perplexities, n_iter=1000, img_name_prefix='t-sne'):

             for index,perplexity in enumerate(perplexities):
                 # perform t-sne
                 print('\nperforming tsne with perplexity {} and with {} iterations at max'.format(perplexity, n_iter
         ))
                 X_reduced = TSNE(verbose=2, perplexity=perplexity).fit_transform(X_data)
                 print('Done..')

                 # prepare the data for seaborn
                 print('Creating plot for this t-sne visualization..')
                 df = pd.DataFrame({'x':X_reduced[:,0], 'y':X_reduced[:,1] ,'label':y_data})

                 # draw the plot in appropriate place in the grid
                 sns.lmplot(data=df, x='x', y='y', hue='label', fit_reg=False, size=8,\
                            palette="Set1",markers=['^','v','s','o', '1','2'])
                 plt.title("perplexity : {} and max_iter : {}".format(perplexity, n_iter))
                 img_name = img_name_prefix + '_perp_{}_iter_{}.png'.format(perplexity, n_iter)
                 print('saving this plot as image in present working directory...')
                 plt.savefig(img_name)
                 plt.show()
                 print('Done')
```

```
In [47]:  X_pre_tsne = train.drop(['subject', 'Activity','ActivityName'], axis=1)
          y_pre_tsne = train['ActivityName']
          perform_tsne(X_data = X_pre_tsne,y_data=y_pre_tsne, perplexities =[2,5,10,20,50])
```

```
performing tsne with perplexity 2 and with 1000 iterations at max
[t-SNE] Computing 7 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.096s...
[t-SNE] Computed neighbors for 7352 samples in 27.701s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 0.635855
[t-SNE] Computed conditional probabilities in 0.052s
[t-SNE] Iteration 50: error = 124.7532959, gradient norm = 0.0285542 (50 iterations in 6.885s)
[t-SNE] Iteration 100: error = 106.8683777, gradient norm = 0.0273265 (50 iterations in 3.556s)
[t-SNE] Iteration 150: error = 100.6163483, gradient norm = 0.0195194 (50 iterations in 2.591s)
[t-SNE] Iteration 200: error = 97.3039246, gradient norm = 0.0156689 (50 iterations in 2.512s)
[t-SNE] Iteration 250: error = 95.0665588, gradient norm = 0.0124335 (50 iterations in 2.484s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 95.066559
[t-SNE] Iteration 300: error = 4.1143718, gradient norm = 0.0015598 (50 iterations in 2.224s)
[t-SNE] Iteration 350: error = 3.2087288, gradient norm = 0.0010000 (50 iterations in 1.990s)
[t-SNE] Iteration 400: error = 2.7785664, gradient norm = 0.0007231 (50 iterations in 2.024s)
[t-SNE] Iteration 450: error = 2.5142882, gradient norm = 0.0005710 (50 iterations in 2.042s)
[t-SNE] Iteration 500: error = 2.3313522, gradient norm = 0.0004800 (50 iterations in 2.062s)
[t-SNE] Iteration 550: error = 2.1932867, gradient norm = 0.0004106 (50 iterations in 2.078s)
[t-SNE] Iteration 600: error = 2.0840328, gradient norm = 0.0003637 (50 iterations in 2.089s)
[t-SNE] Iteration 650: error = 1.9942801, gradient norm = 0.0003322 (50 iterations in 2.104s)
[t-SNE] Iteration 700: error = 1.9186578, gradient norm = 0.0003031 (50 iterations in 2.119s)
[t-SNE] Iteration 750: error = 1.8537792, gradient norm = 0.0002782 (50 iterations in 2.127s)
[t-SNE] Iteration 800: error = 1.7970450, gradient norm = 0.0002557 (50 iterations in 2.133s)
[t-SNE] Iteration 850: error = 1.7470232, gradient norm = 0.0002375 (50 iterations in 2.144s)
[t-SNE] Iteration 900: error = 1.7022941, gradient norm = 0.0002236 (50 iterations in 2.137s)
[t-SNE] Iteration 950: error = 1.6622392, gradient norm = 0.0002098 (50 iterations in 2.146s)
[t-SNE] Iteration 1000: error = 1.6259054, gradient norm = 0.0002008 (50 iterations in 2.150s)
[t-SNE] Error after 1000 iterations: 1.625905
Done..
Creating plot for this t-sne visualization..
saving this plot as image in present working directory...
```
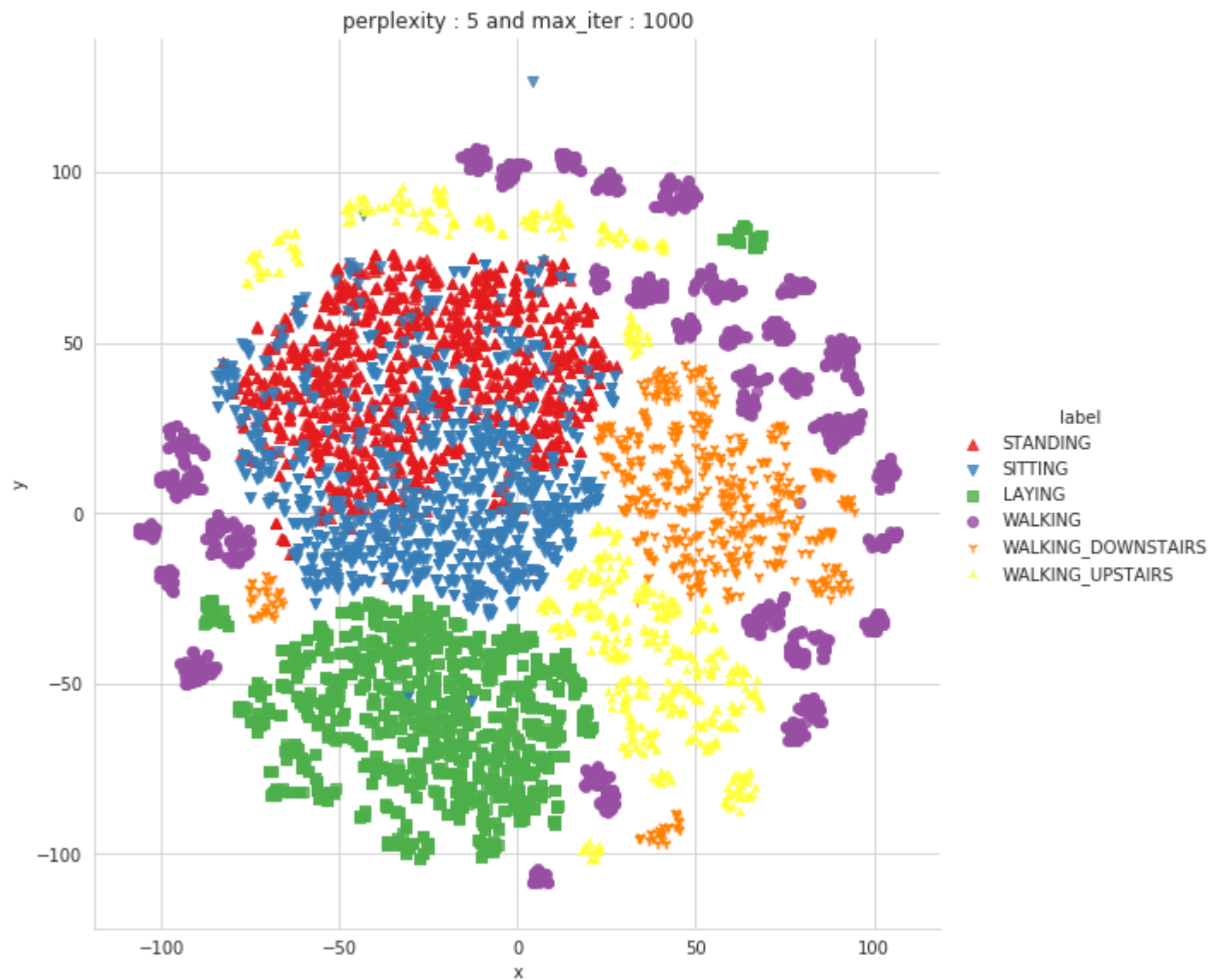
perplexity : 2 and max_iter : 1000
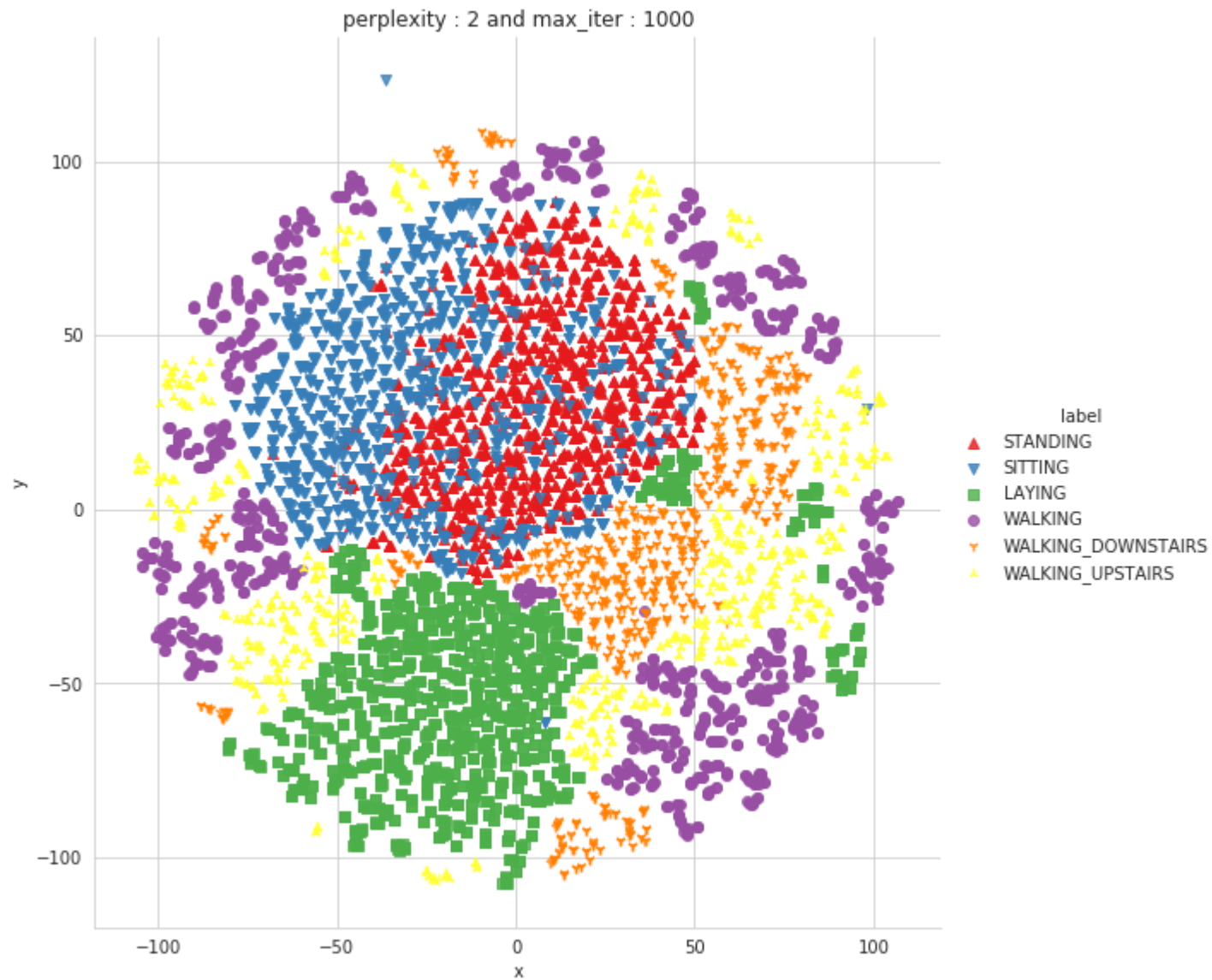
```
Done

performing tsne with perplexity 5 and with 1000 iterations at max
[t-SNE] Computing 16 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.085s...
[t-SNE] Computed neighbors for 7352 samples in 27.997s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 0.961265
[t-SNE] Computed conditional probabilities in 0.058s
[t-SNE] Iteration 50: error = 114.0592880, gradient norm = 0.0203027 (50 iterations in 5.592s)
[t-SNE] Iteration 100: error = 97.2689438, gradient norm = 0.0156565 (50 iterations in 2.620s)
[t-SNE] Iteration 150: error = 92.9875412, gradient norm = 0.0087415 (50 iterations in 2.308s)
[t-SNE] Iteration 200: error = 91.0414810, gradient norm = 0.0071048 (50 iterations in 2.266s)
[t-SNE] Iteration 250: error = 89.8754654, gradient norm = 0.0057384 (50 iterations in 2.205s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 89.875465
[t-SNE] Iteration 300: error = 3.5759211, gradient norm = 0.0014691 (50 iterations in 2.256s)
[t-SNE] Iteration 350: error = 2.8154438, gradient norm = 0.0007505 (50 iterations in 2.240s)
[t-SNE] Iteration 400: error = 2.4350181, gradient norm = 0.0005242 (50 iterations in 2.264s)
[t-SNE] Iteration 450: error = 2.2171905, gradient norm = 0.0004073 (50 iterations in 2.302s)
[t-SNE] Iteration 500: error = 2.0723400, gradient norm = 0.0003336 (50 iterations in 2.340s)
[t-SNE] Iteration 550: error = 1.9670427, gradient norm = 0.0002847 (50 iterations in 2.343s)
[t-SNE] Iteration 600: error = 1.8857234, gradient norm = 0.0002473 (50 iterations in 2.354s)
[t-SNE] Iteration 650: error = 1.8205318, gradient norm = 0.0002198 (50 iterations in 2.367s)
[t-SNE] Iteration 700: error = 1.7666595, gradient norm = 0.0001984 (50 iterations in 2.379s)
[t-SNE] Iteration 750: error = 1.7211496, gradient norm = 0.0001790 (50 iterations in 2.379s)
[t-SNE] Iteration 800: error = 1.6821029, gradient norm = 0.0001657 (50 iterations in 2.390s)
[t-SNE] Iteration 850: error = 1.6482807, gradient norm = 0.0001518 (50 iterations in 2.398s)
[t-SNE] Iteration 900: error = 1.6185459, gradient norm = 0.0001421 (50 iterations in 2.402s)
[t-SNE] Iteration 950: error = 1.5919563, gradient norm = 0.0001332 (50 iterations in 2.406s)
[t-SNE] Iteration 1000: error = 1.5682360, gradient norm = 0.0001277 (50 iterations in 2.403s)
[t-SNE] Error after 1000 iterations: 1.568236
Done..
Creating plot for this t-sne visualization..
saving this plot as image in present working directory...
```

perplexity : 5 and max_iter : 1000

label
▲ STANDING
▼ SITTING
■ LAYING
● WALKING
Y WALKING_DOWNSTAIRS
▲ WALKING_UPSTAIRS

```
Done

performing tsne with perplexity 10 and with 1000 iterations at max
[t-SNE] Computing 31 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.085s...
[t-SNE] Computed neighbors for 7352 samples in 28.368s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 1.133828
[t-SNE] Computed conditional probabilities in 0.155s
[t-SNE] Iteration 50: error = 105.6137085, gradient norm = 0.0229994 (50 iterations in 4.228s)
[t-SNE] Iteration 100: error = 89.9958496, gradient norm = 0.0122725 (50 iterations in 3.063s)
[t-SNE] Iteration 150: error = 87.1489944, gradient norm = 0.0071774 (50 iterations in 2.760s)
[t-SNE] Iteration 200: error = 85.9672318, gradient norm = 0.0061608 (50 iterations in 2.772s)
[t-SNE] Iteration 250: error = 85.2867050, gradient norm = 0.0036593 (50 iterations in 2.769s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 85.286705
[t-SNE] Iteration 300: error = 3.1305749, gradient norm = 0.0013861 (50 iterations in 2.801s)
[t-SNE] Iteration 350: error = 2.4887924, gradient norm = 0.0006460 (50 iterations in 2.720s)
[t-SNE] Iteration 400: error = 2.1697743, gradient norm = 0.0004211 (50 iterations in 2.716s)
[t-SNE] Iteration 450: error = 1.9855604, gradient norm = 0.0003128 (50 iterations in 2.724s)
[t-SNE] Iteration 500: error = 1.8673357, gradient norm = 0.0002509 (50 iterations in 2.730s)
[t-SNE] Iteration 550: error = 1.7841893, gradient norm = 0.0002111 (50 iterations in 2.735s)
[t-SNE] Iteration 600: error = 1.7217950, gradient norm = 0.0001803 (50 iterations in 2.736s)
[t-SNE] Iteration 650: error = 1.6726514, gradient norm = 0.0001601 (50 iterations in 2.735s)
[t-SNE] Iteration 700: error = 1.6333241, gradient norm = 0.0001421 (50 iterations in 2.731s)
[t-SNE] Iteration 750: error = 1.6008626, gradient norm = 0.0001299 (50 iterations in 2.744s)
[t-SNE] Iteration 800: error = 1.5734997, gradient norm = 0.0001197 (50 iterations in 2.738s)
[t-SNE] Iteration 850: error = 1.5501360, gradient norm = 0.0001125 (50 iterations in 2.739s)
[t-SNE] Iteration 900: error = 1.5305120, gradient norm = 0.0001046 (50 iterations in 2.737s)
[t-SNE] Iteration 950: error = 1.5137104, gradient norm = 0.0000972 (50 iterations in 2.745s)
[t-SNE] Iteration 1000: error = 1.4986035, gradient norm = 0.0000922 (50 iterations in 2.751s)
[t-SNE] Error after 1000 iterations: 1.498603
Done..
Creating plot for this t-sne visualization..
saving this plot as image in present working directory...
```
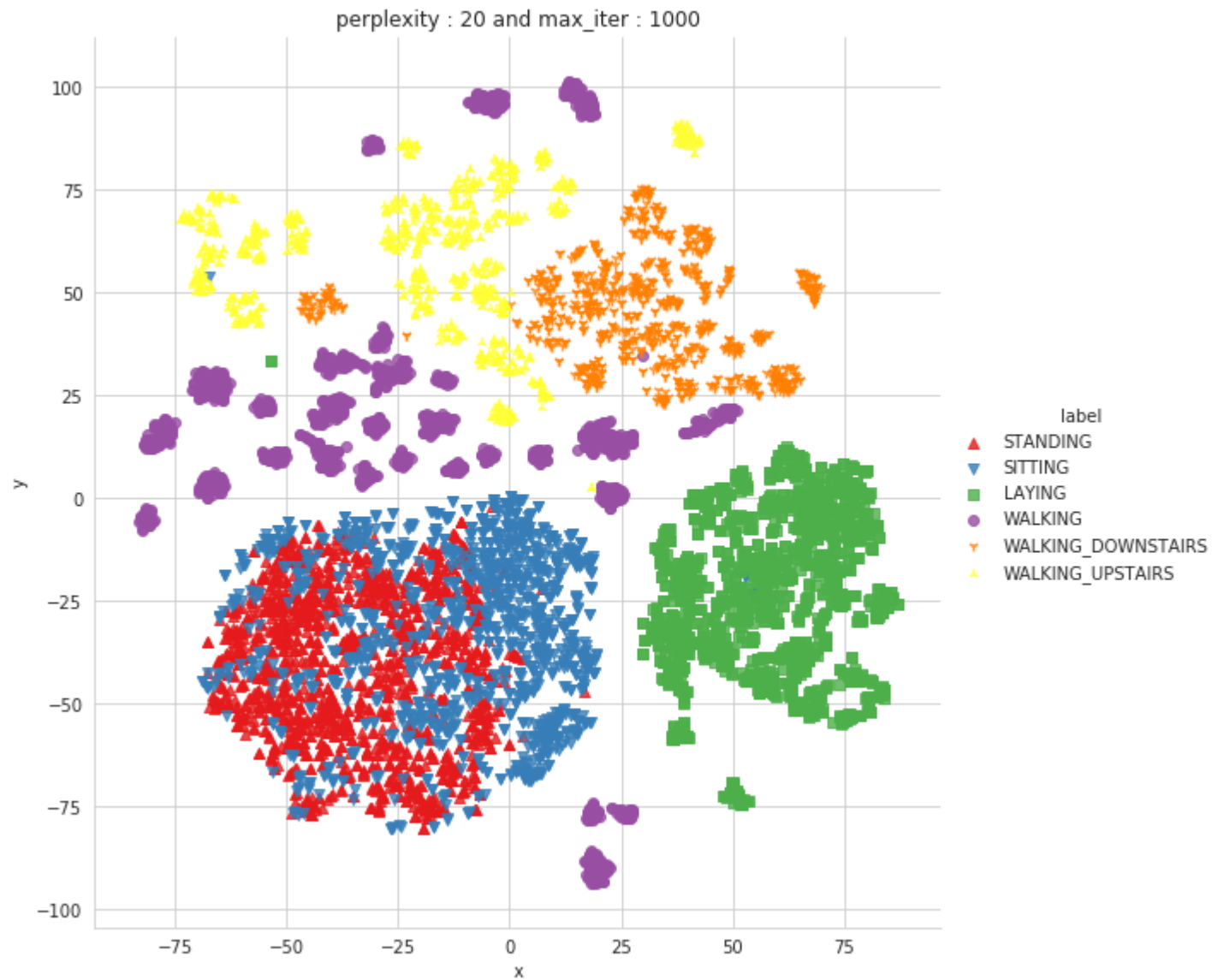
perplexity : 10 and max_iter : 1000
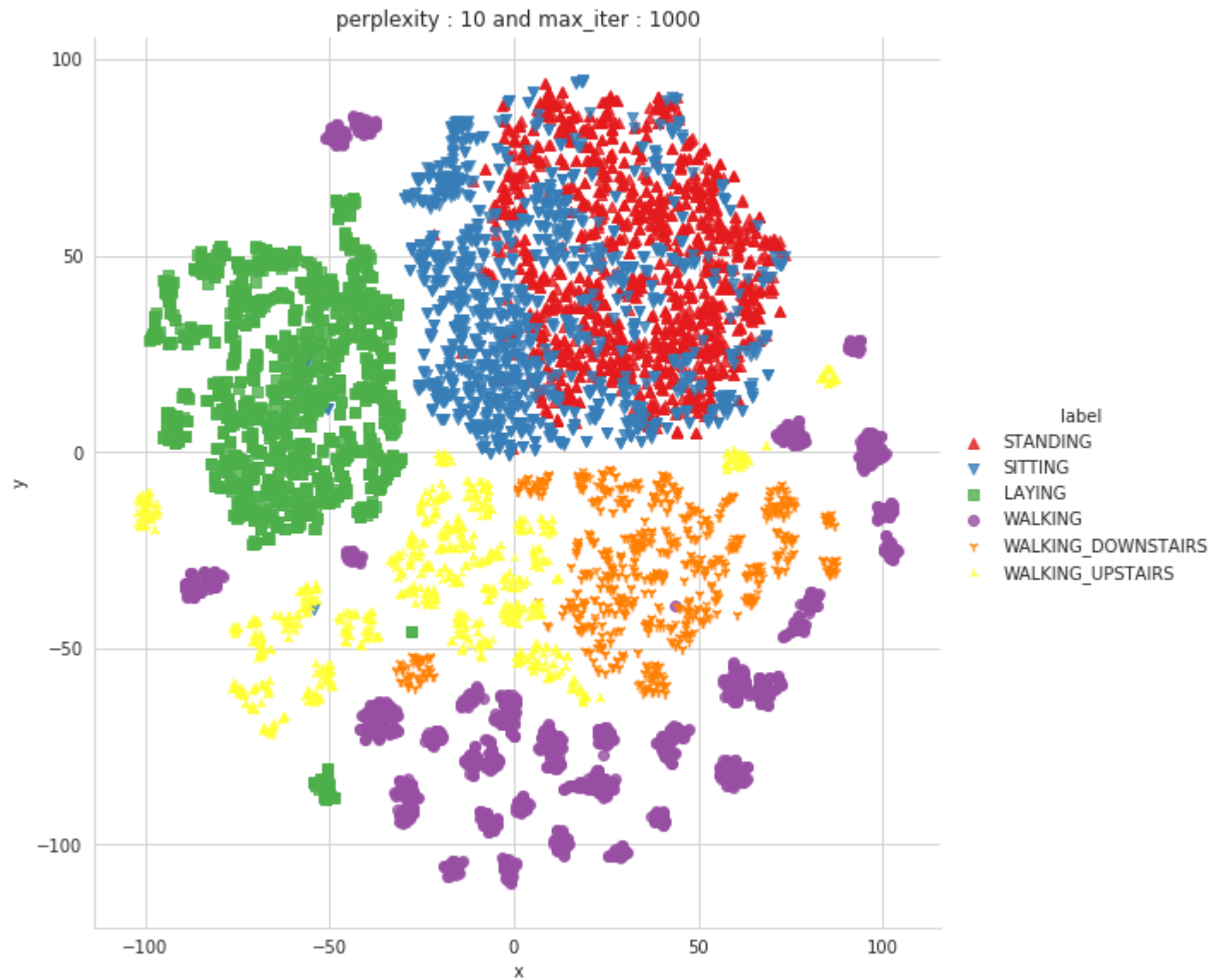
```
Done

performing tsne with perplexity 20 and with 1000 iterations at max
[t-SNE] Computing 61 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.085s...
[t-SNE] Computed neighbors for 7352 samples in 29.036s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 1.274335
[t-SNE] Computed conditional probabilities in 0.271s
[t-SNE] Iteration 50: error = 97.7926636, gradient norm = 0.0125853 (50 iterations in 10.212s)
[t-SNE] Iteration 100: error = 84.0754013, gradient norm = 0.0064392 (50 iterations in 5.176s)
[t-SNE] Iteration 150: error = 81.9258728, gradient norm = 0.0035655 (50 iterations in 4.332s)
[t-SNE] Iteration 200: error = 81.1771851, gradient norm = 0.0022705 (50 iterations in 4.284s)
[t-SNE] Iteration 250: error = 80.7830048, gradient norm = 0.0021464 (50 iterations in 4.261s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 80.783005
[t-SNE] Iteration 300: error = 2.7013526, gradient norm = 0.0013006 (50 iterations in 4.028s)
[t-SNE] Iteration 350: error = 2.1675630, gradient norm = 0.0005758 (50 iterations in 3.776s)
[t-SNE] Iteration 400: error = 1.9185538, gradient norm = 0.0003485 (50 iterations in 3.796s)
[t-SNE] Iteration 450: error = 1.7722032, gradient norm = 0.0002463 (50 iterations in 3.821s)
[t-SNE] Iteration 500: error = 1.6783440, gradient norm = 0.0001935 (50 iterations in 3.838s)
[t-SNE] Iteration 550: error = 1.6141162, gradient norm = 0.0001585 (50 iterations in 3.852s)
[t-SNE] Iteration 600: error = 1.5673211, gradient norm = 0.0001348 (50 iterations in 3.869s)
[t-SNE] Iteration 650: error = 1.5318861, gradient norm = 0.0001161 (50 iterations in 3.879s)
[t-SNE] Iteration 700: error = 1.5039140, gradient norm = 0.0001032 (50 iterations in 3.889s)
[t-SNE] Iteration 750: error = 1.4814334, gradient norm = 0.0000954 (50 iterations in 3.893s)
[t-SNE] Iteration 800: error = 1.4631746, gradient norm = 0.0000885 (50 iterations in 3.909s)
[t-SNE] Iteration 850: error = 1.4486455, gradient norm = 0.0000838 (50 iterations in 3.923s)
[t-SNE] Iteration 900: error = 1.4372107, gradient norm = 0.0000781 (50 iterations in 3.938s)
[t-SNE] Iteration 950: error = 1.4272782, gradient norm = 0.0000750 (50 iterations in 3.935s)
[t-SNE] Iteration 1000: error = 1.4186589, gradient norm = 0.0000716 (50 iterations in 3.933s)
[t-SNE] Error after 1000 iterations: 1.418659
Done..
Creating plot for this t-sne visualization..
saving this plot as image in present working directory...
```

perplexity : 20 and max_iter : 1000

label
▲ STANDING
▼ SITTING
■ LAYING
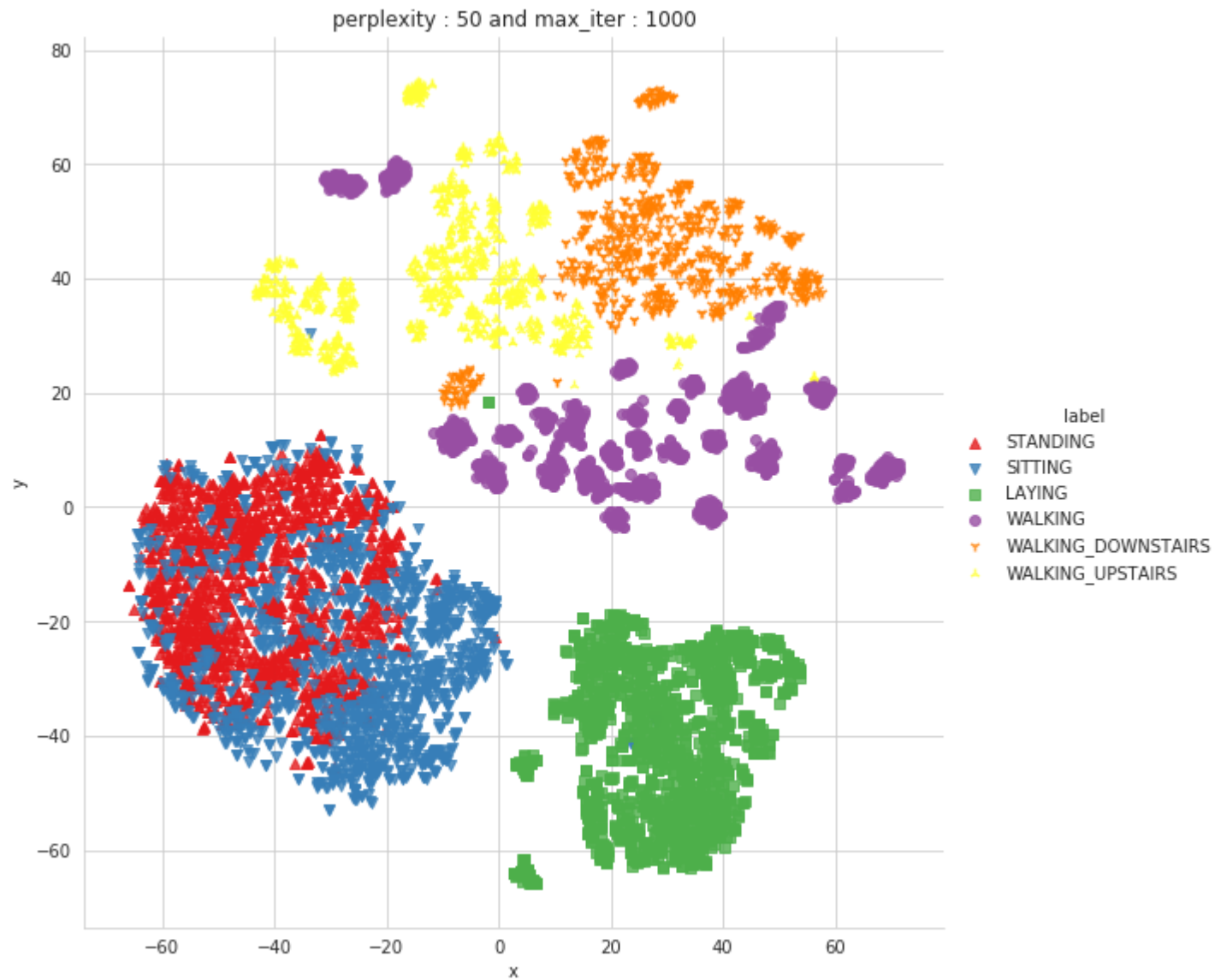● WALKING
Y WALKING_DOWNSTAIRS
▲ WALKING_UPSTAIRS

Done

performing tsne with perplexity 50 and with 1000 iterations at max
[t-SNE] Computing 151 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.086s...
[t-SNE] Computed neighbors for 7352 samples in 29.958s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 1.437672
[t-SNE] Computed conditional probabilities in 0.563s
[t-SNE] Iteration 50: error = 87.2486420, gradient norm = 0.0071327 (50 iterations in 7.677s)
[t-SNE] Iteration 100: error = 75.6975098, gradient norm = 0.0044917 (50 iterations in 7.338s)
[t-SNE] Iteration 150: error = 74.6203918, gradient norm = 0.0024377 (50 iterations in 6.859s)
[t-SNE] Iteration 200: error = 74.2492752, gradient norm = 0.0015409 (50 iterations in 6.908s)
[t-SNE] Iteration 250: error = 74.0674744, gradient norm = 0.0012064 (50 iterations in 6.929s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 74.067474
[t-SNE] Iteration 300: error = 2.1519017, gradient norm = 0.0011851 (50 iterations in 6.938s)
[t-SNE] Iteration 350: error = 1.7552953, gradient norm = 0.0004863 (50 iterations in 6.881s)
[t-SNE] Iteration 400: error = 1.5867779, gradient norm = 0.0002808 (50 iterations in 6.877s)
[t-SNE] Iteration 450: error = 1.4929526, gradient norm = 0.0001902 (50 iterations in 6.869s)
[t-SNE] Iteration 500: error = 1.4330895, gradient norm = 0.0001395 (50 iterations in 6.872s)
[t-SNE] Iteration 550: error = 1.3918693, gradient norm = 0.0001124 (50 iterations in 6.866s)
[t-SNE] Iteration 600: error = 1.3627089, gradient norm = 0.0000937 (50 iterations in 6.858s)
[t-SNE] Iteration 650: error = 1.3417925, gradient norm = 0.0000828 (50 iterations in 6.860s)
[t-SNE] Iteration 700: error = 1.3263514, gradient norm = 0.0000745 (50 iterations in 6.865s)
[t-SNE] Iteration 750: error = 1.3148748, gradient norm = 0.0000693 (50 iterations in 6.873s)
[t-SNE] Iteration 800: error = 1.3062829, gradient norm = 0.0000676 (50 iterations in 6.880s)
[t-SNE] Iteration 850: error = 1.2999574, gradient norm = 0.0000594 (50 iterations in 6.882s)
[t-SNE] Iteration 900: error = 1.2946123, gradient norm = 0.0000580 (50 iterations in 6.883s)
[t-SNE] Iteration 950: error = 1.2901206, gradient norm = 0.0000535 (50 iterations in 6.876s)
[t-SNE] Iteration 1000: error = 1.2863228, gradient norm = 0.0000517 (50 iterations in 6.881s)
[t-SNE] Error after 1000 iterations: 1.286323
Done..
Creating plot for this t-sne visualization..
saving this plot as image in present working directory...

perplexity : 50 and max_iter : 1000

Done

```
In [48]:  X_pre_tsne = train.drop(['subject', 'Activity','ActivityName'], axis=1)
          y_pre_tsne = train['ActivityName']
          perform_tsne(X_data = X_pre_tsne,y_data=y_pre_tsne, perplexities =[20,50,90],n_iter=2000)
```

```
performing tsne with perplexity 20 and with 2000 iterations at max
[t-SNE] Computing 61 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.096s...
[t-SNE] Computed neighbors for 7352 samples in 29.076s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 1.274335
[t-SNE] Computed conditional probabilities in 0.268s
[t-SNE] Iteration 50: error = 97.7995453, gradient norm = 0.0148661 (50 iterations in 4.925s)
[t-SNE] Iteration 100: error = 84.0072556, gradient norm = 0.0072344 (50 iterations in 4.098s)
[t-SNE] Iteration 150: error = 81.9547729, gradient norm = 0.0038887 (50 iterations in 3.829s)
[t-SNE] Iteration 200: error = 81.1930771, gradient norm = 0.0023243 (50 iterations in 3.886s)
[t-SNE] Iteration 250: error = 80.7936783, gradient norm = 0.0017376 (50 iterations in 3.906s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 80.793678
[t-SNE] Iteration 300: error = 2.6971016, gradient norm = 0.0013003 (50 iterations in 3.848s)
[t-SNE] Iteration 350: error = 2.1623621, gradient norm = 0.0005753 (50 iterations in 3.746s)
[t-SNE] Iteration 400: error = 1.9135176, gradient norm = 0.0003476 (50 iterations in 3.750s)
[t-SNE] Iteration 450: error = 1.7679424, gradient norm = 0.0002466 (50 iterations in 3.763s)
[t-SNE] Iteration 500: error = 1.6742762, gradient norm = 0.0001907 (50 iterations in 3.771s)
[t-SNE] Iteration 550: error = 1.6101197, gradient norm = 0.0001570 (50 iterations in 3.776s)
[t-SNE] Iteration 600: error = 1.5637125, gradient norm = 0.0001333 (50 iterations in 3.787s)
[t-SNE] Iteration 650: error = 1.5287232, gradient norm = 0.0001169 (50 iterations in 3.789s)
[t-SNE] Iteration 700: error = 1.5011986, gradient norm = 0.0001056 (50 iterations in 3.797s)
[t-SNE] Iteration 750: error = 1.4793161, gradient norm = 0.0000964 (50 iterations in 3.805s)
[t-SNE] Iteration 800: error = 1.4618779, gradient norm = 0.0000929 (50 iterations in 3.807s)
[t-SNE] Iteration 850: error = 1.4484754, gradient norm = 0.0000847 (50 iterations in 3.801s)
[t-SNE] Iteration 900: error = 1.4374721, gradient norm = 0.0000808 (50 iterations in 3.802s)
[t-SNE] Iteration 950: error = 1.4281392, gradient norm = 0.0000762 (50 iterations in 3.805s)
[t-SNE] Iteration 1000: error = 1.4201696, gradient norm = 0.0000742 (50 iterations in 3.811s)
[t-SNE] Error after 1000 iterations: 1.420170
Done..
Creating plot for this t-sne visualization..
saving this plot as image in present working directory...
```

perplexity : 20 and max_iter : 2000

label
▲ STANDING
▼ SITTING
■ LAYING
● WALKING
Y WALKING_DOWNSTAIRS
▲ WALKING_UPSTAIRS

Done

performing tsne with perplexity 50 and with 2000 iterations at max
[t-SNE] Computing 151 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.084s...
[t-SNE] Computed neighbors for 7352 samples in 29.811s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 1.437672
[t-SNE] Computed conditional probabilities in 0.563s
[t-SNE] Iteration 50: error = 86.5717087, gradient norm = 0.0175077 (50 iterations in 9.532s)
[t-SNE] Iteration 100: error = 75.5988235, gradient norm = 0.0040401 (50 iterations in 7.759s)
[t-SNE] Iteration 150: error = 74.7132950, gradient norm = 0.0022374 (50 iterations in 6.777s)
[t-SNE] Iteration 200: error = 74.3355331, gradient norm = 0.0015600 (50 iterations in 6.712s)
[t-SNE] Iteration 250: error = 74.1238327, gradient norm = 0.0013079 (50 iterations in 6.724s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 74.123833
[t-SNE] Iteration 300: error = 2.1673098, gradient norm = 0.0012021 (50 iterations in 6.918s)
[t-SNE] Iteration 350: error = 1.7651653, gradient norm = 0.0004890 (50 iterations in 6.872s)
[t-SNE] Iteration 400: error = 1.5937643, gradient norm = 0.0002820 (50 iterations in 6.877s)
[t-SNE] Iteration 450: error = 1.4993401, gradient norm = 0.0001900 (50 iterations in 6.881s)
[t-SNE] Iteration 500: error = 1.4392725, gradient norm = 0.0001415 (50 iterations in 6.878s)
[t-SNE] Iteration 550: error = 1.3982749, gradient norm = 0.0001117 (50 iterations in 6.861s)
[t-SNE] Iteration 600: error = 1.3687805, gradient norm = 0.0000930 (50 iterations in 6.867s)
[t-SNE] Iteration 650: error = 1.3471440, gradient norm = 0.0000831 (50 iterations in 6.870s)
[t-SNE] Iteration 700: error = 1.3317789, gradient norm = 0.0000741 (50 iterations in 6.895s)
[t-SNE] Iteration 750: error = 1.3202772, gradient norm = 0.0000682 (50 iterations in 6.894s)
[t-SNE] Iteration 800: error = 1.3111961, gradient norm = 0.0000654 (50 iterations in 6.898s)
[t-SNE] Iteration 850: error = 1.3041462, gradient norm = 0.0000611 (50 iterations in 6.877s)
[t-SNE] Iteration 900: error = 1.2984530, gradient norm = 0.0000579 (50 iterations in 6.878s)
[t-SNE] Iteration 950: error = 1.2937618, gradient norm = 0.0000519 (50 iterations in 6.887s)
[t-SNE] Iteration 1000: error = 1.2894143, gradient norm = 0.0000500 (50 iterations in 6.895s)
[t-SNE] Error after 1000 iterations: 1.289414
Done..
Creating plot for this t-sne visualization..
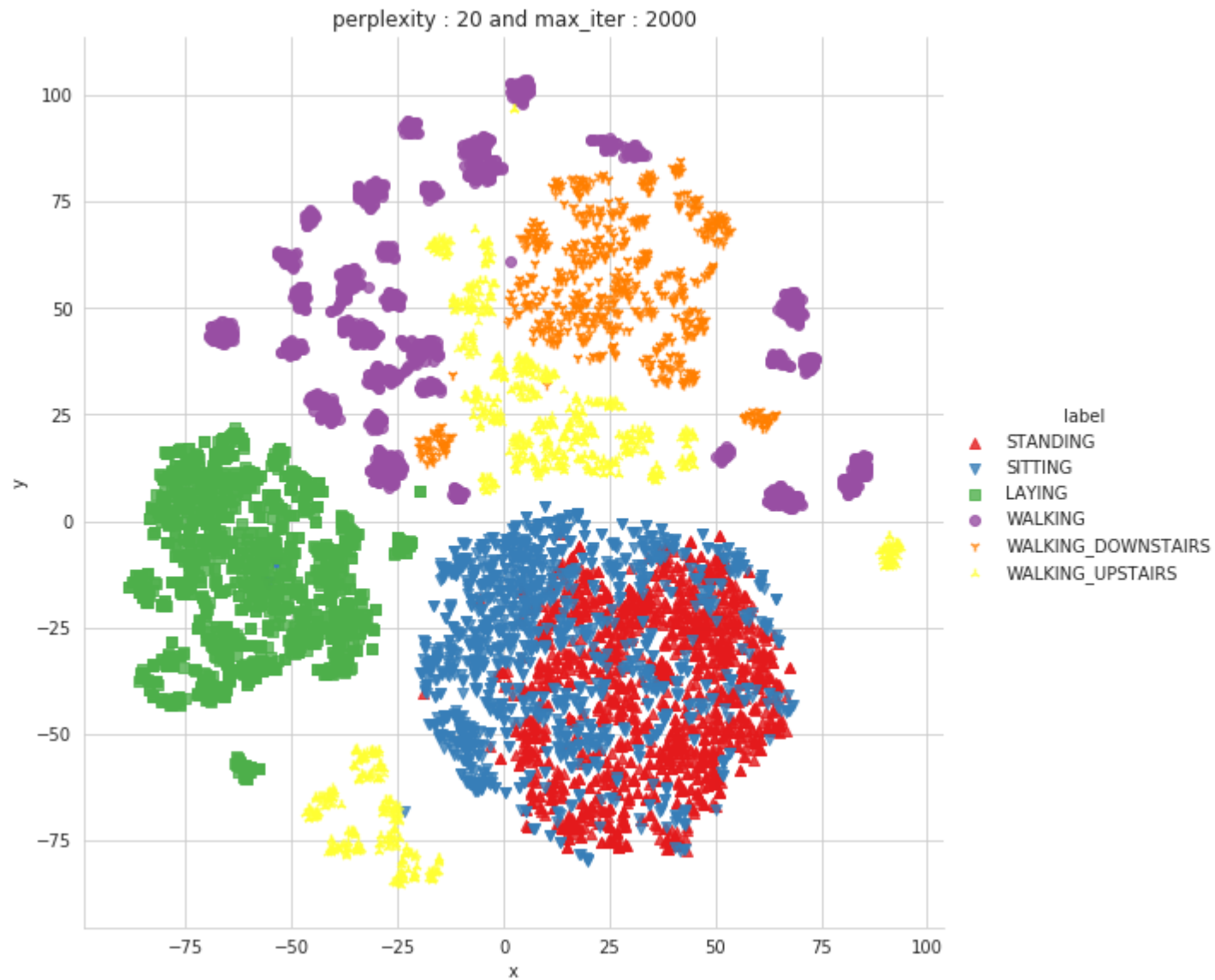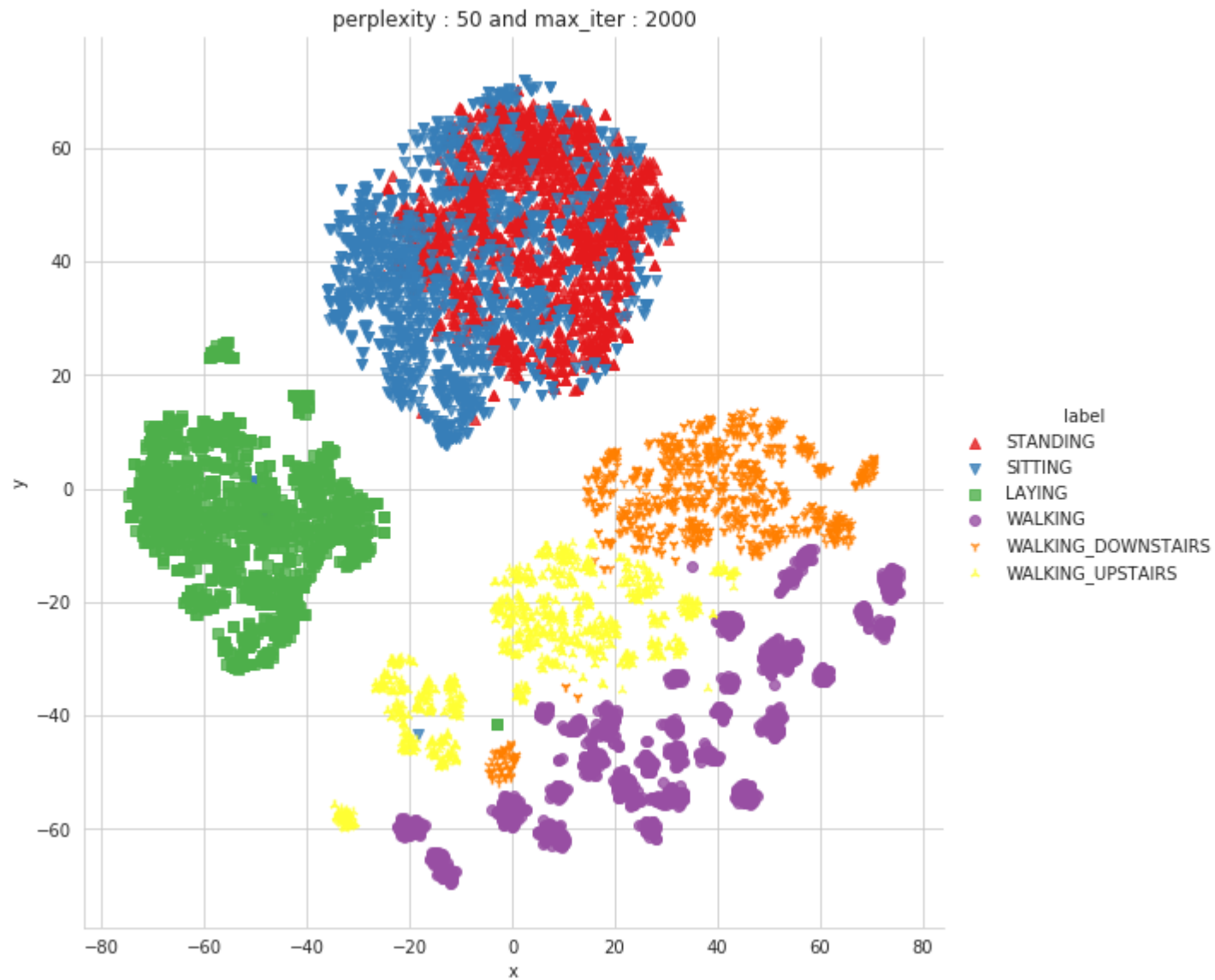saving this plot as image in present working directory...

perplexity : 50 and max_iter : 2000

```
Done

performing tsne with perplexity 90 and with 2000 iterations at max
[t-SNE] Computing 271 nearest neighbors...
[t-SNE] Indexed 7352 samples in 0.085s...
[t-SNE] Computed neighbors for 7352 samples in 30.783s...
[t-SNE] Computed conditional probabilities for sample 1000 / 7352
[t-SNE] Computed conditional probabilities for sample 2000 / 7352
[t-SNE] Computed conditional probabilities for sample 3000 / 7352
[t-SNE] Computed conditional probabilities for sample 4000 / 7352
[t-SNE] Computed conditional probabilities for sample 5000 / 7352
[t-SNE] Computed conditional probabilities for sample 6000 / 7352
[t-SNE] Computed conditional probabilities for sample 7000 / 7352
[t-SNE] Computed conditional probabilities for sample 7352 / 7352
[t-SNE] Mean sigma: 1.540175
[t-SNE] Computed conditional probabilities in 0.960s
[t-SNE] Iteration 50: error = 77.8780289, gradient norm = 0.0304282 (50 iterations in 11.843s)
[t-SNE] Iteration 100: error = 69.3429031, gradient norm = 0.0028602 (50 iterations in 11.184s)
[t-SNE] Iteration 150: error = 68.8140335, gradient norm = 0.0018916 (50 iterations in 10.861s)
[t-SNE] Iteration 200: error = 68.6173096, gradient norm = 0.0011898 (50 iterations in 10.953s)
[t-SNE] Iteration 250: error = 68.5081253, gradient norm = 0.0010420 (50 iterations in 11.034s)
[t-SNE] KL divergence after 250 iterations with early exaggeration: 68.508125
[t-SNE] Iteration 300: error = 1.8464389, gradient norm = 0.0012062 (50 iterations in 11.311s)
[t-SNE] Iteration 350: error = 1.5126369, gradient norm = 0.0004407 (50 iterations in 11.089s)
[t-SNE] Iteration 400: error = 1.3816696, gradient norm = 0.0002530 (50 iterations in 11.059s)
[t-SNE] Iteration 450: error = 1.3117870, gradient norm = 0.0001741 (50 iterations in 11.065s)
[t-SNE] Iteration 500: error = 1.2696241, gradient norm = 0.0001230 (50 iterations in 11.059s)
[t-SNE] Iteration 550: error = 1.2407528, gradient norm = 0.0000947 (50 iterations in 11.048s)
[t-SNE] Iteration 600: error = 1.2200854, gradient norm = 0.0000762 (50 iterations in 11.047s)
[t-SNE] Iteration 650: error = 1.2050776, gradient norm = 0.0000659 (50 iterations in 11.058s)
[t-SNE] Iteration 700: error = 1.1939315, gradient norm = 0.0000586 (50 iterations in 11.072s)
[t-SNE] Iteration 750: error = 1.1858423, gradient norm = 0.0000530 (50 iterations in 11.082s)
[t-SNE] Iteration 800: error = 1.1796997, gradient norm = 0.0000490 (50 iterations in 11.086s)
[t-SNE] Iteration 850: error = 1.1750507, gradient norm = 0.0000472 (50 iterations in 11.079s)
[t-SNE] Iteration 900: error = 1.1714048, gradient norm = 0.0000439 (50 iterations in 11.071s)
[t-SNE] Iteration 950: error = 1.1685311, gradient norm = 0.0000415 (50 iterations in 11.069s)
[t-SNE] Iteration 1000: error = 1.1659497, gradient norm = 0.0000405 (50 iterations in 11.073s)
[t-SNE] Error after 1000 iterations: 1.165950
Done..
Creating plot for this t-sne visualization..
saving this plot as image in present working directory...
```

perplexity : 90 and max_iter : 2000
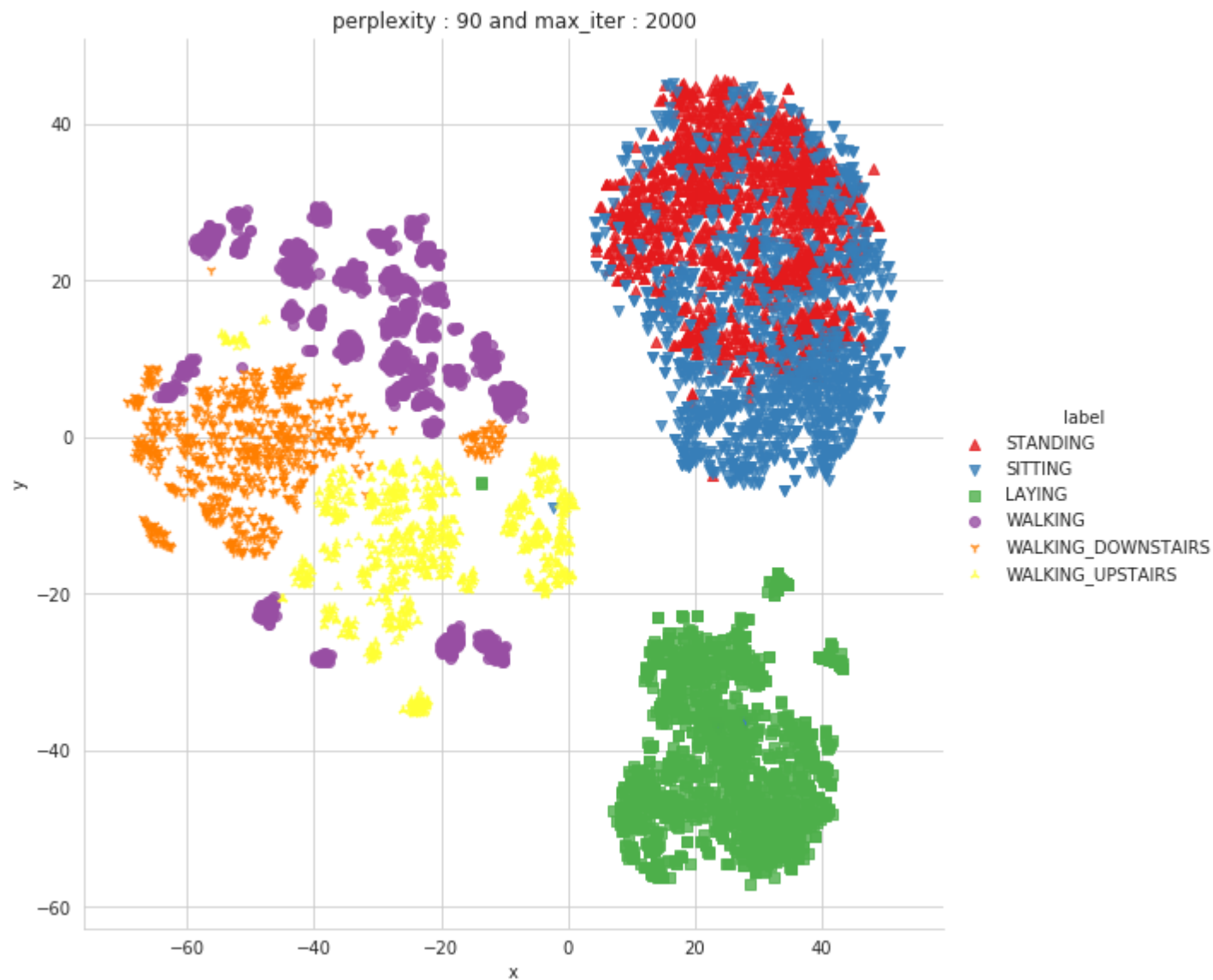
Done

Obtain the train and test data

```
In [2]: train = pd.read_csv('UCI_HAR_Dataset/csv_files/train.csv')
        test = pd.read_csv('UCI_HAR_Dataset/csv_files/test.csv')
        print(train.shape, test.shape)
```

```
(7352, 564) (2947, 564)
```

```
In [3]: train.head(1)
```

Out[3]:

	tBodyAcc_mean_X	tBodyAcc_mean_Y	tBodyAcc_mean_Z	tBodyAcc_std_X	tBodyAcc_std_Y	tBodyAcc_std_Z	tBodyAcc_mad_X	tBc
0	0.288585	-0.020294	-0.132905	-0.995279	-0.983111	-0.913526	-0.995112	

1 rows × 564 columns

```
In [4]: # get X_train and y_train from csv files
        X_train = train.drop(['subject', 'Activity', 'ActivityName'], axis=1)
        y_train = train.ActivityName
```

```
In [5]: # get X_test and y_test from test csv file
        X_test = test.drop(['subject', 'Activity', 'ActivityName'], axis=1)
        y_test = test.ActivityName
```

```
In [6]: print('X_train and y_train : ({},{})'.format(X_train.shape, y_train.shape))
        print('X_test  and y_test  : ({},{})'.format(X_test.shape, y_test.shape))
```

```
X_train and y_train : ((7352, 561),(7352,))
X_test  and y_test  : ((2947, 561),(2947,))
```

Let's model with our data

Labels that are useful in plotting confusion matrix

```
In [43]: labels=['LAYING', 'SITTING','STANDING','WALKING','WALKING_DOWNSTAIRS','WALKING_UPSTAIRS']
```

Function to plot the confusion matrix

```
In [176]: import itertools
          import numpy as np
          import matplotlib.pyplot as plt
          from sklearn.metrics import confusion_matrix

          def plot_confusion_matrix(cm, classes,
                                    normalize=False,
                                    title='Confusion matrix',
                                    cmap=plt.cm.Blues):
              if normalize:
                  cm = cm.astype('float') / cm.sum(axis=1)[:, np.newaxis]

              plt.imshow(cm, interpolation='nearest', cmap=cmap)
              plt.title(title)
              plt.colorbar()
              tick_marks = np.arange(len(classes))
              plt.xticks(tick_marks, classes, rotation=90)
              plt.yticks(tick_marks, classes)

              fmt = '.2f' if normalize else 'd'
              thresh = cm.max() / 2.
              for i, j in itertools.product(range(cm.shape[0]), range(cm.shape[1])):
                  plt.text(j, i, format(cm[i, j], fmt),
                           horizontalalignment="center",
                           color="white" if cm[i, j] > thresh else "black")

              plt.tight_layout()
              plt.ylabel('True label')
              plt.xlabel('Predicted label')
```

Generic function to run any model specified

```
In [177]: from datetime import datetime
          def perform_model(model, X_train, y_train, X_test, y_test, class_labels, cm_normalize=True, \
                          print_cm=True, cm_cmap=plt.cm.Greens):

              # to store results at various phases
              results = dict()

              # time at which model starts training
              train_start_time = datetime.now()
              print('training the model..')
              model.fit(X_train, y_train)
              print('Done \n \n')
              train_end_time = datetime.now()
              results['training_time'] =  train_end_time - train_start_time
              print('training_time(HH:MM:SS.ms) - {}\n\n'.format(results['training_time']))


              # predict test data
              print('Predicting test data')
              test_start_time = datetime.now()
              y_pred = model.predict(X_test)
              test_end_time = datetime.now()
              print('Done \n \n')
              results['testing_time'] = test_end_time - test_start_time
              print('testing time(HH:MM:SS:ms) - {}\n\n'.format(results['testing_time']))
              results['predicted'] = y_pred


              # calculate overall accuracty of the model
              accuracy = metrics.accuracy_score(y_true=y_test, y_pred=y_pred)
              # store accuracy in results
              results['accuracy'] = accuracy
              print('---------------------')
              print('|      Accuracy      |')
              print('---------------------')
              print('\n    {}\n\n'.format(accuracy))


              # confusion matrix
              cm = metrics.confusion_matrix(y_test, y_pred)
              results['confusion_matrix'] = cm
              if print_cm:
```

```python
        print('---------------------')
        print('| Confusion Matrix |')
        print('---------------------')
        print('\n {}'.format(cm))

    # plot confusin matrix
    plt.figure(figsize=(8,8))
    plt.grid(b=False)
    plot_confusion_matrix(cm, classes=class_labels, normalize=True, title='Normalized confusion matrix', cmap
= cm_cmap)
    plt.show()

    # get classification report
    print('--------------------------')
    print('| Classifiction Report |')
    print('--------------------------')
    classification_report = metrics.classification_report(y_test, y_pred)
    # store report in results
    results['classification_report'] = classification_report
    print(classification_report)

    # add the trained  model to the results
    results['model'] = model

    return results
```

Method to print the gridsearch Attributes

```python
In [178]: def print_grid_search_attributes(model):
              # Estimator that gave highest score among all the estimators formed in GridSearch
              print('--------------------------')
              print('|      Best Estimator     |')
              print('--------------------------')
              print('\n\t{}\n'.format(model.best_estimator_))


              # parameters that gave best results while performing grid search
              print('--------------------------')
              print('|      Best parameters    |')
              print('--------------------------')
              print('\tParameters of best estimator : \n\n\t{}\n'.format(model.best_params_))


              #  number of cross validation splits
              print('---------------------------------')
              print('|   No of CrossValidation sets   |')
              print('---------------------------------')
              print('\n\tTotal numbre of cross validation sets: {}\n'.format(model.n_splits_))


              # Average cross validated score of the best estimator, from the Grid Search
              print('--------------------------')
              print('|         Best Score      |')
              print('--------------------------')
              print('\n\tAverage Cross Validate scores of best estimator : \n\n\t{}\n'.format(model.best_score_))
```

1. Logistic Regression with Grid Search

```python
In [11]: from sklearn import linear_model
         from sklearn import metrics

         from sklearn.model_selection import GridSearchCV
```

In [12]:
```python
# start Grid search
parameters = {'C':[0.01, 0.1, 1, 10, 20, 30], 'penalty':['l2','l1']}
log_reg = linear_model.LogisticRegression()
log_reg_grid = GridSearchCV(log_reg, param_grid=parameters, cv=3, verbose=1, n_jobs=8)
log_reg_grid_results =  perform_model(log_reg_grid, X_train, y_train, X_test, y_test, class_labels=labels)
```

```
training the model..
Fitting 3 folds for each of 12 candidates, totalling 36 fits

[Parallel(n_jobs=8)]: Done  36 out of  36 | elapsed:   31.3s finished

Done


training_time(HH:MM:SS.ms) - 0:00:41.152479


Predicting test data
Done


testing time(HH:MM:SS:ms) - 0:00:00.021982


---------------------
|     Accuracy      |
---------------------

    0.9630132337970818


---------------------
| Confusion Matrix |
---------------------

 [[537   0   0   0   0   0]
 [  2 428  57   0   0   4]
 [  0  11 520   1   0   0]
 [  0   0   0 495   1   0]
 [  0   0   0   3 409   8]
 [  0   0   0  22   0 449]]
```
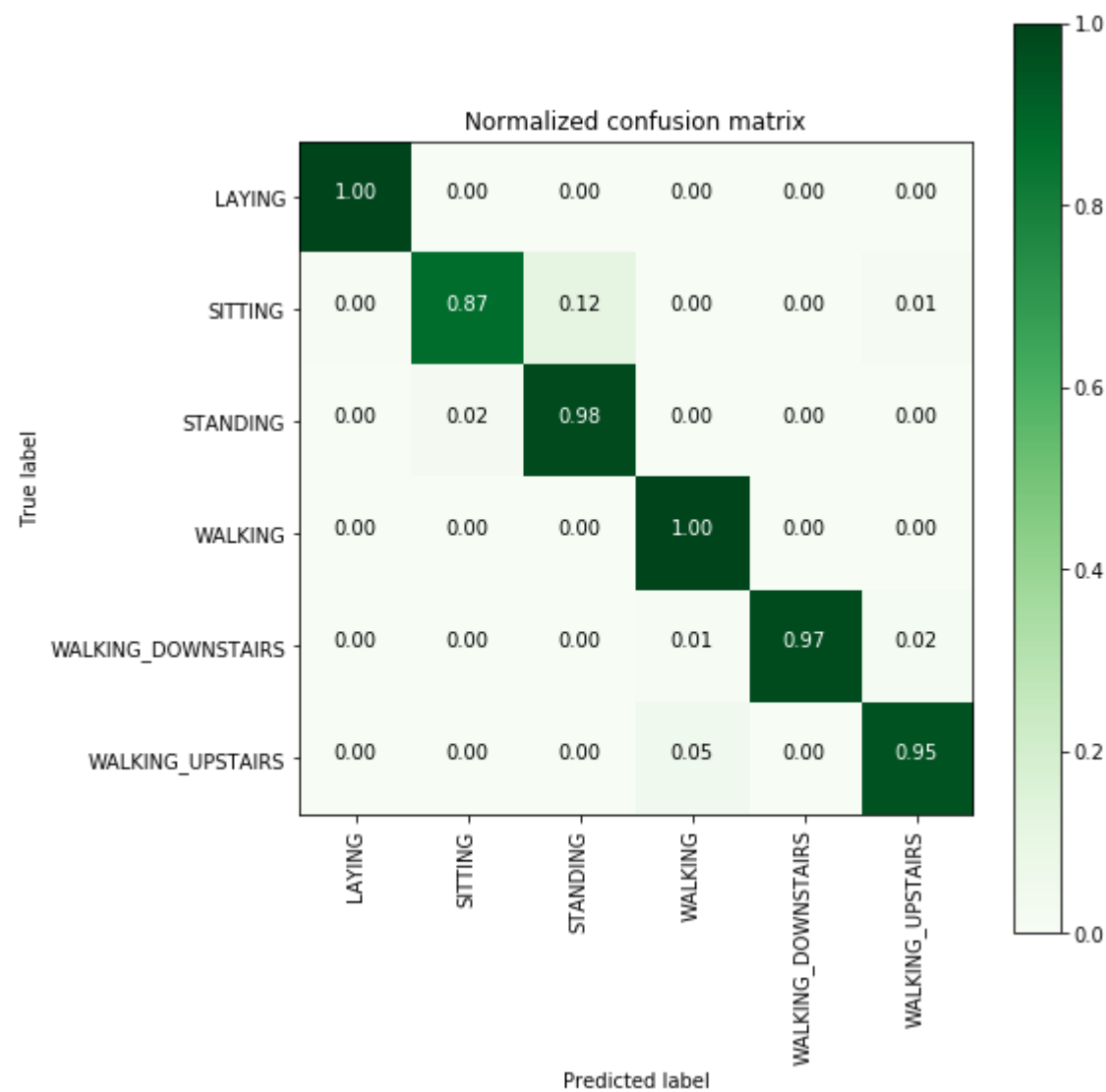
Normalized confusion matrix

```
--------------------------
| Classifiction Report |
--------------------------
                    precision    recall  f1-score   support

           LAYING       1.00      1.00      1.00       537
          SITTING       0.97      0.87      0.92       491
         STANDING       0.90      0.98      0.94       532
          WALKING       0.95      1.00      0.97       496
WALKING_DOWNSTAIRS       1.00      0.97      0.99       420
  WALKING_UPSTAIRS       0.97      0.95      0.96       471

      avg / total       0.96      0.96      0.96      2947
```

In [13]:
```python
plt.figure(figsize=(8,8))
plt.grid(b=False)
plot_confusion_matrix(log_reg_grid_results['confusion_matrix'], classes=labels, cmap=plt.cm.Greens, )
plt.show()
```

Confusion matrix

	LAYING	SITTING	STANDING	WALKING	WALKING_DOWNSTAIRS	WALKING_UPSTAIRS
LAYING	537	0	0	0	0	0
SITTING	2	428	57	0	0	4
STANDING	0	11	520	1	0	0
WALKING	0	0	0	495	1	0
WALKING_DOWNSTAIRS	0	0	0	3	409	8
WALKING_UPSTAIRS	0	0	0	22	0	449

True label

Predicted label
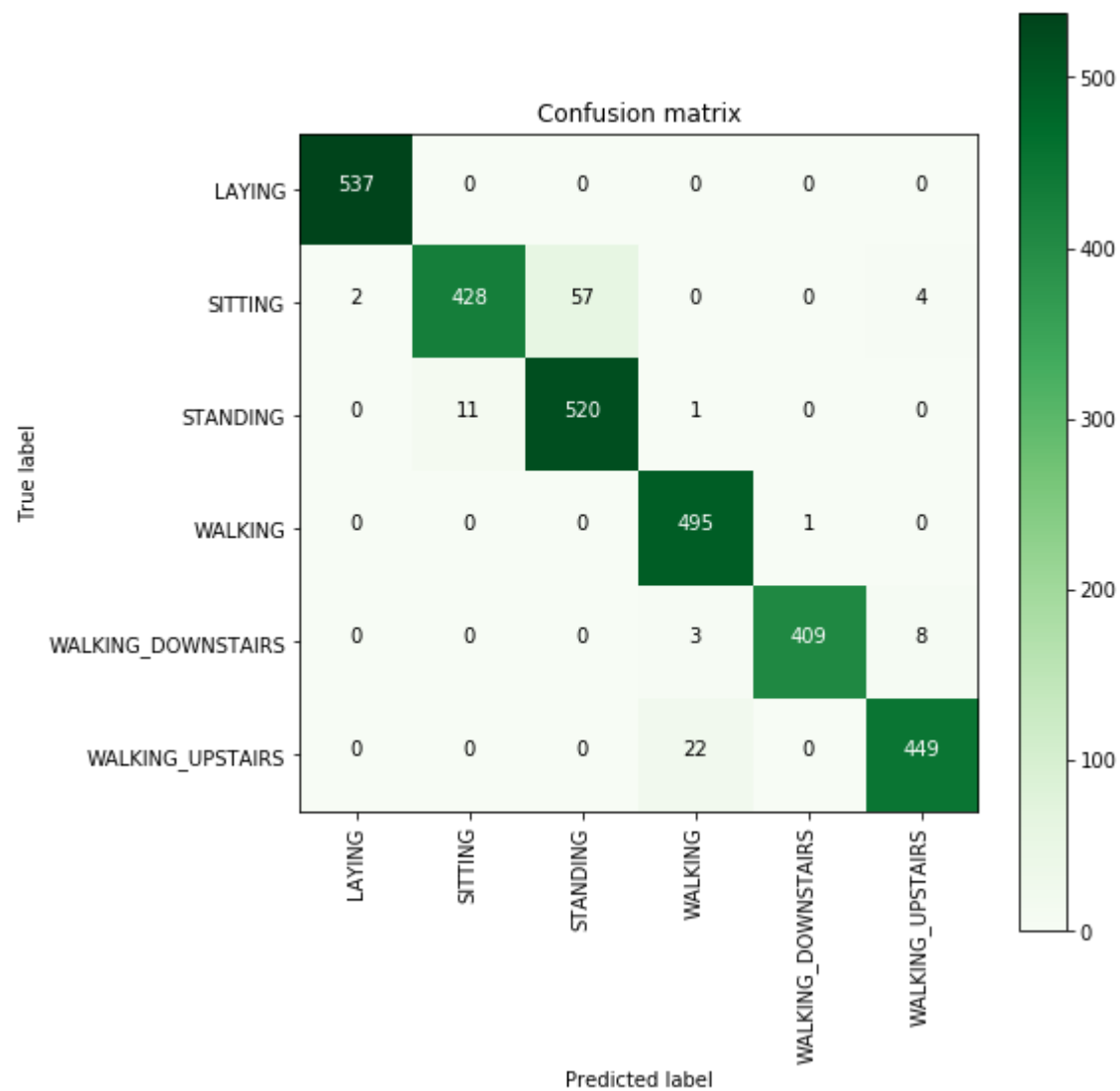
```
In [14]:  # observe the attributes of the model
          print_grid_search_attributes(log_reg_grid_results['model'])
```

```
    --------------------------
    |      Best Estimator     |
    --------------------------

        LogisticRegression(C=30, class_weight=None, dual=False, fit_intercept=True,
          intercept_scaling=1, max_iter=100, multi_class='ovr', n_jobs=1,
          penalty='l2', random_state=None, solver='liblinear', tol=0.0001,
          verbose=0, warm_start=False)


    --------------------------
    |     Best parameters     |
    --------------------------
        Parameters of best estimator :

        {'C': 30, 'penalty': 'l2'}


    ----------------------------------
    |   No of CrossValidation sets    |
    ----------------------------------

        Total numbre of cross validation sets: 3


    --------------------------
    |       Best Score        |
    --------------------------

        Average Cross Validate scores of best estimator :

        0.9460010881392819
```

2. Linear SVC with GridSearch

```
In [15]:  from sklearn.svm import LinearSVC
```

In [16]:
```python
parameters = {'C':[0.125, 0.5, 1, 2, 8, 16]}
lr_svc = LinearSVC(tol=0.00005)
lr_svc_grid = GridSearchCV(lr_svc, param_grid=parameters, n_jobs=8, verbose=1)
lr_svc_grid_results = perform_model(lr_svc_grid, X_train, y_train, X_test, y_test, class_labels=labels)
```

```
training the model..
Fitting 3 folds for each of 6 candidates, totalling 18 fits

[Parallel(n_jobs=8)]: Done  18 out of  18 | elapsed:    9.5s finished

Done


training_time(HH:MM:SS.ms) - 0:00:13.065672


Predicting test data
Done


testing time(HH:MM:SS:ms) - 0:00:00.003324


---------------------
|      Accuracy      |
---------------------

    0.9650492025788938


---------------------
| Confusion Matrix |
---------------------

 [[537   0   0   0   0   0]
 [  2 420  65   0   0   4]
 [  0   7 524   1   0   0]
 [  0   0   0 496   0   0]
 [  0   0   0   2 413   5]
 [  0   0   0  17   0 454]]
```
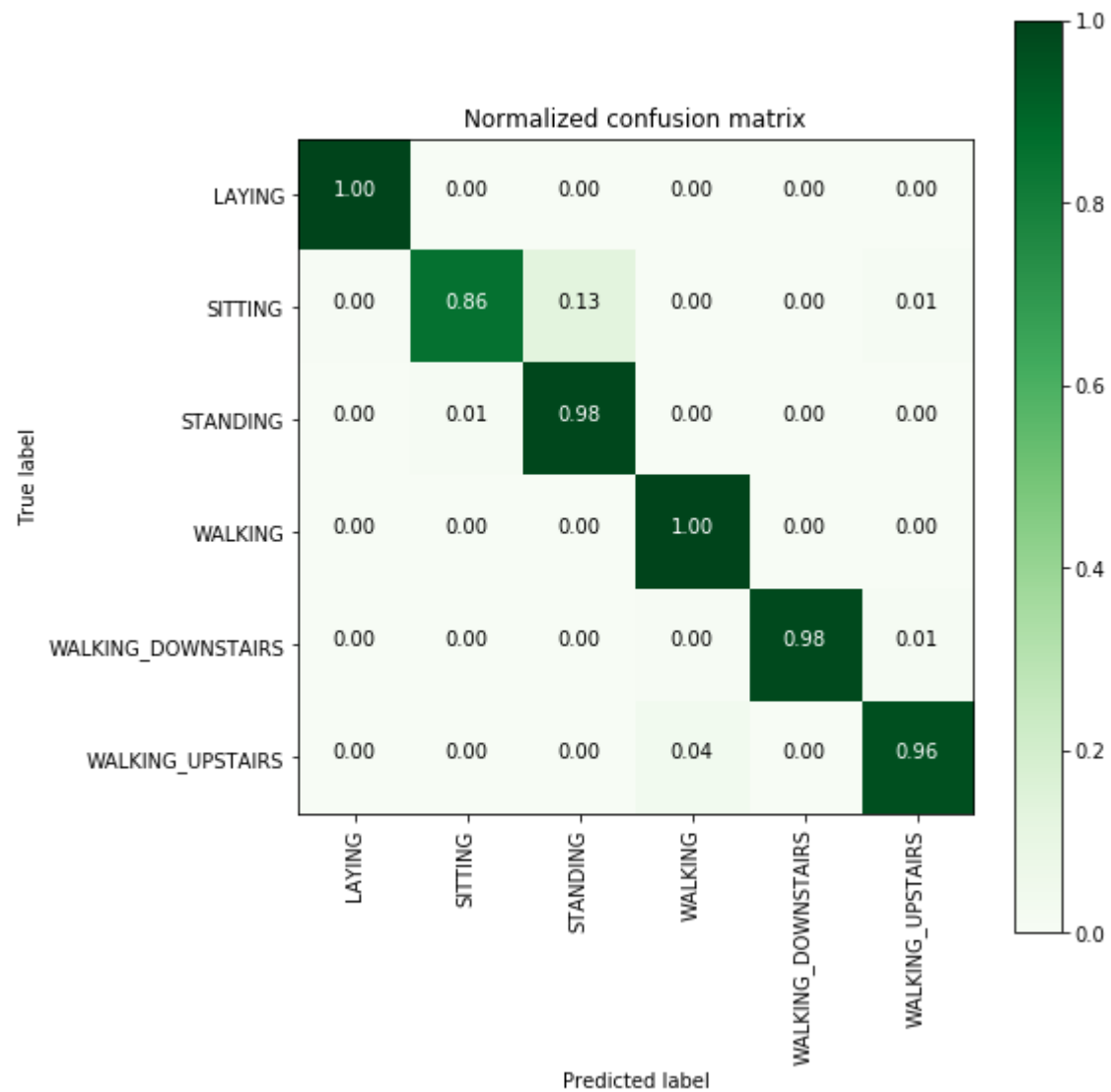
Normalized confusion matrix

```
            --------------------------
            | Classifiction Report |
            --------------------------
                           precision    recall   f1-score    support

                 LAYING        1.00      1.00       1.00         537
                SITTING        0.98      0.86       0.92         491
               STANDING        0.89      0.98       0.93         532
                WALKING        0.96      1.00       0.98         496
     WALKING_DOWNSTAIRS        1.00      0.98       0.99         420
       WALKING_UPSTAIRS        0.98      0.96       0.97         471

            avg / total        0.97      0.97       0.96        2947
```

In [17]: `print_grid_search_attributes(lr_svc_grid_results['model'])`

```
--------------------------
|      Best Estimator     |
--------------------------

        LinearSVC(C=1, class_weight=None, dual=True, fit_intercept=True,
    intercept_scaling=1, loss='squared_hinge', max_iter=1000,
    multi_class='ovr', penalty='l2', random_state=None, tol=5e-05,
    verbose=0)


--------------------------
|     Best parameters     |
--------------------------
        Parameters of best estimator :

        {'C': 1}

----------------------------------
|   No of CrossValidation sets    |
----------------------------------

        Total numbre of cross validation sets: 3


--------------------------
|        Best Score       |
--------------------------

        Average Cross Validate scores of best estimator :

        0.9455930359085963
```

3. Kernel SVM with GridSearch

In [18]:
```python
from sklearn.svm import SVC
parameters = {'C':[2,8,16],\
              'gamma': [ 0.0078125, 0.125, 2]}
rbf_svm = SVC(kernel='rbf')
rbf_svm_grid = GridSearchCV(rbf_svm,param_grid=parameters,n_jobs=8)
rbf_svm_grid_results = perform_model(rbf_svm_grid, X_train, y_train, X_test, y_test, class_labels=labels)
```

```
training the model..
Done


training_time(HH:MM:SS.ms) - 0:02:21.703537


Predicting test data
Done


testing time(HH:MM:SS:ms) - 0:00:02.286671


---------------------
|      Accuracy      |
---------------------

    0.9626739056667798


--------------------
| Confusion Matrix |
--------------------

 [[537   0   0   0   0   0]
 [  0 441  48   0   0   2]
 [  0  12 520   0   0   0]
 [  0   0   0 489   2   5]
 [  0   0   0   4 397  19]
 [  0   0   0  17   1 453]]
```
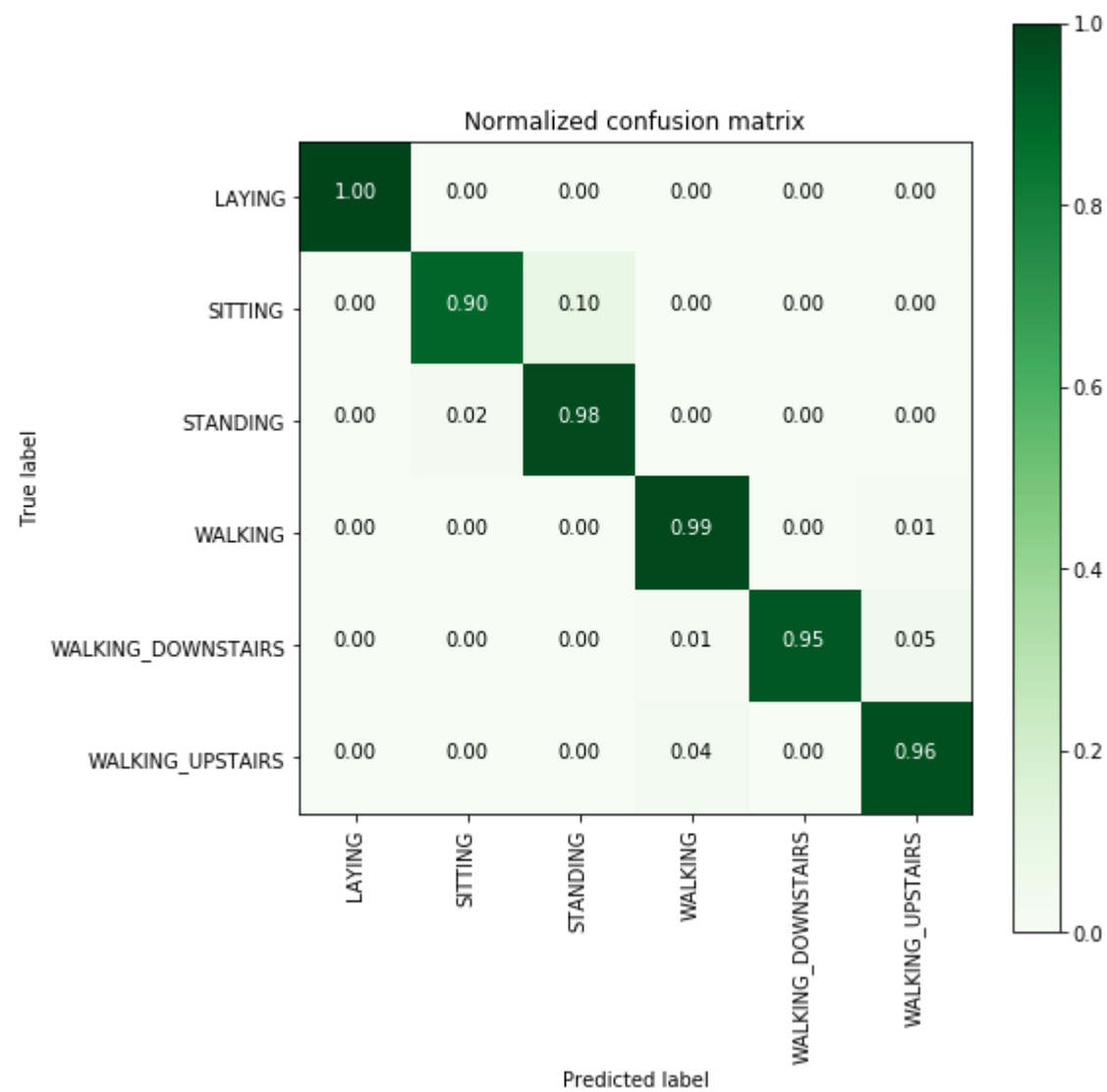
Normalized confusion matrix

```
            -------------------------
            | Classifiction Report |
            -------------------------
                            precision    recall  f1-score   support

                 LAYING         1.00      1.00      1.00       537
                SITTING         0.97      0.90      0.93       491
               STANDING         0.92      0.98      0.95       532
                WALKING         0.96      0.99      0.97       496
     WALKING_DOWNSTAIRS         0.99      0.95      0.97       420
       WALKING_UPSTAIRS         0.95      0.96      0.95       471

            avg / total         0.96      0.96      0.96      2947
```

4. Decision Trees with GridSearchCV

```
In [19]:  from sklearn.tree import DecisionTreeClassifier
          parameters = {'max_depth':np.arange(3,10,2)}
          dt = DecisionTreeClassifier()
          dt_grid = GridSearchCV(dt,param_grid=parameters, n_jobs=8)
          dt_grid_results = perform_model(dt_grid, X_train, y_train, X_test, y_test, class_labels=labels)
          print_grid_search_attributes(dt_grid_results['model'])
```

```
training the model..
Done


training_time(HH:MM:SS.ms) - 0:00:05.120427


Predicting test data
Done


testing time(HH:MM:SS:ms) - 0:00:00.002483


---------------------
|      Accuracy      |
---------------------

    0.8639294197488971


--------------------
| Confusion Matrix |
--------------------

 [[537   0   0   0   0   0]
 [  0 386 105   0   0   0]
 [  0  93 439   0   0   0]
 [  0   0   0 472  16   8]
 [  0   0   0  16 343  61]
 [  0   0   0  78  24 369]]
```

Normalized confusion matrix
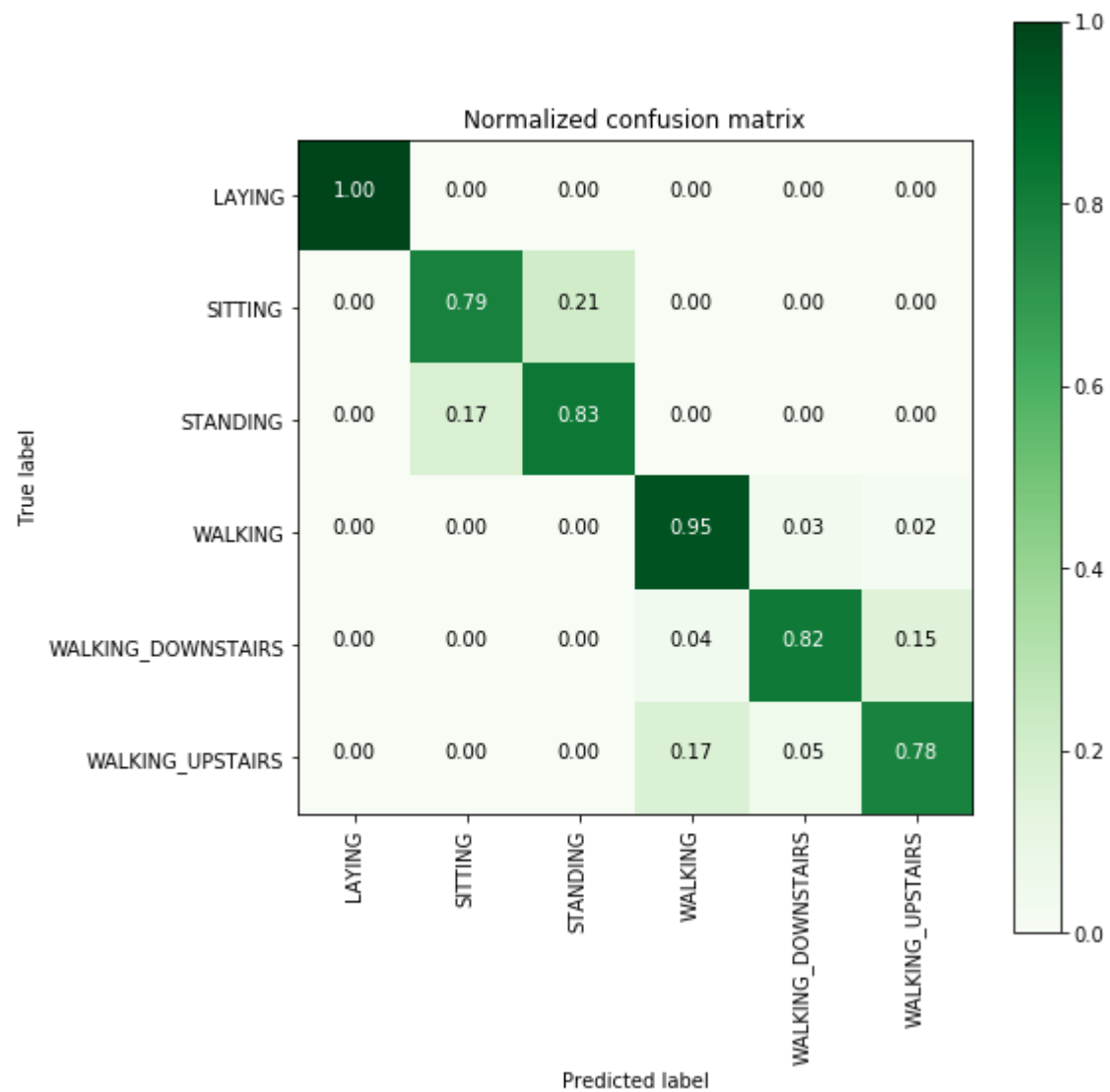
```
--------------------------
| Classifiction Report |
--------------------------
                  precision    recall  f1-score    support

            LAYING      1.00      1.00      1.00       537
           SITTING      0.81      0.79      0.80       491
          STANDING      0.81      0.83      0.82       532
           WALKING      0.83      0.95      0.89       496
WALKING_DOWNSTAIRS      0.90      0.82      0.85       420
  WALKING_UPSTAIRS      0.84      0.78      0.81       471

       avg / total      0.86      0.86      0.86      2947
```

```
--------------------------
|     Best Estimator     |
--------------------------


      DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=7,
          max_features=None, max_leaf_nodes=None,
          min_impurity_decrease=0.0, min_impurity_split=None,
          min_samples_leaf=1, min_samples_split=2,
          min_weight_fraction_leaf=0.0, presort=False, random_state=None,
          splitter='best')
```

```
--------------------------
|    Best parameters     |
--------------------------
      Parameters of best estimator :

      {'max_depth': 7}
```

```
-----------------------------------
|   No of CrossValidation sets    |
-----------------------------------

      Total numbre of cross validation sets: 3
```

```
--------------------------
|      Best Score        |
--------------------------

      Average Cross Validate scores of best estimator :
```

```
0.8382752992383025
```

5. Random Forest Classifier with GridSearch

In [20]:
```python
from sklearn.ensemble import RandomForestClassifier
params = {'n_estimators': np.arange(10,201,20), 'max_depth':np.arange(3,15,2)}
rfc = RandomForestClassifier()
rfc_grid = GridSearchCV(rfc, param_grid=params, n_jobs=8)
rfc_grid_results = perform_model(rfc_grid, X_train, y_train, X_test, y_test, class_labels=labels)
print_grid_search_attributes(rfc_grid_results['model'])
```

```
training the model..
Done


training_time(HH:MM:SS.ms) - 0:01:59.069438


Predicting test data
Done


testing time(HH:MM:SS:ms) - 0:00:00.033301


---------------------
|      Accuracy      |
---------------------

    0.9107567017305734


--------------------
| Confusion Matrix |
--------------------

 [[537   0   0   0   0   0]
 [  0 422  69   0   0   0]
 [  0  49 483   0   0   0]
 [  0   0   0 482  12   2]
 [  0   0   0  40 335  45]
 [  0   0   0  40   6 425]]
```
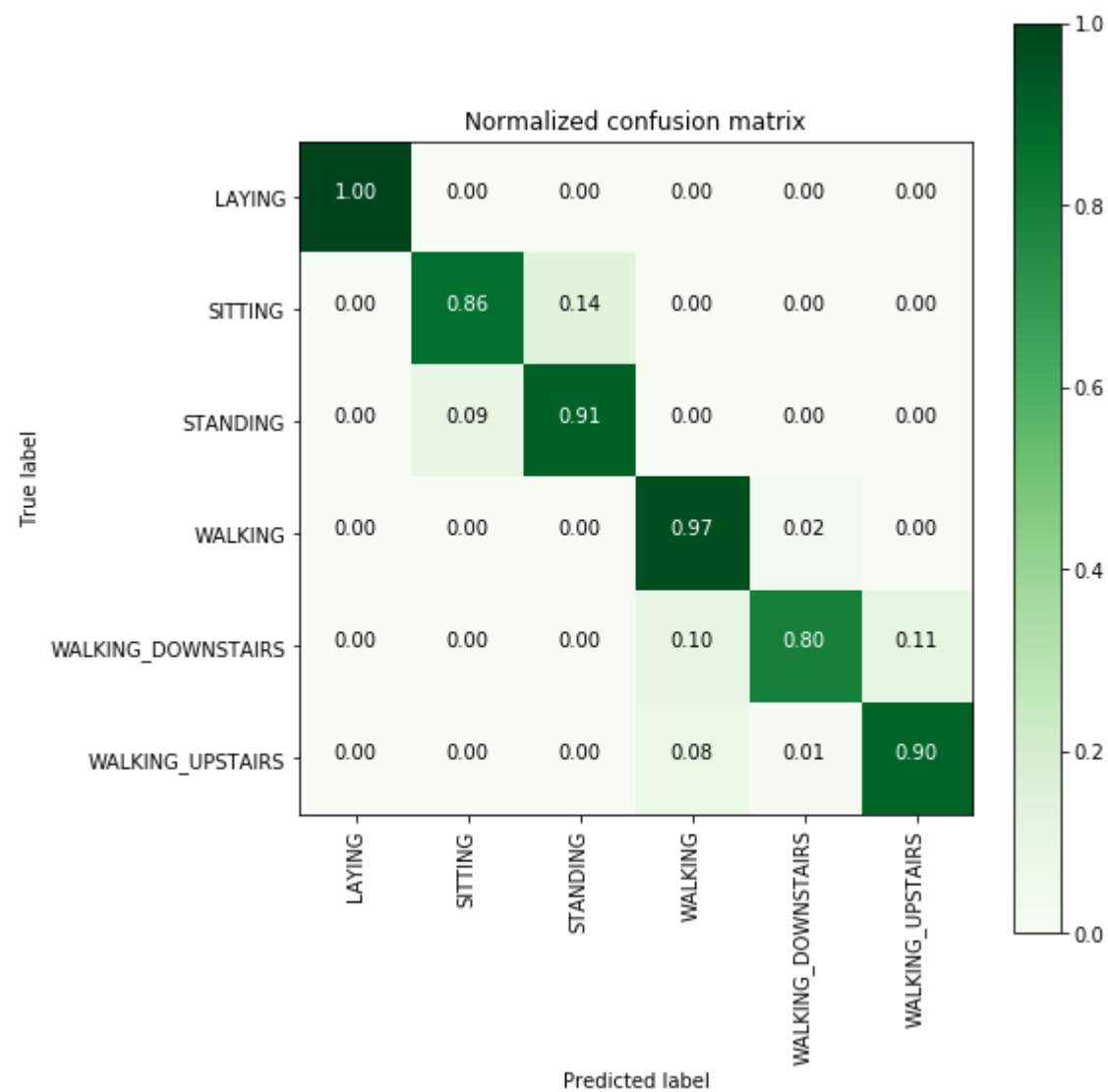
Normalized confusion matrix

```
---------------------------
| Classifiction Report |
---------------------------
                precision    recall  f1-score    support

          LAYING      1.00      1.00      1.00        537
         SITTING      0.90      0.86      0.88        491
        STANDING      0.88      0.91      0.89        532
         WALKING      0.86      0.97      0.91        496
WALKING_DOWNSTAIRS      0.95      0.80      0.87        420
  WALKING_UPSTAIRS      0.90      0.90      0.90        471

       avg / total      0.91      0.91      0.91       2947


---------------------------
|     Best Estimator     |
---------------------------


    RandomForestClassifier(bootstrap=True, class_weight=None, criterion='gini',
        max_depth=7, max_features='auto', max_leaf_nodes=None,
        min_impurity_decrease=0.0, min_impurity_split=None,
        min_samples_leaf=1, min_samples_split=2,
        min_weight_fraction_leaf=0.0, n_estimators=130, n_jobs=1,
        oob_score=False, random_state=None, verbose=0,
        warm_start=False)


---------------------------
|     Best parameters     |
---------------------------
      Parameters of best estimator :

      {'max_depth': 7, 'n_estimators': 130}


----------------------------------
|   No of CrossValidation sets    |
----------------------------------


      Total numbre of cross validation sets: 3


---------------------------
|      Best Score         |
---------------------------
```

```
Average Cross Validate scores of best estimator :

0.9124047878128401
```

6. Gradient Boosted Decision Trees With GridSearch

In [21]:
```python
from sklearn.ensemble import GradientBoostingClassifier
param_grid = {'max_depth': np.arange(5,8,1), \
              'n_estimators':np.arange(130,170,10)}
gbdt = GradientBoostingClassifier()
gbdt_grid = GridSearchCV(gbdt, param_grid=param_grid, n_jobs=8)
gbdt_grid_results = perform_model(gbdt_grid, X_train, y_train, X_test, y_test, class_labels=labels)
print_grid_search_attributes(gbdt_grid_results['model'])
```

```
training the model..
Done


training_time(HH:MM:SS.ms) - 0:17:12.707284


Predicting test data
Done


testing time(HH:MM:SS:ms) - 0:00:00.039210


---------------------
|      Accuracy       |
---------------------

    0.9226331862911435


--------------------
| Confusion Matrix |
--------------------

 [[537   0   0   0   0   0]
 [  0 399  90   0   0   2]
 [  0  38 494   0   0   0]
 [  0   0   0 483   7   6]
 [  0   0   0  10 374  36]
 [  0   1   0  32   6 432]]
```
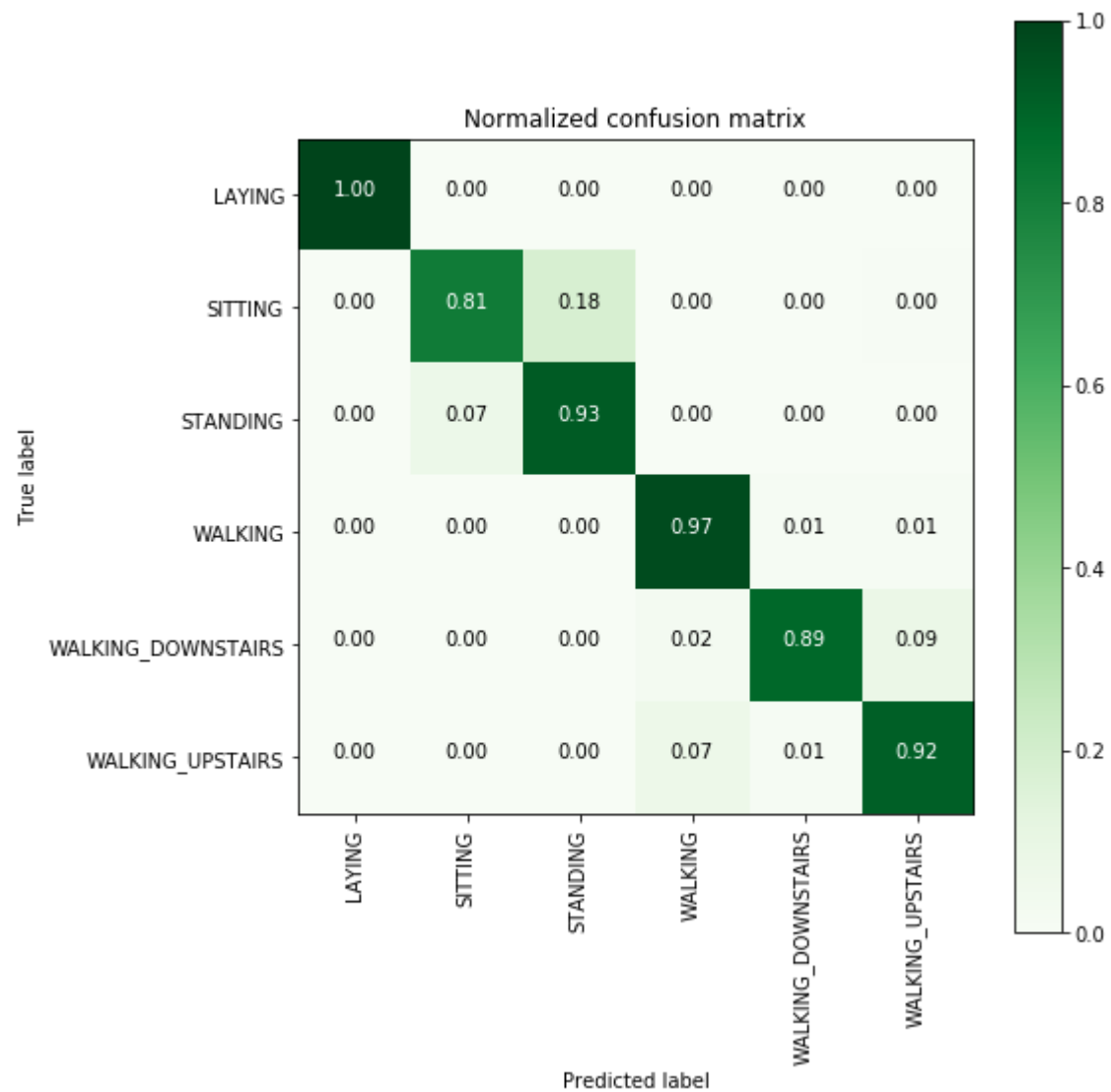
Normalized confusion matrix

	LAYING	SITTING	STANDING	WALKING	WALKING_DOWNSTAIRS	WALKING_UPSTAIRS
LAYING	1.00	0.00	0.00	0.00	0.00	0.00
SITTING	0.00	0.81	0.18	0.00	0.00	0.00
STANDING	0.00	0.07	0.93	0.00	0.00	0.00
WALKING	0.00	0.00	0.00	0.97	0.01	0.01
WALKING_DOWNSTAIRS	0.00	0.00	0.00	0.02	0.89	0.09
WALKING_UPSTAIRS	0.00	0.00	0.00	0.07	0.01	0.92

True label

Predicted label

```
--------------------------
| Classifiction Report |
--------------------------

                   precision    recall   f1-score    support

           LAYING       1.00      1.00       1.00        537
          SITTING       0.91      0.81       0.86        491
         STANDING       0.85      0.93       0.89        532
          WALKING       0.92      0.97       0.95        496
WALKING_DOWNSTAIRS       0.97      0.89       0.93        420
  WALKING_UPSTAIRS       0.91      0.92       0.91        471

      avg / total       0.92      0.92       0.92       2947


--------------------------
|     Best Estimator     |
--------------------------


    GradientBoostingClassifier(criterion='friedman_mse', init=None,
            learning_rate=0.1, loss='deviance', max_depth=5,
            max_features=None, max_leaf_nodes=None,
            min_impurity_decrease=0.0, min_impurity_split=None,
            min_samples_leaf=1, min_samples_split=2,
            min_weight_fraction_leaf=0.0, n_estimators=150,
            presort='auto', random_state=None, subsample=1.0, verbose=0,
            warm_start=False)


--------------------------
|     Best parameters    |
--------------------------
      Parameters of best estimator :

      {'max_depth': 5, 'n_estimators': 150}


-----------------------------------
|   No of CrossValidation sets    |
-----------------------------------

      Total numbre of cross validation sets: 3


--------------------------
|      Best Score        |
--------------------------
```

Average Cross Validate scores of best estimator :

0.9036996735582155

7. Comparing all models

```python
print('\n                    Accuracy      Error')
print('                    ----------    --------')
print('Logistic Regression : {:.04}%       {:.04}%'.format(log_reg_grid_results['accuracy'] * 100,\
                                           100-(log_reg_grid_results['accuracy'] * 100)))

print('Linear SVC          : {:.04}%       {:.04}% '.format(lr_svc_grid_results['accuracy'] * 100,\
                                           100-(lr_svc_grid_results['accuracy'] * 100)))

print('rbf SVM classifier  : {:.04}%       {:.04}% '.format(rbf_svm_grid_results['accuracy'] * 100,\
                                           100-(rbf_svm_grid_results['accuracy'] * 100)))

print('DecisionTree        : {:.04}%       {:.04}% '.format(dt_grid_results['accuracy'] * 100,\
                                           100-(dt_grid_results['accuracy'] * 100)))

print('Random Forest       : {:.04}%       {:.04}% '.format(rfc_grid_results['accuracy'] * 100,\
                                           100-(rfc_grid_results['accuracy'] * 100)))
print('GradientBoosting DT : {:.04}%       {:.04}% '.format(rfc_grid_results['accuracy'] * 100,\
                                           100-(rfc_grid_results['accuracy'] * 100)))
```

```
                      Accuracy      Error
                      ----------    --------
Logistic Regression : 96.3%         3.699%
Linear SVC          : 96.5%         3.495%
rbf SVM classifier  : 96.27%        3.733%
DecisionTree        : 86.39%        13.61%
Random Forest       : 91.08%        8.924%
GradientBoosting DT : 91.08%        8.924%
```

Using raw time series data and deep learning methods:

Approch 1 - Using LSTM

Approch 2 - Using CNN - CNN are useful to get best features and realtions between sequnce data using convolution.

Approch 3 - Using some cascading techniques.

LSTM

```python
# Importing libraries
import numpy as np
import pandas as pd
from numpy import mean
from numpy import std
from numpy import dstack
from pandas import read_csv
from matplotlib import pyplot
from sklearn.preprocessing import StandardScaler
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Flatten
from keras.layers import Dropout
from keras.layers.convolutional import Conv1D
from keras.layers.convolutional import MaxPooling1D
from keras.utils import to_categorical
from keras.models import Sequential
from keras.layers import LSTM
from keras.layers.core import Dense, Dropout
```

In [6]:

Using TensorFlow backend.

In [9]:
```python
# Activities are the class labels
# It is a 6 class classification
ACTIVITIES = {
    0: 'WALKING',
    1: 'WALKING_UPSTAIRS',
    2: 'WALKING_DOWNSTAIRS',
    3: 'SITTING',
    4: 'STANDING',
    5: 'LAYING',
}

# Utility function to print the confusion matrix
def confusion_matrix(Y_true, Y_pred):
    Y_true = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_true, axis=1)])
    Y_pred = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_pred, axis=1)])

    return pd.crosstab(Y_true, Y_pred, rownames=['True'], colnames=['Pred'])
```

In [10]:
```python
# Data directory
DATADIR = 'UCI_HAR_Dataset'
# Raw data signals
# Signals are from Accelerometer and Gyroscope
# The signals are in x,y,z directions
# Sensor signals are filtered to have only body acceleration
# excluding the acceleration due to gravity
# Triaxial acceleration from the accelerometer is total acceleration
SIGNALS = [
    "body_acc_x",
    "body_acc_y",
    "body_acc_z",
    "body_gyro_x",
    "body_gyro_y",
    "body_gyro_z",
    "total_acc_x",
    "total_acc_y",
    "total_acc_z"
]
```

In [11]:
```python
# Utility function to read the data from csv file
def _read_csv(filename):
    return pd.read_csv(filename, delim_whitespace=True, header=None)


# Utility function to load the load
def load_signals(subset):
    signals_data = []

    for signal in SIGNALS:
        filename = f'UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
        signals_data.append(
            _read_csv(filename).as_matrix()
        )

    # Transpose is used to change the dimensionality of the output,
    # aggregating the signals by combination of sample/timestep.
    # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
    return np.transpose(signals_data, (1, 2, 0))
```

In [12]:
```python
def load_y(subset):
    """
    The objective that we are trying to predict is a integer, from 1 to 6,
    that represents a human activity. We return a binary representation of
    every sample objective as a 6 bits vector using One Hot Encoding
    (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
    """
    filename = f'UCI_HAR_Dataset/{subset}/y_{subset}.txt'
    y = _read_csv(filename)[0]

    return pd.get_dummies(y).as_matrix()
```

In [13]:
```python
def load_data():
    """
    Obtain the dataset from multiple files.
    Returns: X_train, X_test, y_train, y_test
    """
    X_train, X_test = load_signals('train'), load_signals('test')
    y_train, y_test = load_y('train'), load_y('test')

    return X_train, y_train, X_test,  y_test
```

In [12]:
```python
# Importing tensorflow
np.random.seed(42)
import tensorflow as tf
tf.set_random_seed(42)
```

In [13]:
```python
# Importing libraries
from keras.models import Sequential
from keras.layers import LSTM
from keras.layers.core import Dense, Dropout
```

In [14]:
```python
# Initializing parameters
epochs = 30
batch_size = 16
n_hidden = 32
```

In [14]:
```python
# Utility function to count the number of classes
def _count_classes(y):
    return len(set([tuple(category) for category in y]))
```

In [16]:
```python
# Loading the train and test data
X_train, Y_train, X_test,  Y_test = load_data()
```

In [17]:
```python
timesteps = len(X_train[0])
input_dim = len(X_train[0][0])
n_classes = _count_classes(Y_train)
#n_classes  = 6
print(timesteps)
print(input_dim)
print(len(X_train))
```

```
128
9
7352
```

Base Model

In [14]:
```python
# Initiliazing the sequential model
model = Sequential()
# Configuring the parameters
model.add(LSTM(n_hidden, input_shape=(timesteps, input_dim)))
# Adding a dropout layer
model.add(Dropout(0.5))
# Adding a dense output layer with sigmoid activation
model.add(Dense(n_classes, activation='sigmoid'))
model.summary()
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
lstm_1 (LSTM)                (None, 32)                5376

_____
dropout_1 (Dropout)          (None, 32)                0

_____
dense_1 (Dense)              (None, 6)                 198
=================================================================
Total params: 5,574
Trainable params: 5,574
Non-trainable params: 0
_____
```

In [22]:
```python
# Compiling the model
model.compile(loss='categorical_crossentropy',
              optimizer='rmsprop',
              metrics=['accuracy'])
```

In [23]:
```python
# Training the model
model.fit(X_train,
          Y_train,
          batch_size=batch_size,
          validation_data=(X_test, Y_test),
          epochs=epochs)
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
7352/7352 [==============================] - 54s 7ms/step - loss: 1.3194 - acc: 0.4376 - val_loss: 1.1805 - v
al_acc: 0.4496
Epoch 2/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.9842 - acc: 0.5749 - val_loss: 0.9447 - v
al_acc: 0.5857
Epoch 3/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.7991 - acc: 0.6470 - val_loss: 0.7865 - v
al_acc: 0.6132
Epoch 4/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.6984 - acc: 0.6661 - val_loss: 0.8261 - v
al_acc: 0.5901
Epoch 5/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.6306 - acc: 0.6876 - val_loss: 0.7671 - v
al_acc: 0.6434
Epoch 6/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.6168 - acc: 0.7084 - val_loss: 0.8407 - v
al_acc: 0.6590
Epoch 7/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.6056 - acc: 0.7361 - val_loss: 0.6495 - v
al_acc: 0.7248
Epoch 8/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.5260 - acc: 0.7719 - val_loss: 0.6340 - v
al_acc: 0.7265
Epoch 9/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.4605 - acc: 0.7900 - val_loss: 0.6768 - v
al_acc: 0.7296
Epoch 10/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.4405 - acc: 0.7999 - val_loss: 0.5573 - v
al_acc: 0.7530
Epoch 11/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.4180 - acc: 0.8013 - val_loss: 0.5859 - v
al_acc: 0.7201
Epoch 12/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.4083 - acc: 0.8198 - val_loss: 0.5773 - v
al_acc: 0.7625
Epoch 13/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.3706 - acc: 0.8560 - val_loss: 0.6319 - v
al_acc: 0.8504
Epoch 14/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.3456 - acc: 0.8832 - val_loss: 0.4920 - v
al_acc: 0.8717
```

```
Epoch 15/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.2947 - acc: 0.9135 - val_loss: 0.6581 - v
al_acc: 0.8554
Epoch 16/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.3015 - acc: 0.9159 - val_loss: 0.4791 - v
al_acc: 0.8833
Epoch 17/30
7352/7352 [==============================] - 52s 7ms/step - loss: 0.2472 - acc: 0.9317 - val_loss: 0.5137 - v
al_acc: 0.8785
Epoch 18/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.2784 - acc: 0.9271 - val_loss: 0.7416 - v
al_acc: 0.8364
Epoch 19/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.2505 - acc: 0.9306 - val_loss: 0.4745 - v
al_acc: 0.8894
Epoch 20/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.2093 - acc: 0.9344 - val_loss: 0.5829 - v
al_acc: 0.8775
Epoch 21/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.2218 - acc: 0.9370 - val_loss: 0.4609 - v
al_acc: 0.8931
Epoch 22/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.1966 - acc: 0.9414 - val_loss: 0.4116 - v
al_acc: 0.9046
Epoch 23/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.1827 - acc: 0.9403 - val_loss: 0.4737 - v
al_acc: 0.8979
Epoch 24/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.1801 - acc: 0.9393 - val_loss: 0.6009 - v
al_acc: 0.8860
Epoch 25/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.1896 - acc: 0.9433 - val_loss: 0.4729 - v
al_acc: 0.9063
Epoch 26/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.2555 - acc: 0.9334 - val_loss: 0.4608 - v
al_acc: 0.9070
Epoch 27/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.1791 - acc: 0.9434 - val_loss: 0.4300 - v
al_acc: 0.9080
Epoch 28/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.2444 - acc: 0.9339 - val_loss: 0.4088 - v
al_acc: 0.9101
Epoch 29/30
```

```
7352/7352 [==============================] - 53s 7ms/step - loss: 0.1938 - acc: 0.9393 - val_loss: 0.4978 - v
al_acc: 0.9050
Epoch 30/30
7352/7352 [==============================] - 53s 7ms/step - loss: 0.1598 - acc: 0.9450 - val_loss: 0.4559 - v
al_acc: 0.9013
```

Out[23]:   <keras.callbacks.History at 0x14f1ed870710>

Multi layer LSTM

In [16]:
```python
# Initiliazing the sequential model
model = Sequential()
# Configuring the parameters
model.add(LSTM(32,return_sequences=True,input_shape=(timesteps, input_dim)))
# Adding a dropout layer
model.add(Dropout(0.5))

model.add(LSTM(28,input_shape=(timesteps, input_dim)))
# Adding a dropout layer
model.add(Dropout(0.6))
# Adding a dense output layer with sigmoid activation
model.add(Dense(n_classes, activation='sigmoid'))
model.summary()
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
lstm_5 (LSTM)                (None, 128, 32)           5376
_____
dropout_5 (Dropout)          (None, 128, 32)           0
_____
lstm_6 (LSTM)                (None, 28)                6832
_____
dropout_6 (Dropout)          (None, 28)                0
_____
dense_3 (Dense)              (None, 6)                 174
=================================================================
Total params: 12,382
Trainable params: 12,382
Non-trainable params: 0
_____
```

In [17]:
```python
# Compiling the model
model.compile(loss='categorical_crossentropy',
              optimizer='rmsprop',
              metrics=['accuracy'])
```

In [18]:
```python
# Training the model
model.fit(X_train,
          Y_train,
          batch_size=batch_size,
          validation_data=(X_test, Y_test),
          epochs=epochs)
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
7352/7352 [==============================] - 109s 15ms/step - loss: 1.3081 - acc: 0.4561 - val_loss: 0.9680 -
val_acc: 0.5409
Epoch 2/30
7352/7352 [==============================] - 107s 15ms/step - loss: 0.8821 - acc: 0.6051 - val_loss: 0.8140 -
val_acc: 0.6284
Epoch 3/30
7352/7352 [==============================] - 106s 14ms/step - loss: 0.7624 - acc: 0.6359 - val_loss: 0.8088 -
val_acc: 0.6037
Epoch 4/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.7258 - acc: 0.6302 - val_loss: 0.7932 -
val_acc: 0.6189
Epoch 5/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.7122 - acc: 0.6474 - val_loss: 0.7969 -
val_acc: 0.6189
Epoch 6/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.6977 - acc: 0.6515 - val_loss: 0.7787 -
val_acc: 0.6152
Epoch 7/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.6750 - acc: 0.6790 - val_loss: 0.7335 -
val_acc: 0.6793
Epoch 8/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.6167 - acc: 0.7329 - val_loss: 0.7110 -
val_acc: 0.6990
Epoch 9/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.5178 - acc: 0.7889 - val_loss: 0.6528 -
val_acc: 0.7357
Epoch 10/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.4557 - acc: 0.8215 - val_loss: 0.5696 -
val_acc: 0.8521
Epoch 11/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.4006 - acc: 0.8554 - val_loss: 0.7078 -
val_acc: 0.8093
Epoch 12/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.3518 - acc: 0.8936 - val_loss: 0.4328 -
val_acc: 0.8884
Epoch 13/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.2959 - acc: 0.9102 - val_loss: 0.5183 -
val_acc: 0.8595
Epoch 14/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.2716 - acc: 0.9240 - val_loss: 0.5887 -
val_acc: 0.8568
```

```
Epoch 15/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.2532 - acc: 0.9223 - val_loss: 0.4996 -
val_acc: 0.8887
Epoch 16/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.2409 - acc: 0.9295 - val_loss: 0.4287 -
val_acc: 0.8992
Epoch 17/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.2296 - acc: 0.9342 - val_loss: 0.4177 -
val_acc: 0.8931
Epoch 18/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.2039 - acc: 0.9377 - val_loss: 0.5764 -
val_acc: 0.8962
Epoch 19/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.2141 - acc: 0.9331 - val_loss: 0.4349 -
val_acc: 0.9080
Epoch 20/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.2001 - acc: 0.9382 - val_loss: 0.5034 -
val_acc: 0.8914
Epoch 21/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1917 - acc: 0.9348 - val_loss: 0.4654 -
val_acc: 0.9108
Epoch 22/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1970 - acc: 0.9362 - val_loss: 0.4669 -
val_acc: 0.8989
Epoch 23/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1801 - acc: 0.9425 - val_loss: 0.5325 -
val_acc: 0.8928
Epoch 24/30
7352/7352 [==============================] - 106s 14ms/step - loss: 0.1680 - acc: 0.9446 - val_loss: 0.5077 -
val_acc: 0.9030
Epoch 25/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1835 - acc: 0.9418 - val_loss: 0.5613 -
val_acc: 0.9067
Epoch 26/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1692 - acc: 0.9449 - val_loss: 0.4361 -
val_acc: 0.9148
Epoch 27/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1722 - acc: 0.9421 - val_loss: 0.6196 -
val_acc: 0.8985
Epoch 28/30
7352/7352 [==============================] - 104s 14ms/step - loss: 0.1739 - acc: 0.9434 - val_loss: 0.4876 -
val_acc: 0.9131
Epoch 29/30
```

```
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1833 - acc: 0.9421 - val_loss: 0.6746 -
val_acc: 0.8999
Epoch 30/30
7352/7352 [==============================] - 105s 14ms/step - loss: 0.1730 - acc: 0.9431 - val_loss: 0.4763 -
val_acc: 0.9084
```

Out[18]: <keras.callbacks.History at 0x14f13724bc88>

Above 2 layer LSTM is giving similar score as 1 layer LSTM which we trained above.

In [14]:
```python
from keras.regularizers import l2
```

In [20]:
```python
# Initiliazing the sequential model
model = Sequential()
# Configuring the parameters
model.add(LSTM(32,recurrent_regularizer=l2(0.003),return_sequences=True,input_shape=(timesteps, input_dim)))
# Adding a dropout layer
model.add(Dropout(0.5))

model.add(LSTM(28,input_shape=(timesteps, input_dim)))
# Adding a dropout layer
model.add(Dropout(0.6))
# Adding a dense output layer with sigmoid activation
model.add(Dense(n_classes, activation='sigmoid'))
model.summary()
```

```
Layer (type)                 Output Shape              Param #
=================================================================
lstm_7 (LSTM)                (None, 128, 32)           5376

dropout_7 (Dropout)          (None, 128, 32)           0

lstm_8 (LSTM)                (None, 28)                6832

dropout_8 (Dropout)          (None, 28)                0

dense_4 (Dense)              (None, 6)                 174
=================================================================
Total params: 12,382
Trainable params: 12,382
Non-trainable params: 0
```

In [21]:
```python
# Compiling the model
model.compile(loss='categorical_crossentropy',
              optimizer='adam',
              metrics=['accuracy'])
```

```
In [22]:  # Training the model
          History = model.fit(X_train,
                    Y_train,
                    batch_size=batch_size,
                    validation_data=(X_test, Y_test),
                    epochs=10)
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/10
7352/7352 [==============================] - 107s 15ms/step - loss: 1.4263 - acc: 0.4241 - val_loss: 1.2625 -
val_acc: 0.5175
Epoch 2/10
7352/7352 [==============================] - 105s 14ms/step - loss: 1.2066 - acc: 0.5011 - val_loss: 1.5878 -
val_acc: 0.3549
Epoch 3/10
7352/7352 [==============================] - 105s 14ms/step - loss: 0.9923 - acc: 0.5695 - val_loss: 0.9060 -
val_acc: 0.6162
Epoch 4/10
7352/7352 [==============================] - 105s 14ms/step - loss: 0.9109 - acc: 0.5839 - val_loss: 0.8547 -
val_acc: 0.5962
Epoch 5/10
7352/7352 [==============================] - 105s 14ms/step - loss: 0.7995 - acc: 0.6223 - val_loss: 0.7806 -
val_acc: 0.6176
Epoch 6/10
7352/7352 [==============================] - 105s 14ms/step - loss: 0.8123 - acc: 0.6062 - val_loss: 0.8927 -
val_acc: 0.5887
Epoch 7/10
7352/7352 [==============================] - 105s 14ms/step - loss: 0.7574 - acc: 0.6319 - val_loss: 0.7507 -
val_acc: 0.6050
Epoch 8/10
7352/7352 [==============================] - 105s 14ms/step - loss: 0.7699 - acc: 0.6411 - val_loss: 0.7285 -
val_acc: 0.6159
Epoch 9/10
7352/7352 [==============================] - 106s 14ms/step - loss: 0.7106 - acc: 0.6493 - val_loss: 0.8037 -
val_acc: 0.5935
Epoch 10/10
7352/7352 [==============================] - 105s 14ms/step - loss: 0.7854 - acc: 0.6389 - val_loss: 1.9405 -
val_acc: 0.3936
```

Hyperparameter Tuning Using Hyperas:

```
In [18]:   # Importing tensorflow
           np.random.seed(36)
           import tensorflow as tf
           tf.set_random_seed(36)
```

```
In [5]:    # Importing libraries
           from keras.models import Sequential
           from keras.layers import LSTM
           from keras.layers.core import Dense, Dropout
           from hyperopt import Trials, STATUS_OK, tpe
           from hyperas import optim
           from hyperas.distributions import choice, uniform
           from hyperas.utils import eval_hyperopt_space
```

In [6]:
```python
##gives train and validation data
def data():
    """
    Obtain the dataset from multiple files.
    Returns: X_train, X_test, y_train, y_test
    """
    # Data directory
    DATADIR = 'UCI_HAR_Dataset'
    # Raw data signals
    # Signals are from Accelerometer and Gyroscope
    # The signals are in x,y,z directions
    # Sensor signals are filtered to have only body acceleration
    # excluding the acceleration due to gravity
    # Triaxial acceleration from the accelerometer is total acceleration
    SIGNALS = [
        "body_acc_x",
        "body_acc_y",
        "body_acc_z",
        "body_gyro_x",
        "body_gyro_y",
        "body_gyro_z",
        "total_acc_x",
        "total_acc_y",
        "total_acc_z"
        ]
    # Utility function to read the data from csv file
    def _read_csv(filename):
        return pd.read_csv(filename, delim_whitespace=True, header=None)

    # Utility function to load the load
    def load_signals(subset):
        signals_data = []

        for signal in SIGNALS:
            filename = f'UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
            signals_data.append( _read_csv(filename).as_matrix())

        # Transpose is used to change the dimensionality of the output,
        # aggregating the signals by combination of sample/timestep.
        # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
        return np.transpose(signals_data, (1, 2, 0))
```

```python
    def load_y(subset):
        """
        The objective that we are trying to predict is a integer, from 1 to 6,
        that represents a human activity. We return a binary representation of
        every sample objective as a 6 bits vector using One Hot Encoding
        (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
        """
        filename = f'UCI_HAR_Dataset/{subset}/y_{subset}.txt'
        y = _read_csv(filename)[0]
        return pd.get_dummies(y).as_matrix()

    X_train, X_val = load_signals('train'), load_signals('test')
    Y_train, Y_val = load_y('train'), load_y('test')

    return X_train, Y_train, X_val,  Y_val
```

In [7]:
```python
from keras.regularizers import l2
import keras
```

```
In [8]:  ##model
         def model(X_train, Y_train, X_val, Y_val):
             # Importing tensorflow
             np.random.seed(36)
             import tensorflow as tf
             tf.set_random_seed(36)
             # Initiliazing the sequential model
             model = Sequential()
             if conditional({{choice(['one', 'two'])}}) == 'two':
                 # Configuring the parameters
                 model.add(LSTM({{choice([28,32,38])}},recurrent_regularizer=l2({{uniform(0,0.0002)}}),return_sequence
         s=True,input_shape=(128, 9),name='LSTM2_1'))
                 # Adding a dropout layer
                 model.add(Dropout({{uniform(0.35,0.65)}},name='Dropout2_1'))
                 model.add(LSTM({{choice([26,32,36])}},recurrent_regularizer=l2({{uniform(0,0.001)}}),input_shape=(128
         , 9),name='LSTM2_2'))
                 model.add(Dropout({{uniform(0.5,0.7)}},name='Dropout2_2'))
                 # Adding a dense output layer with sigmoid activation
                 model.add(Dense(6, activation='sigmoid'))
             else:
                 # Configuring the parameters
                 model.add(LSTM({{choice([28,32,36])}},recurrent_regularizer=l2({{uniform(0,0.001)}}),input_shape=(128
         , 9),name='LSTM1_1'))
                 # Adding a dropout layer
                 model.add(Dropout({{uniform(0.35,0.55)}},name='Dropout1_1'))
                 # Adding a dense output layer with sigmoid activation
                 model.add(Dense(6, activation='sigmoid'))

             adam = keras.optimizers.Adam(lr={{uniform(0.009,0.025)}})
             rmsprop = keras.optimizers.RMSprop(lr={{uniform(0.009,0.025)}})

             choiceval = {{choice(['adam', 'rmsprop'])}}

             if choiceval == 'adam':
                 optim = adam
             else:
                 optim = rmsprop

             print(model.summary())

             model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
```

```python
    result = model.fit(X_train, Y_train,
              batch_size=16,
              nb_epoch=30,
              verbose=2,
              validation_data=(X_val, Y_val))

    score, acc = model.evaluate(X_val, Y_val, verbose=0)
    print('Test accuracy:', acc)
    print('-------------------------------------------------------------------------------')
    return {'loss': -acc, 'status': STATUS_OK, 'model': model}
```

```
In [43]: X_train, Y_train, X_val, Y_val = data()
         trials = Trials()
         best_run, best_model, space = optim.minimize(model=model,
                                           data=data,
                                           algo=tpe.suggest,
                                           max_evals=15,
                                           trials=trials,notebook_name = 'Human Activity Detection',
                                           return_space = True)
```

```
>>> Imports:
#coding=utf-8

try:
    from keras.models import Sequential
except:
    pass

try:
    from keras.layers import LSTM
except:
    pass

try:
    from keras.layers.core import Dense, Dropout
except:
    pass

try:
    from hyperopt import Trials, STATUS_OK, tpe
except:
    pass

try:
    from hyperas import optim
except:
    pass

try:
    from hyperas.distributions import choice, uniform
except:
    pass

try:
    import pandas as pd
except:
    pass

try:
    import numpy as np
except:
    pass
```

```
try:
    import tensorflow as tf
except:
    pass

try:
    from keras.regularizers import l2
except:
    pass

try:
    import tensorflow as tf
except:
    pass

try:
    import keras
except:
    pass

try:
    import pickle
except:
    pass

try:
    from hyperas.utils import eval_hyperopt_space
except:
    pass

>>> Hyperas search space:

def get_space():
    return {
        'conditional': hp.choice('conditional', ['one', 'two']),
        'LSTM': hp.choice('LSTM', [28,32,38]),
        'l2': hp.uniform('l2', 0,0.0002),
        'Dropout': hp.uniform('Dropout', 0.35,0.65),
        'LSTM_1': hp.choice('LSTM_1', [26,32,36]),
        'l2_1': hp.uniform('l2_1', 0,0.001),
        'Dropout_1': hp.uniform('Dropout_1', 0.5,0.7),
        'LSTM_2': hp.choice('LSTM_2', [28,32,36]),
        'l2_2': hp.uniform('l2_2', 0,0.001),
```

```
        'Dropout_2': hp.uniform('Dropout_2', 0.35,0.55),
        'lr': hp.uniform('lr', 0.009,0.025),
        'lr_1': hp.uniform('lr_1', 0.009,0.025),
        'choiceval': hp.choice('choiceval', ['adam', 'rmsprop']),
    }
```

>>> Data
```
 1:
 2: """
 3: Obtain the dataset from multiple files.
 4: Returns: X_train, X_test, y_train, y_test
 5: """
 6: # Data directory
 7: DATADIR = 'UCI_HAR_Dataset'
 8: # Raw data signals
 9: # Signals are from Accelerometer and Gyroscope
10: # The signals are in x,y,z directions
11: # Sensor signals are filtered to have only body acceleration
12: # excluding the acceleration due to gravity
13: # Triaxial acceleration from the accelerometer is total acceleration
14: SIGNALS = [
15:     "body_acc_x",
16:     "body_acc_y",
17:     "body_acc_z",
18:     "body_gyro_x",
19:     "body_gyro_y",
20:     "body_gyro_z",
21:     "total_acc_x",
22:     "total_acc_y",
23:     "total_acc_z"
24:     ]
25: # Utility function to read the data from csv file
26: def _read_csv(filename):
27:     return pd.read_csv(filename, delim_whitespace=True, header=None)
28:
29: # Utility function to load the load
30: def load_signals(subset):
31:     signals_data = []
32:
33:     for signal in SIGNALS:
34:         filename = f'HAR/UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
35:         signals_data.append( _read_csv(filename).as_matrix())
36:
```

```
37:        # Transpose is used to change the dimensionality of the output,
38:        # aggregating the signals by combination of sample/timestep.
39:        # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
40:        return np.transpose(signals_data, (1, 2, 0))
41:
42: def load_y(subset):
43:        """
44:        The objective that we are trying to predict is a integer, from 1 to 6,
45:        that represents a human activity. We return a binary representation of
46:        every sample objective as a 6 bits vector using One Hot Encoding
47:        (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
48:        """
49:        filename = f'HAR/UCI_HAR_Dataset/{subset}/y_{subset}.txt'
50:        y = _read_csv(filename)[0]
51:        return pd.get_dummies(y).as_matrix()
52:
53: X_train, X_val = load_signals('train'), load_signals('test')
54: Y_train, Y_val = load_y('train'), load_y('test')
55:
56:
57:
58:
```

>>> Resulting replaced keras model:

```
 1: def keras_fmin_fnct(space):
 2:
 3:        # Importing tensorflow
 4:        np.random.seed(36)
 5:        tf.set_random_seed(36)
 6:        # Initiliazing the sequential model
 7:        model = Sequential()
 8:        if conditional(space['conditional']) == 'two':
 9:            # Configuring the parameters
10:            model.add(LSTM(space['LSTM'],recurrent_regularizer=l2(space['l2']),return_sequences=True,input_
shape=(128, 9),name='LSTM2_1'))
11:            # Adding a dropout layer
12:            model.add(Dropout(space['Dropout'],name='Dropout2_1'))
13:            model.add(LSTM(space['LSTM_1'],recurrent_regularizer=l2(space['l2_1']),input_shape=(128, 9),nam
e='LSTM2_2'))
14:            model.add(Dropout(space['Dropout_1'],name='Dropout2_2'))
15:            # Adding a dense output layer with sigmoid activation
16:            model.add(Dense(6, activation='sigmoid'))
17:        else:
```

```
18:            # Configuring the parameters
19:            model.add(LSTM(space['LSTM_2'],recurrent_regularizer=l2(space['l2_2']),input_shape=(128, 9),nam
e='LSTM1_1'))
20:            # Adding a dropout layer
21:            model.add(Dropout(space['Dropout_2'],name='Dropout1_1'))
22:            # Adding a dense output layer with sigmoid activation
23:            model.add(Dense(6, activation='sigmoid'))
24:
25:        adam = keras.optimizers.Adam(lr=space['lr'])
26:        rmsprop = keras.optimizers.RMSprop(lr=space['lr_1'])
27:
28:        choiceval = space['choiceval']
29:
30:        if choiceval == 'adam':
31:            optim = adam
32:        else:
33:            optim = rmsprop
34:
35:        print(model.summary())
36:
37:        model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
38:
39:        result = model.fit(X_train, Y_train,
40:                batch_size=16,
41:                nb_epoch=30,
42:                verbose=2,
43:                validation_data=(X_val, Y_val))
44:
45:        score, acc = model.evaluate(X_val, Y_val, verbose=0)
46:        print('Test accuracy:', acc)
47:        print('-----------------------------------------------------------------------------------')
48:        return {'loss': -acc, 'status': STATUS_OK, 'model': model}
49:
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 32)                5376

_____
Dropout1_1 (Dropout)         (None, 32)                0

_____
dense_1 (Dense)              (None, 6)                 198
=================================================================
Total params: 5,574
```

```
Trainable params: 5,574
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 54s - loss: 1.2450 - acc: 0.4542 - val_loss: 1.3427 - val_acc: 0.3712
Epoch 2/30
 - 53s - loss: 0.9058 - acc: 0.5974 - val_loss: 0.7812 - val_acc: 0.6379
Epoch 3/30
 - 52s - loss: 0.7532 - acc: 0.6465 - val_loss: 0.6822 - val_acc: 0.7207
Epoch 4/30
 - 51s - loss: 0.5511 - acc: 0.8190 - val_loss: 0.4388 - val_acc: 0.8626
Epoch 5/30
 - 51s - loss: 0.3685 - acc: 0.9067 - val_loss: 0.7325 - val_acc: 0.8124
Epoch 6/30
 - 52s - loss: 0.3109 - acc: 0.9203 - val_loss: 0.4244 - val_acc: 0.8863
Epoch 7/30
 - 52s - loss: 0.2748 - acc: 0.9271 - val_loss: 0.4503 - val_acc: 0.8948
Epoch 8/30
 - 52s - loss: 0.2566 - acc: 0.9238 - val_loss: 0.5668 - val_acc: 0.8670
Epoch 9/30
 - 51s - loss: 0.2533 - acc: 0.9306 - val_loss: 0.4599 - val_acc: 0.9013
Epoch 10/30
 - 51s - loss: 0.2503 - acc: 0.9287 - val_loss: 0.3217 - val_acc: 0.9009
Epoch 11/30
 - 52s - loss: 0.2251 - acc: 0.9388 - val_loss: 0.3650 - val_acc: 0.9104
Epoch 12/30
 - 51s - loss: 0.2239 - acc: 0.9363 - val_loss: 0.5278 - val_acc: 0.9053
Epoch 13/30
 - 51s - loss: 0.2239 - acc: 0.9324 - val_loss: 0.4011 - val_acc: 0.8924
Epoch 14/30
 - 52s - loss: 0.2066 - acc: 0.9385 - val_loss: 0.5576 - val_acc: 0.8999
Epoch 15/30
 - 52s - loss: 0.2208 - acc: 0.9370 - val_loss: 0.6006 - val_acc: 0.8833
Epoch 16/30
 - 52s - loss: 0.2124 - acc: 0.9392 - val_loss: 0.6876 - val_acc: 0.8666
Epoch 17/30
 - 52s - loss: 0.2021 - acc: 0.9399 - val_loss: 0.4828 - val_acc: 0.9023
Epoch 18/30
 - 52s - loss: 0.2058 - acc: 0.9372 - val_loss: 0.5229 - val_acc: 0.9077
Epoch 19/30
 - 53s - loss: 0.2071 - acc: 0.9392 - val_loss: 0.5419 - val_acc: 0.8904
```

```
Epoch 20/30
 - 53s - loss: 0.2081 - acc: 0.9378 - val_loss: 0.7437 - val_acc: 0.8843
Epoch 21/30
 - 52s - loss: 0.2032 - acc: 0.9407 - val_loss: 0.8337 - val_acc: 0.8911
Epoch 22/30
 - 52s - loss: 0.2136 - acc: 0.9404 - val_loss: 0.6945 - val_acc: 0.8897
Epoch 23/30
 - 53s - loss: 0.1895 - acc: 0.9388 - val_loss: 0.5063 - val_acc: 0.8999
Epoch 24/30
 - 53s - loss: 0.1968 - acc: 0.9468 - val_loss: 0.4665 - val_acc: 0.9074
Epoch 25/30
 - 52s - loss: 0.1866 - acc: 0.9450 - val_loss: 0.7473 - val_acc: 0.8856
Epoch 26/30
 - 52s - loss: 0.1845 - acc: 0.9412 - val_loss: 0.6272 - val_acc: 0.8901
Epoch 27/30
 - 52s - loss: 0.2020 - acc: 0.9426 - val_loss: 0.5100 - val_acc: 0.8975
Epoch 28/30
 - 52s - loss: 0.1866 - acc: 0.9406 - val_loss: 0.6803 - val_acc: 0.8887
Epoch 29/30
 - 52s - loss: 0.1897 - acc: 0.9434 - val_loss: 0.6320 - val_acc: 0.8982
Epoch 30/30
 - 52s - loss: 0.1871 - acc: 0.9486 - val_loss: 0.6176 - val_acc: 0.9002
Test accuracy: 0.9002375296912114
--------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
LSTM2_1 (LSTM)               (None, 128, 28)           4256
_____
Dropout2_1 (Dropout)         (None, 128, 28)           0
_____
LSTM2_2 (LSTM)               (None, 32)                7808
_____
Dropout2_2 (Dropout)         (None, 32)                0
_____
dense_2 (Dense)              (None, 6)                 198
=================================================================
Total params: 12,262
Trainable params: 12,262
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
```

```
Epoch 1/30
 - 116s - loss: 1.3509 - acc: 0.4094 - val_loss: 1.2985 - val_acc: 0.4211
Epoch 2/30
 - 114s - loss: 1.1227 - acc: 0.5048 - val_loss: 0.9203 - val_acc: 0.5840
Epoch 3/30
 - 114s - loss: 0.9163 - acc: 0.5909 - val_loss: 0.7878 - val_acc: 0.5979
Epoch 4/30
 - 113s - loss: 0.7372 - acc: 0.6355 - val_loss: 0.8733 - val_acc: 0.6576
Epoch 5/30
 - 113s - loss: 0.7606 - acc: 0.6559 - val_loss: 0.7596 - val_acc: 0.6627
Epoch 6/30
 - 113s - loss: 0.6631 - acc: 0.7126 - val_loss: 0.6731 - val_acc: 0.7272
Epoch 7/30
 - 112s - loss: 0.6001 - acc: 0.7648 - val_loss: 0.6734 - val_acc: 0.7401
Epoch 8/30
 - 112s - loss: 0.5491 - acc: 0.8194 - val_loss: 0.7685 - val_acc: 0.7767
Epoch 9/30
 - 113s - loss: 0.4469 - acc: 0.8749 - val_loss: 0.6154 - val_acc: 0.8039
Epoch 10/30
 - 113s - loss: 0.3422 - acc: 0.9060 - val_loss: 0.4643 - val_acc: 0.8728
Epoch 11/30
 - 113s - loss: 0.3277 - acc: 0.9120 - val_loss: 0.5444 - val_acc: 0.8935
Epoch 12/30
 - 113s - loss: 0.2989 - acc: 0.9165 - val_loss: 0.5426 - val_acc: 0.8873
Epoch 13/30
 - 113s - loss: 0.3066 - acc: 0.9183 - val_loss: 0.5929 - val_acc: 0.8890
Epoch 14/30
 - 113s - loss: 0.2790 - acc: 0.9238 - val_loss: 0.8567 - val_acc: 0.8605
Epoch 15/30
 - 113s - loss: 0.2381 - acc: 0.9308 - val_loss: 0.4199 - val_acc: 0.8795
Epoch 16/30
 - 113s - loss: 0.2765 - acc: 0.9237 - val_loss: 0.4038 - val_acc: 0.9009
Epoch 17/30
 - 113s - loss: 0.2222 - acc: 0.9347 - val_loss: 0.9794 - val_acc: 0.8558
Epoch 18/30
 - 113s - loss: 0.2855 - acc: 0.9245 - val_loss: 0.5541 - val_acc: 0.8721
Epoch 19/30
 - 113s - loss: 0.2214 - acc: 0.9329 - val_loss: 0.6838 - val_acc: 0.8890
Epoch 20/30
 - 113s - loss: 0.2382 - acc: 0.9294 - val_loss: 0.6224 - val_acc: 0.8975
Epoch 21/30
 - 113s - loss: 0.2227 - acc: 0.9377 - val_loss: 0.9649 - val_acc: 0.8761
Epoch 22/30
```

```
 - 113s - loss: 0.2391 - acc: 0.9344 - val_loss: 0.7248 - val_acc: 0.8945
Epoch 23/30
 - 112s - loss: 0.2880 - acc: 0.9316 - val_loss: 0.6072 - val_acc: 0.8928
Epoch 24/30
 - 113s - loss: 0.2283 - acc: 0.9309 - val_loss: 0.5543 - val_acc: 0.8958
Epoch 25/30
 - 113s - loss: 0.2152 - acc: 0.9378 - val_loss: 0.7930 - val_acc: 0.8558
Epoch 26/30
 - 113s - loss: 0.2582 - acc: 0.9338 - val_loss: 0.6463 - val_acc: 0.8836
Epoch 27/30
 - 113s - loss: 0.2352 - acc: 0.9317 - val_loss: 0.5760 - val_acc: 0.8884
Epoch 28/30
 - 113s - loss: 0.2256 - acc: 0.9378 - val_loss: 0.7432 - val_acc: 0.8755
Epoch 29/30
 - 114s - loss: 0.2372 - acc: 0.9453 - val_loss: 0.6815 - val_acc: 0.8948
Epoch 30/30
 - 113s - loss: 0.2550 - acc: 0.9340 - val_loss: 0.6620 - val_acc: 0.8721
Test accuracy: 0.8720732948761453
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
LSTM2_1 (LSTM)	(None, 128, 38)	7296
Dropout2_1 (Dropout)	(None, 128, 38)	0
LSTM2_2 (LSTM)	(None, 36)	10800
Dropout2_2 (Dropout)	(None, 36)	0
dense_3 (Dense)	(None, 6)	222

```
Total params: 18,318
Trainable params: 18,318
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 119s - loss: 1.1983 - acc: 0.4893 - val_loss: 0.8035 - val_acc: 0.6149
Epoch 2/30
 - 116s - loss: 0.7894 - acc: 0.6400 - val_loss: 0.8551 - val_acc: 0.6111
Epoch 3/30
```

```
    - 116s - loss: 0.7522 - acc: 0.6668 - val_loss: 0.9096 - val_acc: 0.6844
Epoch 4/30
    - 116s - loss: 0.5412 - acc: 0.7935 - val_loss: 0.8693 - val_acc: 0.8110
Epoch 5/30
    - 116s - loss: 0.4574 - acc: 0.8808 - val_loss: 0.6524 - val_acc: 0.8880
Epoch 6/30
    - 116s - loss: 0.3585 - acc: 0.9127 - val_loss: 0.6781 - val_acc: 0.8758
Epoch 7/30
    - 116s - loss: 0.3066 - acc: 0.9203 - val_loss: 0.7484 - val_acc: 0.8890
Epoch 8/30
    - 117s - loss: 0.2817 - acc: 0.9278 - val_loss: 0.8017 - val_acc: 0.8690
Epoch 9/30
    - 116s - loss: 0.2543 - acc: 0.9283 - val_loss: 1.2660 - val_acc: 0.8320
Epoch 10/30
    - 116s - loss: 0.2435 - acc: 0.9365 - val_loss: 0.8145 - val_acc: 0.8646
Epoch 11/30
    - 116s - loss: 0.2767 - acc: 0.9317 - val_loss: 0.5959 - val_acc: 0.8979
Epoch 12/30
    - 116s - loss: 0.2265 - acc: 0.9373 - val_loss: 0.6543 - val_acc: 0.8935
Epoch 13/30
    - 116s - loss: 0.2253 - acc: 0.9363 - val_loss: 0.5145 - val_acc: 0.9216
Epoch 14/30
    - 116s - loss: 0.2458 - acc: 0.9310 - val_loss: 0.4773 - val_acc: 0.9175
Epoch 15/30
    - 116s - loss: 0.2122 - acc: 0.9389 - val_loss: 0.6626 - val_acc: 0.8958
Epoch 16/30
    - 116s - loss: 0.2367 - acc: 0.9393 - val_loss: 0.6204 - val_acc: 0.8965
Epoch 17/30
    - 116s - loss: 0.2317 - acc: 0.9414 - val_loss: 0.9979 - val_acc: 0.8772
Epoch 18/30
    - 116s - loss: 0.2406 - acc: 0.9350 - val_loss: 0.9485 - val_acc: 0.8744
Epoch 19/30
    - 116s - loss: 0.2186 - acc: 0.9408 - val_loss: 0.7989 - val_acc: 0.8870
Epoch 20/30
    - 116s - loss: 0.2050 - acc: 0.9427 - val_loss: 0.8482 - val_acc: 0.8738
Epoch 21/30
    - 117s - loss: 0.1984 - acc: 0.9415 - val_loss: 0.6845 - val_acc: 0.8945
Epoch 22/30
    - 116s - loss: 0.1928 - acc: 0.9445 - val_loss: 0.5078 - val_acc: 0.9192
Epoch 23/30
    - 116s - loss: 0.2071 - acc: 0.9427 - val_loss: 0.6209 - val_acc: 0.9172
Epoch 24/30
    - 116s - loss: 0.2433 - acc: 0.9381 - val_loss: 0.6083 - val_acc: 0.9091
```

```
Epoch 25/30
 - 117s - loss: 0.2048 - acc: 0.9429 - val_loss: 0.6255 - val_acc: 0.8772
Epoch 26/30
 - 116s - loss: 0.1990 - acc: 0.9397 - val_loss: 0.9037 - val_acc: 0.8809
Epoch 27/30
 - 116s - loss: 0.1816 - acc: 0.9426 - val_loss: 0.8393 - val_acc: 0.8748
Epoch 28/30
 - 116s - loss: 0.2225 - acc: 0.9412 - val_loss: 0.6894 - val_acc: 0.9070
Epoch 29/30
 - 116s - loss: 0.2070 - acc: 0.9449 - val_loss: 0.7186 - val_acc: 0.9063
Epoch 30/30
 - 116s - loss: 0.2195 - acc: 0.9421 - val_loss: 0.8332 - val_acc: 0.8972
Test accuracy: 0.8971835765184933
-------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
LSTM2_1 (LSTM)               (None, 128, 32)           5376
_____
Dropout2_1 (Dropout)         (None, 128, 32)           0
_____
LSTM2_2 (LSTM)               (None, 32)                8320
_____
Dropout2_2 (Dropout)         (None, 32)                0
_____
dense_4 (Dense)              (None, 6)                 198
=================================================================
Total params: 13,894
Trainable params: 13,894
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 115s - loss: 1.4372 - acc: 0.3659 - val_loss: 1.4671 - val_acc: 0.3539
Epoch 2/30
 - 113s - loss: 1.3271 - acc: 0.4178 - val_loss: 1.1843 - val_acc: 0.4785
Epoch 3/30
 - 112s - loss: 1.1944 - acc: 0.5075 - val_loss: 1.0682 - val_acc: 0.5185
Epoch 4/30
 - 112s - loss: 0.9614 - acc: 0.5405 - val_loss: 0.9636 - val_acc: 0.5450
Epoch 5/30
 - 112s - loss: 0.8921 - acc: 0.5649 - val_loss: 1.0393 - val_acc: 0.5697
```

```
Epoch 6/30
 - 112s - loss: 0.9083 - acc: 0.5941 - val_loss: 1.0248 - val_acc: 0.5938
Epoch 7/30
 - 112s - loss: 0.8562 - acc: 0.6053 - val_loss: 0.8309 - val_acc: 0.6081
Epoch 8/30
 - 112s - loss: 0.7939 - acc: 0.6302 - val_loss: 0.7886 - val_acc: 0.6210
Epoch 9/30
 - 112s - loss: 0.7313 - acc: 0.6542 - val_loss: 0.7931 - val_acc: 0.6356
Epoch 10/30
 - 112s - loss: 0.7418 - acc: 0.6492 - val_loss: 0.7654 - val_acc: 0.6305
Epoch 11/30
 - 112s - loss: 0.7019 - acc: 0.6542 - val_loss: 0.7826 - val_acc: 0.6261
Epoch 12/30
 - 112s - loss: 0.6793 - acc: 0.6644 - val_loss: 0.7845 - val_acc: 0.6244
Epoch 13/30
 - 112s - loss: 0.6800 - acc: 0.6647 - val_loss: 0.7932 - val_acc: 0.6200
Epoch 14/30
 - 112s - loss: 0.6687 - acc: 0.6666 - val_loss: 0.7532 - val_acc: 0.6295
Epoch 15/30
 - 112s - loss: 0.7405 - acc: 0.6615 - val_loss: 0.7667 - val_acc: 0.6261
Epoch 16/30
 - 112s - loss: 0.6780 - acc: 0.6643 - val_loss: 0.7667 - val_acc: 0.6172
Epoch 17/30
 - 112s - loss: 0.6512 - acc: 0.6696 - val_loss: 0.7582 - val_acc: 0.6295
Epoch 18/30
 - 112s - loss: 0.6180 - acc: 0.6904 - val_loss: 0.6705 - val_acc: 0.6423
Epoch 19/30
 - 112s - loss: 0.5738 - acc: 0.7399 - val_loss: 0.8903 - val_acc: 0.6834
Epoch 20/30
 - 112s - loss: 0.5144 - acc: 0.7964 - val_loss: 0.7585 - val_acc: 0.7564
Epoch 21/30
 - 112s - loss: 0.5651 - acc: 0.7982 - val_loss: 0.6209 - val_acc: 0.7893
Epoch 22/30
 - 112s - loss: 0.4844 - acc: 0.8009 - val_loss: 0.6228 - val_acc: 0.8249
Epoch 23/30
 - 111s - loss: 0.4312 - acc: 0.8070 - val_loss: 0.5516 - val_acc: 0.7516
Epoch 24/30
 - 112s - loss: 0.4394 - acc: 0.8192 - val_loss: 0.6016 - val_acc: 0.7845
Epoch 25/30
 - 112s - loss: 0.4126 - acc: 0.8383 - val_loss: 0.6123 - val_acc: 0.8205
Epoch 26/30
 - 112s - loss: 0.4230 - acc: 0.8743 - val_loss: 0.4831 - val_acc: 0.8734
Epoch 27/30
```

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 - 112s - loss: 0.3373 - acc: 0.9131 - val_loss: 0.5120 - val_acc: 0.8870
Epoch 28/30
 - 112s - loss: 0.2753 - acc: 0.9346 - val_loss: 0.5130 - val_acc: 0.8724
Epoch 29/30
 - 112s - loss: 0.2642 - acc: 0.9325 - val_loss: 0.3661 - val_acc: 0.8985
Epoch 30/30
 - 112s - loss: 0.2854 - acc: 0.9282 - val_loss: 0.4492 - val_acc: 0.8958
Test accuracy: 0.8958262639972854
--------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
LSTM2_1 (LSTM)               (None, 128, 32)           5376
_____
Dropout2_1 (Dropout)         (None, 128, 32)           0
_____
LSTM2_2 (LSTM)               (None, 32)                8320
_____
Dropout2_2 (Dropout)         (None, 32)                0
_____
dense_5 (Dense)              (None, 6)                 198
=================================================================
Total params: 13,894
Trainable params: 13,894
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 116s - loss: 1.5210 - acc: 0.3177 - val_loss: 1.8157 - val_acc: 0.1805
Epoch 2/30
 - 113s - loss: 1.7460 - acc: 0.2628 - val_loss: 1.4418 - val_acc: 0.3529
Epoch 3/30
 - 113s - loss: 1.4133 - acc: 0.3596 - val_loss: 1.3828 - val_acc: 0.3617
Epoch 4/30
 - 113s - loss: 1.3750 - acc: 0.3727 - val_loss: 1.4695 - val_acc: 0.3536
Epoch 5/30
 - 113s - loss: 1.3640 - acc: 0.3776 - val_loss: 1.4747 - val_acc: 0.3536
Epoch 6/30
 - 113s - loss: 1.3579 - acc: 0.3674 - val_loss: 1.3544 - val_acc: 0.3624
Epoch 7/30
 - 113s - loss: 1.3526 - acc: 0.3740 - val_loss: 1.4759 - val_acc: 0.3536
Epoch 8/30
```

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         - 113s - loss: 1.3457 - acc: 0.3681 - val_loss: 1.2573 - val_acc: 0.4133
        Epoch 9/30
         - 112s - loss: 1.4167 - acc: 0.3753 - val_loss: 1.3990 - val_acc: 0.3536
        Epoch 10/30
         - 112s - loss: 1.3734 - acc: 0.3826 - val_loss: 1.3683 - val_acc: 0.3685
        Epoch 11/30
         - 114s - loss: 1.3230 - acc: 0.4319 - val_loss: 1.3894 - val_acc: 0.3756
        Epoch 12/30
         - 112s - loss: 1.3716 - acc: 0.3898 - val_loss: 1.4371 - val_acc: 0.3512
        Epoch 13/30
         - 113s - loss: 1.3323 - acc: 0.4132 - val_loss: 1.2813 - val_acc: 0.4011
        Epoch 14/30
         - 113s - loss: 1.1793 - acc: 0.4763 - val_loss: 1.2701 - val_acc: 0.4435
        Epoch 15/30
         - 112s - loss: 1.0988 - acc: 0.4761 - val_loss: 1.0824 - val_acc: 0.4130
        Epoch 16/30
         - 113s - loss: 0.9046 - acc: 0.5589 - val_loss: 1.1002 - val_acc: 0.5395
        Epoch 17/30
         - 113s - loss: 0.8583 - acc: 0.5683 - val_loss: 0.9662 - val_acc: 0.5161
        Epoch 18/30
         - 113s - loss: 0.7778 - acc: 0.6159 - val_loss: 0.9013 - val_acc: 0.5836
        Epoch 19/30
         - 113s - loss: 0.8041 - acc: 0.6264 - val_loss: 0.8678 - val_acc: 0.6149
        Epoch 20/30
         - 113s - loss: 0.7989 - acc: 0.6192 - val_loss: 0.9060 - val_acc: 0.5769
        Epoch 21/30
         - 114s - loss: 0.7531 - acc: 0.6269 - val_loss: 0.8337 - val_acc: 0.5772
        Epoch 22/30
         - 112s - loss: 0.7393 - acc: 0.6353 - val_loss: 0.8051 - val_acc: 0.5853
        Epoch 23/30
         - 113s - loss: 0.8261 - acc: 0.5998 - val_loss: 1.2974 - val_acc: 0.3695
        Epoch 24/30
         - 113s - loss: 1.1817 - acc: 0.4483 - val_loss: 0.9910 - val_acc: 0.5555
        Epoch 25/30
         - 113s - loss: 0.7748 - acc: 0.6117 - val_loss: 0.7969 - val_acc: 0.6023
        Epoch 26/30
         - 113s - loss: 0.8745 - acc: 0.5828 - val_loss: 0.9096 - val_acc: 0.5599
        Epoch 27/30
         - 113s - loss: 0.9154 - acc: 0.5937 - val_loss: 0.8608 - val_acc: 0.5738
        Epoch 28/30
         - 113s - loss: 0.9566 - acc: 0.5649 - val_loss: 1.0465 - val_acc: 0.5209
        Epoch 29/30
         - 113s - loss: 0.9162 - acc: 0.5412 - val_loss: 0.8763 - val_acc: 0.5344
```

```
Epoch 30/30
 - 113s - loss: 0.9363 - acc: 0.5345 - val_loss: 0.9800 - val_acc: 0.4856
Test accuracy: 0.4855785544621649
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
LSTM2_1 (LSTM)	(None, 128, 28)	4256
Dropout2_1 (Dropout)	(None, 128, 28)	0
LSTM2_2 (LSTM)	(None, 32)	7808
Dropout2_2 (Dropout)	(None, 32)	0
dense_6 (Dense)	(None, 6)	198

```
Total params: 12,262
Trainable params: 12,262
Non-trainable params: 0


None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 114s - loss: 1.2473 - acc: 0.4480 - val_loss: 0.8644 - val_acc: 0.6189
Epoch 2/30
 - 112s - loss: 0.9461 - acc: 0.5958 - val_loss: 0.9319 - val_acc: 0.5304
Epoch 3/30
 - 112s - loss: 0.8364 - acc: 0.6109 - val_loss: 0.8742 - val_acc: 0.6532
Epoch 4/30
 - 112s - loss: 0.7885 - acc: 0.6352 - val_loss: 0.7957 - val_acc: 0.6054
Epoch 5/30
 - 112s - loss: 0.7112 - acc: 0.6623 - val_loss: 0.8570 - val_acc: 0.7038
Epoch 6/30
 - 112s - loss: 0.5906 - acc: 0.7859 - val_loss: 0.7603 - val_acc: 0.8297
Epoch 7/30
 - 112s - loss: 0.4219 - acc: 0.8789 - val_loss: 0.7585 - val_acc: 0.8470
Epoch 8/30
 - 111s - loss: 0.3792 - acc: 0.9044 - val_loss: 0.7414 - val_acc: 0.8765
Epoch 9/30
 - 112s - loss: 0.3187 - acc: 0.9166 - val_loss: 0.6164 - val_acc: 0.9057
Epoch 10/30
 - 112s - loss: 0.2635 - acc: 0.9264 - val_loss: 0.6408 - val_acc: 0.8812
```

```
Epoch 11/30
 - 112s - loss: 0.3462 - acc: 0.9204 - val_loss: 0.8713 - val_acc: 0.8602
Epoch 12/30
 - 112s - loss: 0.2796 - acc: 0.9270 - val_loss: 1.0391 - val_acc: 0.8629
Epoch 13/30
 - 112s - loss: 0.3115 - acc: 0.9234 - val_loss: 0.8092 - val_acc: 0.8548
Epoch 14/30
 - 112s - loss: 0.2593 - acc: 0.9331 - val_loss: 0.9853 - val_acc: 0.8826
Epoch 15/30
 - 111s - loss: 0.2985 - acc: 0.9310 - val_loss: 0.7689 - val_acc: 0.8901
Epoch 16/30
 - 112s - loss: 0.3149 - acc: 0.9268 - val_loss: 0.7485 - val_acc: 0.9040
Epoch 17/30
 - 111s - loss: 0.2692 - acc: 0.9327 - val_loss: 0.9946 - val_acc: 0.8887
Epoch 18/30
 - 112s - loss: 0.2224 - acc: 0.9412 - val_loss: 0.8671 - val_acc: 0.9040
Epoch 19/30
 - 112s - loss: 0.2948 - acc: 0.9355 - val_loss: 0.9961 - val_acc: 0.8911
Epoch 20/30
 - 112s - loss: 0.3114 - acc: 0.9335 - val_loss: 0.8864 - val_acc: 0.8907
Epoch 21/30
 - 112s - loss: 0.2119 - acc: 0.9395 - val_loss: 0.9013 - val_acc: 0.8951
Epoch 22/30
 - 112s - loss: 0.1955 - acc: 0.9472 - val_loss: 1.2858 - val_acc: 0.8863
Epoch 23/30
 - 112s - loss: 0.2033 - acc: 0.9476 - val_loss: 1.1028 - val_acc: 0.8853
Epoch 24/30
 - 112s - loss: 0.2260 - acc: 0.9448 - val_loss: 0.7571 - val_acc: 0.9169
Epoch 25/30
 - 111s - loss: 0.2121 - acc: 0.9489 - val_loss: 0.9081 - val_acc: 0.8979
Epoch 26/30
 - 111s - loss: 0.2351 - acc: 0.9480 - val_loss: 0.6938 - val_acc: 0.9053
Epoch 27/30
 - 112s - loss: 0.1817 - acc: 0.9489 - val_loss: 0.8636 - val_acc: 0.9118
Epoch 28/30
 - 112s - loss: 0.2097 - acc: 0.9480 - val_loss: 0.7828 - val_acc: 0.9019
Epoch 29/30
 - 112s - loss: 0.2703 - acc: 0.9436 - val_loss: 0.7614 - val_acc: 0.9060
Epoch 30/30
 - 112s - loss: 0.2324 - acc: 0.9459 - val_loss: 0.8418 - val_acc: 0.8914
Test accuracy: 0.8914149983033594
--------------------------------------------------------------------------------
```

```
Layer (type)                     Output Shape                  Param #
=================================================================
LSTM2_1 (LSTM)                   (None, 128, 38)               7296
_____
Dropout2_1 (Dropout)             (None, 128, 38)               0
_____
LSTM2_2 (LSTM)                   (None, 32)                    9088
_____
Dropout2_2 (Dropout)             (None, 32)                    0
_____
dense_7 (Dense)                  (None, 6)                     198
=================================================================
Total params: 16,582
Trainable params: 16,582
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 117s - loss: 1.5296 - acc: 0.3341 - val_loss: 1.4561 - val_acc: 0.4876
Epoch 2/30
 - 115s - loss: 1.2383 - acc: 0.4608 - val_loss: 0.9390 - val_acc: 0.5667
Epoch 3/30
 - 115s - loss: 0.9184 - acc: 0.5537 - val_loss: 0.9031 - val_acc: 0.5721
Epoch 4/30
 - 115s - loss: 1.2038 - acc: 0.4587 - val_loss: 1.4212 - val_acc: 0.3556
Epoch 5/30
 - 115s - loss: 1.1103 - acc: 0.4985 - val_loss: 0.9811 - val_acc: 0.5687
Epoch 6/30
 - 115s - loss: 0.9085 - acc: 0.5677 - val_loss: 1.0072 - val_acc: 0.5389
Epoch 7/30
 - 115s - loss: 0.8435 - acc: 0.5822 - val_loss: 0.9197 - val_acc: 0.5819
Epoch 8/30
 - 115s - loss: 0.8009 - acc: 0.6193 - val_loss: 0.8783 - val_acc: 0.5979
Epoch 9/30
 - 115s - loss: 0.8192 - acc: 0.6200 - val_loss: 0.9072 - val_acc: 0.6026
Epoch 10/30
 - 115s - loss: 0.7571 - acc: 0.6187 - val_loss: 0.8579 - val_acc: 0.6162
Epoch 11/30
 - 115s - loss: 0.7762 - acc: 0.6315 - val_loss: 0.8407 - val_acc: 0.6254
Epoch 12/30
 - 115s - loss: 1.0781 - acc: 0.5133 - val_loss: 1.2932 - val_acc: 0.4147
Epoch 13/30
```

```
     - 115s - loss: 1.2008 - acc: 0.4531 - val_loss: 1.0318 - val_acc: 0.5684
Epoch 14/30
     - 115s - loss: 0.8106 - acc: 0.6344 - val_loss: 0.7879 - val_acc: 0.6203
Epoch 15/30
     - 114s - loss: 0.7129 - acc: 0.6447 - val_loss: 0.7458 - val_acc: 0.6274
Epoch 16/30
     - 115s - loss: 0.6834 - acc: 0.6595 - val_loss: 0.7537 - val_acc: 0.6247
Epoch 17/30
     - 115s - loss: 0.6826 - acc: 0.6499 - val_loss: 0.7547 - val_acc: 0.5908
Epoch 18/30
     - 115s - loss: 0.7327 - acc: 0.6394 - val_loss: 0.8384 - val_acc: 0.6183
Epoch 19/30
     - 115s - loss: 0.6892 - acc: 0.6489 - val_loss: 0.7795 - val_acc: 0.6196
Epoch 20/30
     - 115s - loss: 0.7285 - acc: 0.6459 - val_loss: 0.8308 - val_acc: 0.6050
Epoch 21/30
     - 115s - loss: 0.7120 - acc: 0.6402 - val_loss: 0.8046 - val_acc: 0.6067
Epoch 22/30
     - 115s - loss: 0.6636 - acc: 0.6532 - val_loss: 0.7412 - val_acc: 0.6216
Epoch 23/30
     - 114s - loss: 0.7886 - acc: 0.6255 - val_loss: 1.1953 - val_acc: 0.4910
Epoch 24/30
     - 115s - loss: 1.0712 - acc: 0.4948 - val_loss: 0.7798 - val_acc: 0.6162
Epoch 25/30
     - 115s - loss: 0.7376 - acc: 0.6514 - val_loss: 0.7224 - val_acc: 0.6274
Epoch 26/30
     - 115s - loss: 0.7513 - acc: 0.6495 - val_loss: 0.7578 - val_acc: 0.6244
Epoch 27/30
     - 115s - loss: 0.6702 - acc: 0.6591 - val_loss: 0.7168 - val_acc: 0.6800
Epoch 28/30
     - 115s - loss: 0.6637 - acc: 0.6695 - val_loss: 0.7188 - val_acc: 0.6688
Epoch 29/30
     - 115s - loss: 0.7230 - acc: 0.6480 - val_loss: 0.7956 - val_acc: 0.6512
Epoch 30/30
     - 115s - loss: 0.7597 - acc: 0.6450 - val_loss: 0.7395 - val_acc: 0.6736
Test accuracy: 0.673566338649474
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
LSTM2_1 (LSTM)	(None, 128, 32)	5376
Dropout2_1 (Dropout)	(None, 128, 32)	0

```
_____
LSTM2_2 (LSTM)                  (None, 26)                    6136
_____
Dropout2_2 (Dropout)            (None, 26)                    0
_____
dense_8 (Dense)                 (None, 6)                     162
====================================================================
Total params: 11,674
Trainable params: 11,674
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 116s - loss: 1.3997 - acc: 0.3817 - val_loss: 1.4977 - val_acc: 0.3139
Epoch 2/30
 - 113s - loss: 1.1907 - acc: 0.4922 - val_loss: 1.0425 - val_acc: 0.4971
Epoch 3/30
 - 113s - loss: 0.8832 - acc: 0.5906 - val_loss: 0.8801 - val_acc: 0.6077
Epoch 4/30
 - 113s - loss: 0.8497 - acc: 0.6089 - val_loss: 1.0227 - val_acc: 0.5395
Epoch 5/30
 - 113s - loss: 0.8742 - acc: 0.6083 - val_loss: 0.8807 - val_acc: 0.6016
Epoch 6/30
 - 114s - loss: 0.8527 - acc: 0.6085 - val_loss: 0.9190 - val_acc: 0.5646
Epoch 7/30
 - 113s - loss: 0.9217 - acc: 0.5895 - val_loss: 0.9211 - val_acc: 0.5925
Epoch 8/30
 - 114s - loss: 0.8325 - acc: 0.6280 - val_loss: 0.8287 - val_acc: 0.6050
Epoch 9/30
 - 113s - loss: 0.7780 - acc: 0.6338 - val_loss: 0.8622 - val_acc: 0.6101
Epoch 10/30
 - 113s - loss: 1.4237 - acc: 0.4249 - val_loss: 1.4747 - val_acc: 0.5029
Epoch 11/30
 - 113s - loss: 1.2080 - acc: 0.4835 - val_loss: 1.0813 - val_acc: 0.5633
Epoch 12/30
 - 114s - loss: 0.8836 - acc: 0.5924 - val_loss: 0.9811 - val_acc: 0.5959
Epoch 13/30
 - 114s - loss: 1.0894 - acc: 0.5231 - val_loss: 1.1186 - val_acc: 0.5151
Epoch 14/30
 - 113s - loss: 0.9932 - acc: 0.5367 - val_loss: 1.0401 - val_acc: 0.5053
Epoch 15/30
 - 113s - loss: 0.9519 - acc: 0.5646 - val_loss: 1.0127 - val_acc: 0.5097
```

```
Epoch 16/30
 - 114s - loss: 0.9355 - acc: 0.6186 - val_loss: 0.9665 - val_acc: 0.5847
Epoch 17/30
 - 113s - loss: 0.8531 - acc: 0.6378 - val_loss: 0.8733 - val_acc: 0.6088
Epoch 18/30
 - 114s - loss: 0.8238 - acc: 0.6472 - val_loss: 0.8909 - val_acc: 0.6006
Epoch 19/30
 - 113s - loss: 0.7985 - acc: 0.6564 - val_loss: 0.9155 - val_acc: 0.5422
Epoch 20/30
 - 114s - loss: 0.8029 - acc: 0.6555 - val_loss: 0.9345 - val_acc: 0.6094
Epoch 21/30
 - 113s - loss: 0.7954 - acc: 0.6575 - val_loss: 0.9065 - val_acc: 0.6410
Epoch 22/30
 - 113s - loss: 0.7906 - acc: 0.6700 - val_loss: 0.9385 - val_acc: 0.5443
Epoch 23/30
 - 113s - loss: 0.7928 - acc: 0.6568 - val_loss: 0.9592 - val_acc: 0.5592
Epoch 24/30
 - 114s - loss: 0.7944 - acc: 0.6620 - val_loss: 0.9956 - val_acc: 0.5304
Epoch 25/30
 - 114s - loss: 0.7747 - acc: 0.6609 - val_loss: 1.0209 - val_acc: 0.5249
Epoch 26/30
 - 114s - loss: 0.7727 - acc: 0.6680 - val_loss: 0.9124 - val_acc: 0.6376
Epoch 27/30
 - 113s - loss: 0.7619 - acc: 0.6710 - val_loss: 0.9372 - val_acc: 0.5236
Epoch 28/30
 - 113s - loss: 0.7483 - acc: 0.6744 - val_loss: 0.9400 - val_acc: 0.6135
Epoch 29/30
 - 113s - loss: 0.7346 - acc: 0.6794 - val_loss: 0.9644 - val_acc: 0.6328
Epoch 30/30
 - 114s - loss: 0.7393 - acc: 0.6857 - val_loss: 0.9658 - val_acc: 0.5962
Test accuracy: 0.5961995249507304
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
LSTM1_1 (LSTM)	(None, 28)	4256
Dropout1_1 (Dropout)	(None, 28)	0
dense_9 (Dense)	(None, 6)	174

```
Total params: 4,430
Trainable params: 4,430
```

```
Non-trainable params: 0

_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 56s - loss: 1.1159 - acc: 0.4990 - val_loss: 0.8833 - val_acc: 0.6060
Epoch 2/30
 - 53s - loss: 0.7621 - acc: 0.6319 - val_loss: 0.8008 - val_acc: 0.5955
Epoch 3/30
 - 54s - loss: 0.7072 - acc: 0.6363 - val_loss: 0.6816 - val_acc: 0.6064
Epoch 4/30
 - 54s - loss: 0.6291 - acc: 0.6567 - val_loss: 0.7050 - val_acc: 0.6247
Epoch 5/30
 - 54s - loss: 0.5655 - acc: 0.7236 - val_loss: 0.5158 - val_acc: 0.7564
Epoch 6/30
 - 53s - loss: 0.4537 - acc: 0.8071 - val_loss: 0.6697 - val_acc: 0.7581
Epoch 7/30
 - 54s - loss: 0.3525 - acc: 0.8992 - val_loss: 0.6083 - val_acc: 0.8588
Epoch 8/30
 - 53s - loss: 0.2895 - acc: 0.9185 - val_loss: 0.4039 - val_acc: 0.8863
Epoch 9/30
 - 54s - loss: 0.2687 - acc: 0.9267 - val_loss: 0.4397 - val_acc: 0.8948
Epoch 10/30
 - 54s - loss: 0.2544 - acc: 0.9321 - val_loss: 0.5715 - val_acc: 0.8649
Epoch 11/30
 - 53s - loss: 0.2165 - acc: 0.9378 - val_loss: 0.4928 - val_acc: 0.8660
Epoch 12/30
 - 53s - loss: 0.2228 - acc: 0.9365 - val_loss: 0.3271 - val_acc: 0.9101
Epoch 13/30
 - 54s - loss: 0.2147 - acc: 0.9392 - val_loss: 0.4956 - val_acc: 0.8918
Epoch 14/30
 - 54s - loss: 0.2089 - acc: 0.9384 - val_loss: 0.3574 - val_acc: 0.9135
Epoch 15/30
 - 54s - loss: 0.2050 - acc: 0.9361 - val_loss: 0.4138 - val_acc: 0.9182
Epoch 16/30
 - 53s - loss: 0.2098 - acc: 0.9377 - val_loss: 0.3259 - val_acc: 0.9135
Epoch 17/30
 - 53s - loss: 0.1989 - acc: 0.9385 - val_loss: 0.4665 - val_acc: 0.9009
Epoch 18/30
 - 53s - loss: 0.2019 - acc: 0.9392 - val_loss: 0.8034 - val_acc: 0.8588
Epoch 19/30
 - 54s - loss: 0.1824 - acc: 0.9468 - val_loss: 0.3951 - val_acc: 0.8945
Epoch 20/30
```

```
 - 54s - loss: 0.1787 - acc: 0.9419 - val_loss: 0.3930 - val_acc: 0.9026
Epoch 21/30
 - 54s - loss: 0.1685 - acc: 0.9471 - val_loss: 0.6037 - val_acc: 0.8951
Epoch 22/30
 - 54s - loss: 0.1908 - acc: 0.9455 - val_loss: 1.0361 - val_acc: 0.8259
Epoch 23/30
 - 53s - loss: 0.1743 - acc: 0.9464 - val_loss: 0.5038 - val_acc: 0.9111
Epoch 24/30
 - 53s - loss: 0.1644 - acc: 0.9504 - val_loss: 0.5073 - val_acc: 0.9046
Epoch 25/30
 - 54s - loss: 0.1617 - acc: 0.9497 - val_loss: 0.6129 - val_acc: 0.8846
Epoch 26/30
 - 54s - loss: 0.1754 - acc: 0.9480 - val_loss: 0.6234 - val_acc: 0.8989
Epoch 27/30
 - 54s - loss: 0.1600 - acc: 0.9514 - val_loss: 0.6284 - val_acc: 0.8948
Epoch 28/30
 - 53s - loss: 0.1748 - acc: 0.9476 - val_loss: 0.5432 - val_acc: 0.9006
Epoch 29/30
 - 54s - loss: 0.1575 - acc: 0.9518 - val_loss: 0.6938 - val_acc: 0.8802
Epoch 30/30
 - 54s - loss: 0.1635 - acc: 0.9502 - val_loss: 0.5709 - val_acc: 0.9080
Test accuracy: 0.9080420766881574
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
LSTM1_1 (LSTM)	(None, 28)	4256
Dropout1_1 (Dropout)	(None, 28)	0
dense_10 (Dense)	(None, 6)	174

```
Total params: 4,430
Trainable params: 4,430
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 57s - loss: 1.1384 - acc: 0.4871 - val_loss: 0.9078 - val_acc: 0.5752
Epoch 2/30
 - 55s - loss: 0.7859 - acc: 0.6450 - val_loss: 0.6904 - val_acc: 0.7234
Epoch 3/30
```

```
            - 55s - loss: 0.5756 - acc: 0.7835 - val_loss: 0.6575 - val_acc: 0.7743
          Epoch 4/30
            - 54s - loss: 0.4032 - acc: 0.8697 - val_loss: 0.5826 - val_acc: 0.8124
          Epoch 5/30
            - 54s - loss: 0.3922 - acc: 0.8872 - val_loss: 0.5953 - val_acc: 0.8276
          Epoch 6/30
            - 55s - loss: 0.3531 - acc: 0.8987 - val_loss: 0.5288 - val_acc: 0.8751
          Epoch 7/30
            - 55s - loss: 0.2814 - acc: 0.9208 - val_loss: 0.7520 - val_acc: 0.8493
          Epoch 8/30
            - 54s - loss: 0.2437 - acc: 0.9300 - val_loss: 0.5382 - val_acc: 0.8707
          Epoch 9/30
            - 55s - loss: 0.2432 - acc: 0.9294 - val_loss: 0.8665 - val_acc: 0.8649
          Epoch 10/30
            - 54s - loss: 0.2525 - acc: 0.9332 - val_loss: 0.6180 - val_acc: 0.8823
          Epoch 11/30
            - 55s - loss: 0.2438 - acc: 0.9350 - val_loss: 0.8062 - val_acc: 0.8812
          Epoch 12/30
            - 54s - loss: 0.2181 - acc: 0.9359 - val_loss: 0.5735 - val_acc: 0.8867
          Epoch 13/30
            - 55s - loss: 0.2097 - acc: 0.9363 - val_loss: 0.8048 - val_acc: 0.8711
          Epoch 14/30
            - 55s - loss: 0.1825 - acc: 0.9422 - val_loss: 0.5308 - val_acc: 0.8884
          Epoch 15/30
            - 55s - loss: 0.2044 - acc: 0.9389 - val_loss: 0.8616 - val_acc: 0.8592
          Epoch 16/30
            - 54s - loss: 0.1932 - acc: 0.9407 - val_loss: 0.8238 - val_acc: 0.8850
          Epoch 17/30
            - 55s - loss: 0.2073 - acc: 0.9350 - val_loss: 1.0110 - val_acc: 0.8575
          Epoch 18/30
            - 55s - loss: 0.2428 - acc: 0.9370 - val_loss: 0.8547 - val_acc: 0.8826
          Epoch 19/30
            - 55s - loss: 0.1989 - acc: 0.9404 - val_loss: 0.8010 - val_acc: 0.8856
          Epoch 20/30
            - 54s - loss: 0.2050 - acc: 0.9404 - val_loss: 0.6379 - val_acc: 0.8812
          Epoch 21/30
            - 55s - loss: 0.1937 - acc: 0.9393 - val_loss: 0.6550 - val_acc: 0.9040
          Epoch 22/30
            - 54s - loss: 0.1771 - acc: 0.9426 - val_loss: 0.5317 - val_acc: 0.8968
          Epoch 23/30
            - 55s - loss: 0.1857 - acc: 0.9430 - val_loss: 0.7792 - val_acc: 0.8775
          Epoch 24/30
            - 54s - loss: 0.1789 - acc: 0.9453 - val_loss: 0.6949 - val_acc: 0.8870
```

```
Epoch 25/30
 - 55s - loss: 0.1665 - acc: 0.9430 - val_loss: 0.7166 - val_acc: 0.8694
Epoch 26/30
 - 54s - loss: 0.1960 - acc: 0.9437 - val_loss: 0.8243 - val_acc: 0.8799
Epoch 27/30
 - 55s - loss: 0.2010 - acc: 0.9426 - val_loss: 0.6781 - val_acc: 0.8951
Epoch 28/30
 - 55s - loss: 0.1664 - acc: 0.9476 - val_loss: 0.8844 - val_acc: 0.8839
Epoch 29/30
 - 55s - loss: 0.1778 - acc: 0.9468 - val_loss: 0.7395 - val_acc: 0.8744
Epoch 30/30
 - 54s - loss: 0.1610 - acc: 0.9471 - val_loss: 0.8714 - val_acc: 0.8585
Test accuracy: 0.8585001696640652
--------------------------------------------------------------------------------
```

```
_____
Layer (type)                Output Shape              Param #
===============================================================
LSTM1_1 (LSTM)              (None, 32)                5376
_____
Dropout1_1 (Dropout)       (None, 32)                0
_____
dense_11 (Dense)           (None, 6)                 198
===============================================================
Total params: 5,574
Trainable params: 5,574
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 56s - loss: 1.1627 - acc: 0.4997 - val_loss: 1.0767 - val_acc: 0.5395
Epoch 2/30
 - 54s - loss: 0.7603 - acc: 0.6753 - val_loss: 0.6746 - val_acc: 0.7024
Epoch 3/30
 - 54s - loss: 0.5395 - acc: 0.8118 - val_loss: 0.4673 - val_acc: 0.8293
Epoch 4/30
 - 54s - loss: 0.3655 - acc: 0.8972 - val_loss: 0.4531 - val_acc: 0.8521
Epoch 5/30
 - 54s - loss: 0.3289 - acc: 0.9109 - val_loss: 0.3577 - val_acc: 0.8833
Epoch 6/30
 - 54s - loss: 0.2702 - acc: 0.9276 - val_loss: 0.5242 - val_acc: 0.8687
Epoch 7/30
 - 54s - loss: 0.2520 - acc: 0.9314 - val_loss: 0.3830 - val_acc: 0.8965
```

```
Epoch 8/30
 - 54s - loss: 0.2218 - acc: 0.9348 - val_loss: 0.4224 - val_acc: 0.9030
Epoch 9/30
 - 54s - loss: 0.2194 - acc: 0.9385 - val_loss: 0.4662 - val_acc: 0.8826
Epoch 10/30
 - 55s - loss: 0.2095 - acc: 0.9384 - val_loss: 0.4849 - val_acc: 0.8880
Epoch 11/30
 - 55s - loss: 0.2168 - acc: 0.9392 - val_loss: 0.3884 - val_acc: 0.9016
Epoch 12/30
 - 55s - loss: 0.2031 - acc: 0.9387 - val_loss: 0.4717 - val_acc: 0.8836
Epoch 13/30
 - 55s - loss: 0.1956 - acc: 0.9429 - val_loss: 0.3812 - val_acc: 0.8955
Epoch 14/30
 - 55s - loss: 0.1765 - acc: 0.9472 - val_loss: 0.5949 - val_acc: 0.8958
Epoch 15/30
 - 54s - loss: 0.1944 - acc: 0.9436 - val_loss: 0.4595 - val_acc: 0.9026
Epoch 16/30
 - 54s - loss: 0.1752 - acc: 0.9484 - val_loss: 0.4092 - val_acc: 0.9046
Epoch 17/30
 - 55s - loss: 0.1727 - acc: 0.9453 - val_loss: 0.3518 - val_acc: 0.8965
Epoch 18/30
 - 54s - loss: 0.1679 - acc: 0.9438 - val_loss: 0.4842 - val_acc: 0.8989
Epoch 19/30
 - 54s - loss: 0.1715 - acc: 0.9479 - val_loss: 0.4790 - val_acc: 0.8911
Epoch 20/30
 - 55s - loss: 0.1777 - acc: 0.9463 - val_loss: 0.6256 - val_acc: 0.8748
Epoch 21/30
 - 54s - loss: 0.1576 - acc: 0.9491 - val_loss: 0.4094 - val_acc: 0.9094
Epoch 22/30
 - 54s - loss: 0.1655 - acc: 0.9472 - val_loss: 0.4630 - val_acc: 0.9019
Epoch 23/30
 - 54s - loss: 0.1548 - acc: 0.9486 - val_loss: 0.4075 - val_acc: 0.9009
Epoch 24/30
 - 55s - loss: 0.1537 - acc: 0.9498 - val_loss: 0.5320 - val_acc: 0.8904
Epoch 25/30
 - 55s - loss: 0.1508 - acc: 0.9512 - val_loss: 0.6119 - val_acc: 0.9050
Epoch 26/30
 - 54s - loss: 0.1562 - acc: 0.9470 - val_loss: 0.4720 - val_acc: 0.8975
Epoch 27/30
 - 54s - loss: 0.1473 - acc: 0.9499 - val_loss: 0.8082 - val_acc: 0.8809
Epoch 28/30
 - 54s - loss: 0.1444 - acc: 0.9524 - val_loss: 0.6733 - val_acc: 0.8897
Epoch 29/30
```

```
 - 55s - loss: 0.1508 - acc: 0.9510 - val_loss: 0.5657 - val_acc: 0.9030
Epoch 30/30
 - 54s - loss: 0.1428 - acc: 0.9512 - val_loss: 0.4780 - val_acc: 0.9172
Test accuracy: 0.9172039362063115
--------------------------------------------------------------------------------
_____
Layer (type)                    Output Shape                   Param #
=======================================================================
LSTM1_1 (LSTM)                  (None, 36)                     6624
_____
Dropout1_1 (Dropout)            (None, 36)                     0
_____
dense_12 (Dense)                (None, 6)                      222
=======================================================================
Total params: 6,846
Trainable params: 6,846
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 57s - loss: 1.1751 - acc: 0.5121 - val_loss: 0.8565 - val_acc: 0.6386
Epoch 2/30
 - 55s - loss: 1.3933 - acc: 0.5654 - val_loss: 1.4125 - val_acc: 0.5898
Epoch 3/30
 - 55s - loss: 1.0599 - acc: 0.6488 - val_loss: 0.9485 - val_acc: 0.6189
Epoch 4/30
 - 55s - loss: 0.8547 - acc: 0.6576 - val_loss: 0.9183 - val_acc: 0.6685
Epoch 5/30
 - 55s - loss: 0.6698 - acc: 0.7356 - val_loss: 0.8007 - val_acc: 0.7509
Epoch 6/30
 - 55s - loss: 0.5329 - acc: 0.8184 - val_loss: 0.6638 - val_acc: 0.8334
Epoch 7/30
 - 55s - loss: 0.4624 - acc: 0.8626 - val_loss: 1.1916 - val_acc: 0.6030
Epoch 8/30
 - 55s - loss: 0.6670 - acc: 0.7958 - val_loss: 0.7028 - val_acc: 0.8476
Epoch 9/30
 - 55s - loss: 0.3917 - acc: 0.9041 - val_loss: 0.6530 - val_acc: 0.8636
Epoch 10/30
 - 55s - loss: 0.3107 - acc: 0.9161 - val_loss: 0.5861 - val_acc: 0.8775
Epoch 11/30
 - 55s - loss: 0.3224 - acc: 0.9132 - val_loss: 0.5838 - val_acc: 0.8673
Epoch 12/30
```

```
          - 55s - loss: 0.2968 - acc: 0.9217 - val_loss: 0.5438 - val_acc: 0.8697
        Epoch 13/30
          - 55s - loss: 0.2591 - acc: 0.9280 - val_loss: 0.6289 - val_acc: 0.8772
        Epoch 14/30
          - 55s - loss: 0.2558 - acc: 0.9309 - val_loss: 0.5403 - val_acc: 0.8680
        Epoch 15/30
          - 55s - loss: 0.2329 - acc: 0.9329 - val_loss: 0.6780 - val_acc: 0.8578
        Epoch 16/30
          - 55s - loss: 0.2715 - acc: 0.9312 - val_loss: 0.5799 - val_acc: 0.8775
        Epoch 17/30
          - 55s - loss: 0.3103 - acc: 0.9173 - val_loss: 0.4122 - val_acc: 0.8880
        Epoch 18/30
          - 55s - loss: 0.2286 - acc: 0.9362 - val_loss: 0.6918 - val_acc: 0.8510
        Epoch 19/30
          - 55s - loss: 0.2378 - acc: 0.9336 - val_loss: 0.5272 - val_acc: 0.8877
        Epoch 20/30
          - 55s - loss: 0.2437 - acc: 0.9339 - val_loss: 0.4316 - val_acc: 0.8846
        Epoch 21/30
          - 55s - loss: 0.2078 - acc: 0.9377 - val_loss: 0.5531 - val_acc: 0.8799
        Epoch 22/30
          - 55s - loss: 0.2344 - acc: 0.9328 - val_loss: 0.4419 - val_acc: 0.8890
        Epoch 23/30
          - 55s - loss: 0.2114 - acc: 0.9385 - val_loss: 0.4200 - val_acc: 0.8806
        Epoch 24/30
          - 55s - loss: 0.1937 - acc: 0.9419 - val_loss: 0.4129 - val_acc: 0.8935
        Epoch 25/30
          - 55s - loss: 0.2091 - acc: 0.9392 - val_loss: 0.5488 - val_acc: 0.8646
        Epoch 26/30
          - 55s - loss: 0.2399 - acc: 0.9347 - val_loss: 0.4561 - val_acc: 0.8935
        Epoch 27/30
          - 55s - loss: 0.2055 - acc: 0.9387 - val_loss: 0.4420 - val_acc: 0.8985
        Epoch 28/30
          - 55s - loss: 0.2788 - acc: 0.9283 - val_loss: 0.4602 - val_acc: 0.8897
        Epoch 29/30
          - 55s - loss: 0.2292 - acc: 0.9381 - val_loss: 0.4052 - val_acc: 0.8958
        Epoch 30/30
          - 55s - loss: 0.2152 - acc: 0.9388 - val_loss: 0.4672 - val_acc: 0.8894
        Test accuracy: 0.8893790295215473
        ----------------------------------------------------------------------------

        _____
        Layer (type)                 Output Shape              Param #
        ============================================================
        LSTM2_1 (LSTM)               (None, 128, 38)           7296
```

```
Dropout2_1 (Dropout)          (None, 128, 38)              0
_____
LSTM2_2 (LSTM)                (None, 32)                9088
_____
Dropout2_2 (Dropout)          (None, 32)                   0
_____
dense_13 (Dense)              (None, 6)                  198
=================================================================
Total params: 16,582
Trainable params: 16,582
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 119s - loss: 1.3962 - acc: 0.3897 - val_loss: 1.1641 - val_acc: 0.4649
Epoch 2/30
 - 116s - loss: 0.9053 - acc: 0.6020 - val_loss: 0.7868 - val_acc: 0.5853
Epoch 3/30
 - 116s - loss: 0.7861 - acc: 0.6479 - val_loss: 0.7485 - val_acc: 0.6240
Epoch 4/30
 - 116s - loss: 0.7637 - acc: 0.6405 - val_loss: 0.8719 - val_acc: 0.6162
Epoch 5/30
 - 116s - loss: 0.6971 - acc: 0.6980 - val_loss: 1.0038 - val_acc: 0.6345
Epoch 6/30
 - 115s - loss: 0.5672 - acc: 0.8048 - val_loss: 0.7988 - val_acc: 0.8280
Epoch 7/30
 - 116s - loss: 0.4332 - acc: 0.8856 - val_loss: 0.7549 - val_acc: 0.8307
Epoch 8/30
 - 116s - loss: 0.3788 - acc: 0.9042 - val_loss: 0.6115 - val_acc: 0.8795
Epoch 9/30
 - 115s - loss: 0.3367 - acc: 0.9138 - val_loss: 0.7760 - val_acc: 0.8663
Epoch 10/30
 - 116s - loss: 0.3072 - acc: 0.9139 - val_loss: 0.5898 - val_acc: 0.9094
Epoch 11/30
 - 115s - loss: 0.2979 - acc: 0.9217 - val_loss: 0.7345 - val_acc: 0.8897
Epoch 12/30
 - 115s - loss: 0.2988 - acc: 0.9212 - val_loss: 0.5408 - val_acc: 0.8914
Epoch 13/30
 - 116s - loss: 0.2695 - acc: 0.9267 - val_loss: 0.7084 - val_acc: 0.8904
Epoch 14/30
 - 115s - loss: 0.2583 - acc: 0.9285 - val_loss: 0.7715 - val_acc: 0.8894
```

```
Epoch 15/30
 - 115s - loss: 0.2734 - acc: 0.9267 - val_loss: 0.9041 - val_acc: 0.8982
Epoch 16/30
 - 116s - loss: 0.2625 - acc: 0.9294 - val_loss: 0.7045 - val_acc: 0.8979
Epoch 17/30
 - 116s - loss: 0.2606 - acc: 0.9289 - val_loss: 0.6480 - val_acc: 0.9006
Epoch 18/30
 - 116s - loss: 0.2542 - acc: 0.9314 - val_loss: 0.7842 - val_acc: 0.8819
Epoch 19/30
 - 115s - loss: 0.2445 - acc: 0.9313 - val_loss: 0.8210 - val_acc: 0.8928
Epoch 20/30
 - 115s - loss: 0.2520 - acc: 0.9321 - val_loss: 0.6904 - val_acc: 0.9050
Epoch 21/30
 - 115s - loss: 0.2544 - acc: 0.9317 - val_loss: 0.7692 - val_acc: 0.8911
Epoch 22/30
 - 116s - loss: 0.2450 - acc: 0.9310 - val_loss: 0.6523 - val_acc: 0.9057
Epoch 23/30
 - 115s - loss: 0.2483 - acc: 0.9329 - val_loss: 0.6386 - val_acc: 0.9040
Epoch 24/30
 - 116s - loss: 0.2394 - acc: 0.9372 - val_loss: 0.6962 - val_acc: 0.8945
Epoch 25/30
 - 115s - loss: 0.2238 - acc: 0.9336 - val_loss: 0.7469 - val_acc: 0.8901
Epoch 26/30
 - 115s - loss: nan - acc: 0.7690 - val_loss: nan - val_acc: 0.1683
Epoch 27/30
 - 116s - loss: nan - acc: 0.1668 - val_loss: nan - val_acc: 0.1683
Epoch 28/30
 - 115s - loss: nan - acc: 0.1668 - val_loss: nan - val_acc: 0.1683
Epoch 29/30
 - 116s - loss: nan - acc: 0.1668 - val_loss: nan - val_acc: 0.1683
Epoch 30/30
 - 116s - loss: nan - acc: 0.1668 - val_loss: nan - val_acc: 0.1683
Test accuracy: 0.168306752629793
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
LSTM1_1 (LSTM)	(None, 32)	5376
Dropout1_1 (Dropout)	(None, 32)	0
dense_14 (Dense)	(None, 6)	198

```
Total params: 5,574
Trainable params: 5,574
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 56s - loss: 1.1571 - acc: 0.5097 - val_loss: 1.0674 - val_acc: 0.5833
Epoch 2/30
 - 54s - loss: 1.1179 - acc: 0.5733 - val_loss: 0.9277 - val_acc: 0.5874
Epoch 3/30
 - 54s - loss: 0.8314 - acc: 0.6604 - val_loss: 0.8207 - val_acc: 0.6417
Epoch 4/30
 - 54s - loss: 0.7140 - acc: 0.7183 - val_loss: 0.6658 - val_acc: 0.7710
Epoch 5/30
 - 54s - loss: 0.5664 - acc: 0.8232 - val_loss: 0.6426 - val_acc: 0.8083
Epoch 6/30
 - 54s - loss: 0.3956 - acc: 0.8815 - val_loss: 0.6067 - val_acc: 0.8517
Epoch 7/30
 - 54s - loss: 0.4281 - acc: 0.8859 - val_loss: 0.5300 - val_acc: 0.8799
Epoch 8/30
 - 54s - loss: 0.3570 - acc: 0.9131 - val_loss: 0.5881 - val_acc: 0.8812
Epoch 9/30
 - 54s - loss: 0.3461 - acc: 0.9195 - val_loss: 0.4996 - val_acc: 0.8792
Epoch 10/30
 - 54s - loss: 0.2919 - acc: 0.9267 - val_loss: 0.5529 - val_acc: 0.8768
Epoch 11/30
 - 54s - loss: 0.3594 - acc: 0.9144 - val_loss: 0.5464 - val_acc: 0.8707
Epoch 12/30
 - 54s - loss: 0.3306 - acc: 0.9276 - val_loss: 0.7686 - val_acc: 0.8405
Epoch 13/30
 - 54s - loss: 0.3139 - acc: 0.9253 - val_loss: 0.5115 - val_acc: 0.8721
Epoch 14/30
 - 54s - loss: 0.2549 - acc: 0.9329 - val_loss: 0.4201 - val_acc: 0.8860
Epoch 15/30
 - 54s - loss: 0.2187 - acc: 0.9415 - val_loss: 0.3677 - val_acc: 0.9033
Epoch 16/30
 - 54s - loss: 0.2296 - acc: 0.9346 - val_loss: 0.3998 - val_acc: 0.8951
Epoch 17/30
 - 54s - loss: 0.2213 - acc: 0.9363 - val_loss: 0.4440 - val_acc: 0.8972
Epoch 18/30
 - 54s - loss: 0.2298 - acc: 0.9343 - val_loss: 0.5169 - val_acc: 0.8806
Epoch 19/30
```

```
   - 54s - loss: 0.2469 - acc: 0.9358 - val_loss: 0.4917 - val_acc: 0.8992
Epoch 20/30
   - 54s - loss: 0.1910 - acc: 0.9400 - val_loss: 0.3785 - val_acc: 0.9046
Epoch 21/30
   - 54s - loss: 0.1775 - acc: 0.9472 - val_loss: 0.4941 - val_acc: 0.9016
Epoch 22/30
   - 54s - loss: 0.2179 - acc: 0.9376 - val_loss: 0.5053 - val_acc: 0.8972
Epoch 23/30
   - 54s - loss: 0.2553 - acc: 0.9328 - val_loss: 0.4692 - val_acc: 0.8884
Epoch 24/30
   - 54s - loss: 0.1926 - acc: 0.9421 - val_loss: 0.3857 - val_acc: 0.8965
Epoch 25/30
   - 54s - loss: 0.1970 - acc: 0.9395 - val_loss: 0.4568 - val_acc: 0.8962
Epoch 26/30
   - 54s - loss: 0.2238 - acc: 0.9354 - val_loss: 0.5431 - val_acc: 0.8945
Epoch 27/30
   - 54s - loss: 0.1852 - acc: 0.9427 - val_loss: 0.5686 - val_acc: 0.9063
Epoch 28/30
   - 54s - loss: 0.2364 - acc: 0.9343 - val_loss: 0.4388 - val_acc: 0.9006
Epoch 29/30
   - 54s - loss: 0.2425 - acc: 0.9324 - val_loss: 0.4072 - val_acc: 0.9118
Epoch 30/30
   - 54s - loss: 0.1823 - acc: 0.9457 - val_loss: 0.3116 - val_acc: 0.9199
Test accuracy: 0.9199185612487275
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
LSTM2_1 (LSTM)	(None, 128, 32)	5376
Dropout2_1 (Dropout)	(None, 128, 32)	0
LSTM2_2 (LSTM)	(None, 32)	8320
Dropout2_2 (Dropout)	(None, 32)	0
dense_15 (Dense)	(None, 6)	198

```
Total params: 13,894
Trainable params: 13,894
Non-trainable params: 0
```

None

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 116s - loss: 1.4041 - acc: 0.3607 - val_loss: 1.4238 - val_acc: 0.3448
Epoch 2/30
 - 112s - loss: 1.3603 - acc: 0.3855 - val_loss: 1.4379 - val_acc: 0.4038
Epoch 3/30
 - 112s - loss: 1.3052 - acc: 0.4049 - val_loss: 1.0620 - val_acc: 0.3882
Epoch 4/30
 - 113s - loss: 1.2095 - acc: 0.4909 - val_loss: 1.0250 - val_acc: 0.5083
Epoch 5/30
 - 113s - loss: 0.9901 - acc: 0.5301 - val_loss: 0.8279 - val_acc: 0.6159
Epoch 6/30
 - 112s - loss: 0.8973 - acc: 0.5941 - val_loss: 0.8105 - val_acc: 0.6220
Epoch 7/30
 - 112s - loss: 0.7839 - acc: 0.6291 - val_loss: 0.7552 - val_acc: 0.6176
Epoch 8/30
 - 112s - loss: 0.7660 - acc: 0.6219 - val_loss: 0.8569 - val_acc: 0.5948
Epoch 9/30
 - 112s - loss: 0.7627 - acc: 0.6240 - val_loss: 0.7599 - val_acc: 0.6220
Epoch 10/30
 - 113s - loss: 0.7986 - acc: 0.6296 - val_loss: 0.8444 - val_acc: 0.6172
Epoch 11/30
 - 112s - loss: 0.7062 - acc: 0.6669 - val_loss: 0.8629 - val_acc: 0.6223
Epoch 12/30
 - 112s - loss: 0.6929 - acc: 0.6608 - val_loss: 0.8061 - val_acc: 0.6240
Epoch 13/30
 - 112s - loss: 0.6894 - acc: 0.6632 - val_loss: 0.8014 - val_acc: 0.6264
Epoch 14/30
 - 112s - loss: 0.7562 - acc: 0.6458 - val_loss: 0.8395 - val_acc: 0.6200
Epoch 15/30
 - 112s - loss: 0.7116 - acc: 0.6639 - val_loss: 0.8772 - val_acc: 0.6206
Epoch 16/30
 - 112s - loss: 0.7058 - acc: 0.6564 - val_loss: 0.7293 - val_acc: 0.6213
Epoch 17/30
 - 112s - loss: 0.6849 - acc: 0.6560 - val_loss: 0.7797 - val_acc: 0.6342
Epoch 18/30
 - 112s - loss: 0.6793 - acc: 0.6612 - val_loss: 0.7296 - val_acc: 0.6359
Epoch 19/30
 - 112s - loss: 0.7748 - acc: 0.6462 - val_loss: 0.7778 - val_acc: 0.6210
Epoch 20/30
 - 112s - loss: 0.6893 - acc: 0.6576 - val_loss: 0.7779 - val_acc: 0.6240
Epoch 21/30
 - 112s - loss: 0.6725 - acc: 0.6560 - val_loss: 0.7446 - val_acc: 0.6186
```

```
Epoch 22/30
 - 112s - loss: 0.6960 - acc: 0.6564 - val_loss: 0.7433 - val_acc: 0.6301
Epoch 23/30
 - 112s - loss: 0.6884 - acc: 0.6557 - val_loss: 0.7521 - val_acc: 0.6240
Epoch 24/30
 - 112s - loss: 0.6909 - acc: 0.6613 - val_loss: 0.7613 - val_acc: 0.6267
Epoch 25/30
 - 112s - loss: 0.6607 - acc: 0.6676 - val_loss: 0.8038 - val_acc: 0.6172
Epoch 26/30
 - 112s - loss: 0.6454 - acc: 0.6693 - val_loss: 0.8014 - val_acc: 0.6200
Epoch 27/30
 - 112s - loss: 0.6491 - acc: 0.6624 - val_loss: 0.7241 - val_acc: 0.6261
Epoch 28/30
 - 112s - loss: 0.6288 - acc: 0.6723 - val_loss: 0.7202 - val_acc: 0.6318
Epoch 29/30
 - 113s - loss: 0.6441 - acc: 0.6695 - val_loss: 0.7551 - val_acc: 0.6257
Epoch 30/30
 - 112s - loss: 0.6480 - acc: 0.6634 - val_loss: 0.7780 - val_acc: 0.6210
Test accuracy: 0.6209704784526637
---------------------------------------------------------------------------
```

```
In [48]: total_trials = dict()
         for t, trial in enumerate(trials):
                 vals = trial.get('misc').get('vals')
                 print('Model',t+1,'parameters')
                 print(vals)
                 print()
                 z = eval_hyperopt_space(space, vals)
                 total_trials['M'+str(t+1)] = z
                 print(z)
                 print('------------------------------------------------')
```

Model 1 parameters
{'Dropout': [0.36598023572757926], 'Dropout_1': [0.6047146037530785], 'Dropout_2': [0.5188826519950874], 'LSTM': [0], 'LSTM_1': [1], 'LSTM_2': [1], 'choiceval': [1], 'conditional': [0], 'l2': [0.00016900597529479822], 'l2_1': [0.0006108763092812357], 'l2_2': [0.0007371698374615214], 'lr': [0.01942874904782045], 'lr_1': [0.015993860150909475]}

{'Dropout': 0.36598023572757926, 'Dropout_1': 0.6047146037530785, 'Dropout_2': 0.5188826519950874, 'LSTM': 28, 'LSTM_1': 32, 'LSTM_2': 32, 'choiceval': 'rmsprop', 'conditional': 'one', 'l2': 0.00016900597529479822, 'l2_1': 0.0006108763092812357, 'l2_2': 0.0007371698374615214, 'lr': 0.01942874904782045, 'lr_1': 0.015993860150909475}

Model 2 parameters
{'Dropout': [0.604072168386432], 'Dropout_1': [0.5642077861572957], 'Dropout_2': [0.4689742513688654], 'LSTM': [0], 'LSTM_1': [1], 'LSTM_2': [0], 'choiceval': [1], 'conditional': [1], 'l2': [2.221286943616341e-06], 'l2_1': [0.0009770005173795487], 'l2_2': [0.0008366666847115819], 'lr': [0.023605271151689124], 'lr_1': [0.015140941766877332]}

{'Dropout': 0.604072168386432, 'Dropout_1': 0.5642077861572957, 'Dropout_2': 0.4689742513688654, 'LSTM': 28, 'LSTM_1': 32, 'LSTM_2': 28, 'choiceval': 'rmsprop', 'conditional': 'two', 'l2': 2.221286943616341e-06, 'l2_1': 0.0009770005173795487, 'l2_2': 0.0008366666847115819, 'lr': 0.023605271151689124, 'lr_1': 0.01514094176877332}

Model 3 parameters
{'Dropout': [0.649118836907314], 'Dropout_1': [0.6408661828169875], 'Dropout_2': [0.5025116318997556], 'LSTM': [2], 'LSTM_1': [2], 'LSTM_2': [1], 'choiceval': [1], 'conditional': [1], 'l2': [0.00011247630115130428], 'l2_1': [0.0003949936266626689], 'l2_2': [0.0009758185183456943], 'lr': [0.013618600574440736], 'lr_1': [0.0144020220950061829]}

{'Dropout': 0.649118836907314, 'Dropout_1': 0.6408661828169875, 'Dropout_2': 0.5025116318997556, 'LSTM': 38, 'LSTM_1': 36, 'LSTM_2': 32, 'choiceval': 'rmsprop', 'conditional': 'two', 'l2': 0.00011247630115130428, 'l2_1': 0.0003949936266626689, 'l2_2': 0.0009758185183456943, 'lr': 0.013618600574440736, 'lr_1': 0.014402022095061829}

Model 4 parameters
{'Dropout': [0.5709919477993022], 'Dropout_1': [0.6574295784428639], 'Dropout_2': [0.39377498664819843], 'LSTM': [1], 'LSTM_1': [1], 'LSTM_2': [2], 'choiceval': [0], 'conditional': [1], 'l2': [0.00019824027740992625], 'l2_1': [0.0007646166765488501], 'l2_2': [0.00041266207281071243], 'lr': [0.01675112837971219], 'lr_1': [0.009417276849790152]}

{'Dropout': 0.5709919477993022, 'Dropout_1': 0.6574295784428639, 'Dropout_2': 0.39377498664819843, 'LSTM': 32, 'LSTM_1': 32, 'LSTM_2': 36, 'choiceval': 'adam', 'conditional': 'two', 'l2': 0.00019824027740992625, 'l2_1': 0.0007646166765488501, 'l2_2': 0.00041266207281071243, 'lr': 0.01675112837971219, 'lr_1': 0.009417276849790152}

```
--------------------------------------------------
Model 5 parameters
{'Dropout': [0.48051787644406624], 'Dropout_1': [0.5744163772727372], 'Dropout_2': [0.5086629864785656], 'LST
M': [1], 'LSTM_1': [1], 'LSTM_2': [0], 'choiceval': [0], 'conditional': [1], 'l2': [2.749908849077252e-05],
'l2_1': [0.000587606728324542], 'l2_2': [0.0003746350041674067], 'lr': [0.01834130504525777], 'lr_1': [0.0229
410270349058]}

{'Dropout': 0.48051787644406624, 'Dropout_1': 0.5744163772727372, 'Dropout_2': 0.5086629864785656, 'LSTM': 3
2, 'LSTM_1': 32, 'LSTM_2': 28, 'choiceval': 'adam', 'conditional': 'two', 'l2': 2.749908849077252e-05, 'l2_
1': 0.000587606728324542, 'l2_2': 0.0003746350041674067, 'lr': 0.01834130504525777, 'lr_1': 0.022941027034905
8}
--------------------------------------------------
Model 6 parameters
{'Dropout': [0.5813560517914963], 'Dropout_1': [0.6046109124722276], 'Dropout_2': [0.5355832635290444], 'LST
M': [0], 'LSTM_1': [1], 'LSTM_2': [2], 'choiceval': [1], 'conditional': [1], 'l2': [1.612769130873457e-05],
'l2_1': [0.0009772817488940724], 'l2_2': [0.0006883693507416478], 'lr': [0.017446396677831936], 'lr_1': [0.01
5805655140931824]}

{'Dropout': 0.5813560517914963, 'Dropout_1': 0.6046109124722276, 'Dropout_2': 0.5355832635290444, 'LSTM': 28,
'LSTM_1': 32, 'LSTM_2': 36, 'choiceval': 'rmsprop', 'conditional': 'two', 'l2': 1.612769130873457e-05, 'l2_
1': 0.0009772817488940724, 'l2_2': 0.0006883693507416478, 'lr': 0.017446396677831936, 'lr_1': 0.0158056551409
31824}
--------------------------------------------------
Model 7 parameters
{'Dropout': [0.5293597400197904], 'Dropout_1': [0.5958807193410454], 'Dropout_2': [0.42617520692074906], 'LST
M': [2], 'LSTM_1': [1], 'LSTM_2': [2], 'choiceval': [0], 'conditional': [1], 'l2': [4.567626225804864e-05],
'l2_1': [0.0005422412690636627], 'l2_2': [0.00033351393608141357], 'lr': [0.01068491666284852], 'lr_1': [0.01
643494651558678]}

{'Dropout': 0.5293597400197904, 'Dropout_1': 0.5958807193410454, 'Dropout_2': 0.42617520692074906, 'LSTM': 3
8, 'LSTM_1': 32, 'LSTM_2': 36, 'choiceval': 'adam', 'conditional': 'two', 'l2': 4.567626225804864e-05, 'l2_
1': 0.0005422412690636627, 'l2_2': 0.00033351393608141357, 'lr': 0.01068491666284852, 'lr_1': 0.0164349465155
8678}
--------------------------------------------------
Model 8 parameters
{'Dropout': [0.5950749367948185], 'Dropout_1': [0.5997621117444732], 'Dropout_2': [0.4999621572265873], 'LST
M': [1], 'LSTM_1': [0], 'LSTM_2': [1], 'choiceval': [0], 'conditional': [1], 'l2': [5.865420439323175e-05],
'l2_1': [0.0007302305870589934], 'l2_2': [0.000258985915829989], 'lr': [0.010314137826059229], 'lr_1': [0.009
310543992889801]}

{'Dropout': 0.5950749367948185, 'Dropout_1': 0.5997621117444732, 'Dropout_2': 0.4999621572265873, 'LSTM': 32,
'LSTM_1': 26, 'LSTM_2': 32, 'choiceval': 'adam', 'conditional': 'two', 'l2': 5.865420439323175e-05, 'l2_1':
0.0007302305870589934, 'l2_2': 0.000258985915829989, 'lr': 0.010314137826059229, 'lr_1': 0.00931054399288980
```

```
1}
---------------------------------------------------
Model 9 parameters
{'Dropout': [0.45037579382108217], 'Dropout_1': [0.6781762554752515], 'Dropout_2': [0.4794831735512747], 'LST
M': [1], 'LSTM_1': [1], 'LSTM_2': [0], 'choiceval': [1], 'conditional': [0], 'l2': [5.201497156118029e-05],
'l2_1': [0.0006257491042113806], 'l2_2': [0.0004437546321946204], 'lr': [0.023536039320918772], 'lr_1': [0.01
2611516495429879]}

{'Dropout': 0.45037579382108217, 'Dropout_1': 0.6781762554752515, 'Dropout_2': 0.4794831735512747, 'LSTM': 3
2, 'LSTM_1': 32, 'LSTM_2': 28, 'choiceval': 'rmsprop', 'conditional': 'one', 'l2': 5.201497156118029e-05, 'l2
_1': 0.0006257491042113806, 'l2_2': 0.0004437546321946204, 'lr': 0.023536039320918772, 'lr_1': 0.012611516495
429879}
---------------------------------------------------
Model 10 parameters
{'Dropout': [0.45714950357785966], 'Dropout_1': [0.6894085538291769], 'Dropout_2': [0.45216713875784914], 'LS
TM': [0], 'LSTM_1': [1], 'LSTM_2': [0], 'choiceval': [1], 'conditional': [0], 'l2': [7.681307310729229e-05],
'l2_1': [0.0004143619965361732], 'l2_2': [9.225974322037534e-05], 'lr': [0.01235075833910319], 'lr_1': [0.018
058999803996133]}

{'Dropout': 0.45714950357785966, 'Dropout_1': 0.6894085538291769, 'Dropout_2': 0.45216713875784914, 'LSTM': 2
8, 'LSTM_1': 32, 'LSTM_2': 28, 'choiceval': 'rmsprop', 'conditional': 'one', 'l2': 7.681307310729229e-05, 'l2
_1': 0.0004143619965361732, 'l2_2': 9.225974322037534e-05, 'lr': 0.01235075833910319, 'lr_1': 0.0180589998039
96133}
---------------------------------------------------
Model 11 parameters
{'Dropout': [0.5808002757682877], 'Dropout_1': [0.660514929179723], 'Dropout_2': [0.4733734305745834], 'LST
M': [1], 'LSTM_1': [0], 'LSTM_2': [1], 'choiceval': [1], 'conditional': [0], 'l2': [0.0001195365208222095],
'l2_1': [0.0001849314123467004], 'l2_2': [0.0005106207029550342], 'lr': [0.013696392786995321], 'lr_1': [0.00
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{'Dropout': 0.5808002757682877, 'Dropout_1': 0.660514929179723, 'Dropout_2': 0.4733734305745834, 'LSTM': 32,
'LSTM_1': 26, 'LSTM_2': 32, 'choiceval': 'rmsprop', 'conditional': 'one', 'l2': 0.0001195365208222095, 'l2_
1': 0.0001849314123467004, 'l2_2': 0.0005106207029550342, 'lr': 0.013696392786995321, 'lr_1': 0.0094209576699
47726}
---------------------------------------------------
Model 12 parameters
{'Dropout': [0.5666044972741778], 'Dropout_1': [0.5837804766498599], 'Dropout_2': [0.38708976069745693], 'LST
M': [1], 'LSTM_1': [2], 'LSTM_2': [2], 'choiceval': [0], 'conditional': [0], 'l2': [6.379888690521487e-05],
'l2_1': [0.00013256157391301627], 'l2_2': [0.0009457487322332761], 'lr': [0.021003723896153827], 'lr_1': [0.0
14111778261744532]}

{'Dropout': 0.5666044972741778, 'Dropout_1': 0.5837804766498599, 'Dropout_2': 0.38708976069745693, 'LSTM': 3
2, 'LSTM_1': 36, 'LSTM_2': 36, 'choiceval': 'adam', 'conditional': 'one', 'l2': 6.379888690521487e-05, 'l2_
```

```
1': 0.00013256157391301627, 'l2_2': 0.0009457487322332761, 'lr': 0.021003723896153827, 'lr_1': 0.014111778261
744532}
--------------------------------------------------
Model 13 parameters
{'Dropout': [0.47945603666694214], 'Dropout_1': [0.6410658485741121], 'Dropout_2': [0.431428962525653], 'LST
M': [2], 'LSTM_1': [1], 'LSTM_2': [2], 'choiceval': [1], 'conditional': [1], 'l2': [0.00018573736431464218],
'l2_1': [0.0009992918522039433], 'l2_2': [0.000376241262719619], 'lr': [0.02028522715636994], 'lr_1': [0.0207
5108210315991]}


{'Dropout': 0.47945603666694214, 'Dropout_1': 0.6410658485741121, 'Dropout_2': 0.431428962525653, 'LSTM': 38,
'LSTM_1': 32, 'LSTM_2': 36, 'choiceval': 'rmsprop', 'conditional': 'two', 'l2': 0.00018573736431464218, 'l2_
1': 0.0009992918522039433, 'l2_2': 0.000376241262719619, 'lr': 0.02028522715636994, 'lr_1': 0.020751082103159
91}
--------------------------------------------------
Model 14 parameters
{'Dropout': [0.3802031741395868], 'Dropout_1': [0.6903389204823146], 'Dropout_2': [0.3654341425327902], 'LST
M': [2], 'LSTM_1': [2], 'LSTM_2': [1], 'choiceval': [0], 'conditional': [0], 'l2': [0.00015208023802140732],
'l2_1': [0.000643128044948208], 'l2_2': [0.0007102309264917989], 'lr': [0.016347608866364167], 'lr_1': [0.024
543333891182614]}


{'Dropout': 0.3802031741395868, 'Dropout_1': 0.6903389204823146, 'Dropout_2': 0.3654341425327902, 'LSTM': 38,
'LSTM_1': 36, 'LSTM_2': 32, 'choiceval': 'adam', 'conditional': 'one', 'l2': 0.00015208023802140732, 'l2_1':
0.000643128044948208, 'l2_2': 0.0007102309264917989, 'lr': 0.016347608866364167, 'lr_1': 0.02454333389118261
4}
--------------------------------------------------
Model 15 parameters
{'Dropout': [0.578227610775208], 'Dropout_1': [0.6959943282933752], 'Dropout_2': [0.4519332465495095], 'LST
M': [1], 'LSTM_1': [1], 'LSTM_2': [1], 'choiceval': [0], 'conditional': [1], 'l2': [9.909767403125834e-05],
'l2_1': [0.0004671776323322324], 'l2_2': [0.0008869747685138522], 'lr': [0.010099240007717829], 'lr_1': [0.02
4293576282946767]}


{'Dropout': 0.578227610775208, 'Dropout_1': 0.6959943282933752, 'Dropout_2': 0.4519332465495095, 'LSTM': 32,
'LSTM_1': 32, 'LSTM_2': 32, 'choiceval': 'adam', 'conditional': 'two', 'l2': 9.909767403125834e-05, 'l2_1':
0.0004671776323322324, 'l2_2': 0.0008869747685138522, 'lr': 0.010099240007717829, 'lr_1': 0.02429357628294676
7}
--------------------------------------------------
```

In [54]:
```python
best_run
```

Out[54]:
```
{'Dropout': 0.3802031741395868,
 'Dropout_1': 0.6903389204823146,
 'Dropout_2': 0.3654341425327902,
 'LSTM': 2,
 'LSTM_1': 2,
 'LSTM_2': 1,
 'choiceval': 0,
 'conditional': 0,
 'l2': 0.00015208023802140732,
 'l2_1': 0.000643128044948208,
 'l2_2': 0.0007102309264917989,
 'lr': 0.016347608866364167,
 'lr_1': 0.024543333891182614}
```

In [55]:
```python
#BEST MODEL PARAMS
total_trials['M14']
```

Out[55]:
```
{'Dropout': 0.3802031741395868,
 'Dropout_1': 0.6903389204823146,
 'Dropout_2': 0.3654341425327902,
 'LSTM': 38,
 'LSTM_1': 36,
 'LSTM_2': 32,
 'choiceval': 'adam',
 'conditional': 'one',
 'l2': 0.00015208023802140732,
 'l2_1': 0.000643128044948208,
 'l2_2': 0.0007102309264917989,
 'lr': 0.016347608866364167,
 'lr_1': 0.024543333891182614}
```

In [50]:
```python
#layes of best model
best_model.layers
```

Out[50]:
```
[<keras.layers.recurrent.LSTM at 0x146c379d2ac8>,
 <keras.layers.core.Dropout at 0x146c379d2cc0>,
 <keras.layers.core.Dense at 0x146c379d2a90>]
```

In [51]:
```python
X_train, Y_train, X_val, Y_val = data()
```

```
In [56]: _,val_acc = best_model.evaluate(X_val, Y_val, verbose=0)
         _,train_acc = best_model.evaluate(X_train, Y_train, verbose=0)
         print('Train_accuracy',val_acc)
         print('validation accuracy',val_acc)
```

```
Train_accuracy 0.94560663764961915
validation accuracy 0.9199185612487275
```

```
In [15]: # Activities are the class labels
         # It is a 6 class classification
         ACTIVITIES = {
             0: 'WALKING',
             1: 'WALKING_UPSTAIRS',
             2: 'WALKING_DOWNSTAIRS',
             3: 'SITTING',
             4: 'STANDING',
             5: 'LAYING',
         }

         # Utility function to print the confusion matrix
         def confusion_matrix_rnn(Y_true, Y_pred):
             Y_true = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_true, axis=1)])
             Y_pred = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_pred, axis=1)])

             #return pd.crosstab(Y_true, Y_pred, rownames=['True'], colnames=['Pred'])
             return metrics.confusion_matrix(Y_true, Y_pred)
```

```
In [74]: # Confusion Matrix
         print(confusion_matrix_rnn(Y_val, best_model.predict(X_val)))
```

```
[[537   0   0   0   0   0]
 [  1 412  75   0   0   3]
 [  0  88 444   0   0   0]
 [  0   0   0 464  10  22]
 [  0   0   0  15 390  15]
 [  0   4   0   2   1 464]]
```

```
In [16]: from sklearn import metrics
```

```
In [80]: plt.figure(figsize=(8,8))
         cm = confusion_matrix_rnn(Y_val, best_model.predict(X_val))
         plot_confusion_matrix(cm, classes=labels, normalize=True, title='Normalized confusion matrix', cmap = plt.cm.
         Greens)
         plt.show()
```


Normalized confusion matrix
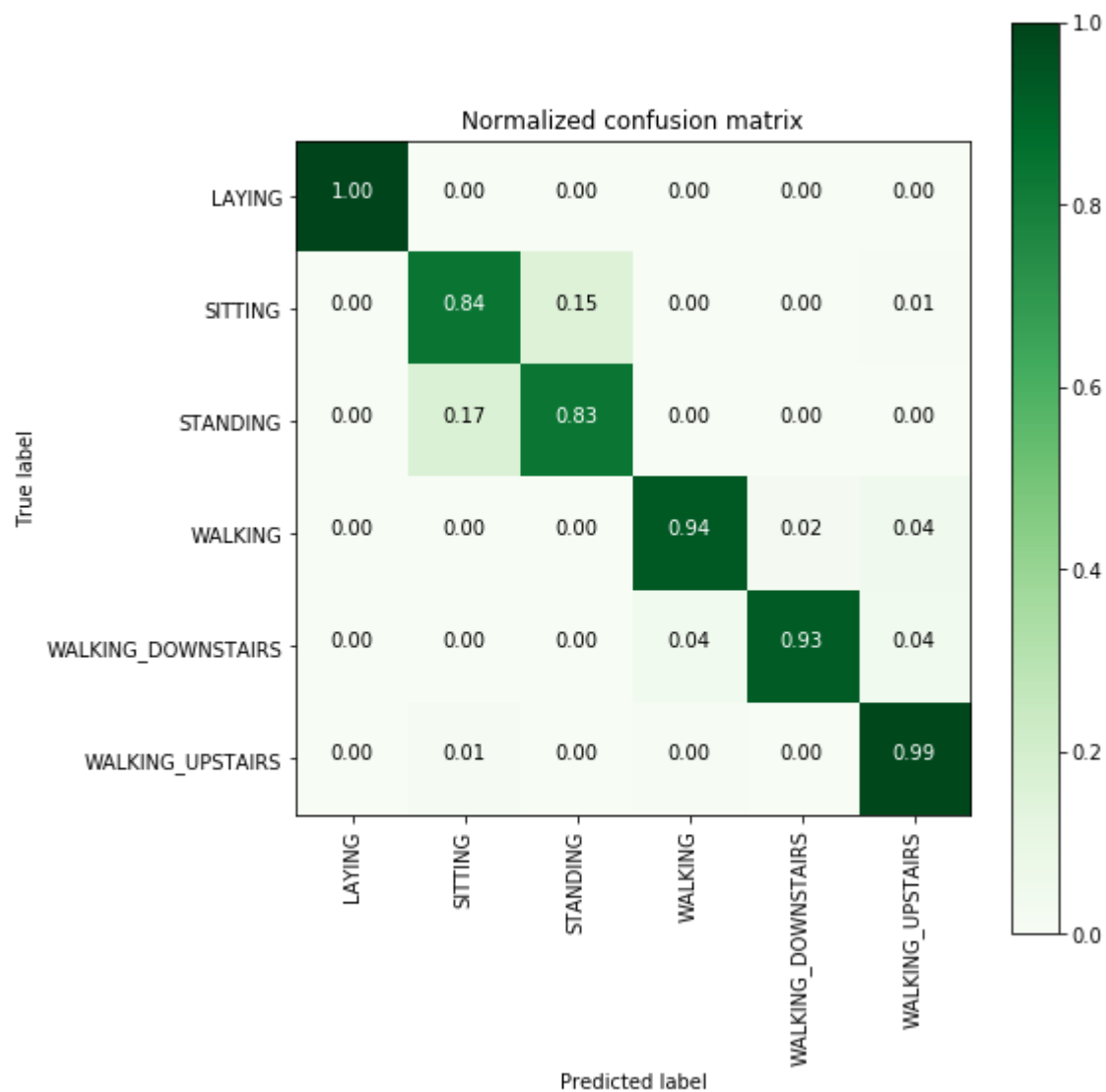
Using CNN

```
In [2]:  import os
         os.environ['PYTHONHASHSEED'] = '0'
         import numpy as np
         import tensorflow as tf
         import random as rn
         np.random.seed(36)
         rn.seed(36)
         tf.set_random_seed(36)
         # Force TensorFlow to use single thread.
         # Multiple threads are a potential source of non-reproducible results.
         # For further details, see: https://stackoverflow.com/questions/42022950/
         session_conf = tf.ConfigProto(intra_op_parallelism_threads=1,
                                       inter_op_parallelism_threads=1)


         from keras import backend as K

         # The below tf.set_random_seed() will make random number generation
         # in the TensorFlow backend have a well-defined initial state.
         # For further details, see:
         # https://www.tensorflow.org/api_docs/python/tf/set_random_seed

         tf.set_random_seed(36)

         sess = tf.Session(graph=tf.get_default_graph(), config=session_conf)
         K.set_session(sess)
```

Using TensorFlow backend.

In [3]:
```python
# Importing libraries
import pandas as pd
from matplotlib import pyplot
from sklearn.preprocessing import StandardScaler
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Flatten
from keras.layers import Dropout
from keras.layers.convolutional import Conv1D
from keras.layers.convolutional import MaxPooling1D
from keras.utils import to_categorical
from keras.models import Sequential
from keras.layers import LSTM
from keras.layers.core import Dense, Dropout
```

In [18]:
```python
X_train, Y_train, X_val, Y_val = data()
```

In [19]:
```python
###Scling data
from sklearn.base import BaseEstimator, TransformerMixin
class scaling_tseries_data(BaseEstimator, TransformerMixin):
    from sklearn.preprocessing import StandardScaler
    def __init__(self):
        self.scale = None

    def transform(self, X):
        temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
        temp_X1 = self.scale.transform(temp_X1)
        return temp_X1.reshape(X.shape)

    def fit(self, X):
        # remove overlaping
        remove = int(X.shape[1] / 2)
        temp_X = X[:, -remove:, :]
        # flatten data
        temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
        scale = StandardScaler()
        scale.fit(temp_X)
        self.scale = scale
        return self
```

```
In [20]: Scale = scaling_tseries_data()
         Scale.fit(X_train)
         X_train_sc = Scale.transform(X_train)
         X_val_sc = Scale.transform(X_val)
```

```
In [21]: print('Shape of scaled X train',X_train_sc.shape)
         print('Shape of scaled X test',X_val_sc.shape)
```

```
Shape of scaled X train (7352, 128, 9)
Shape of scaled X test (2947, 128, 9)
```

Base Model

In [26]:
```python
model = Sequential()
model.add(Conv1D(filters=32, kernel_size=3, activation='relu',kernel_initializer='he_uniform',input_shape=(12
8,9)))
model.add(Conv1D(filters=32, kernel_size=3, activation='relu',kernel_initializer='he_uniform'))
model.add(Dropout(0.6))
model.add(MaxPooling1D(pool_size=2))
model.add(Flatten())
model.add(Dense(50, activation='relu'))
model.add(Dense(6, activation='softmax'))
model.summary()
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 126, 32)           896
_____
conv1d_2 (Conv1D)            (None, 124, 32)           3104
_____
dropout_1 (Dropout)          (None, 124, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 62, 32)            0
_____
flatten_1 (Flatten)          (None, 1984)              0
_____
dense_1 (Dense)              (None, 50)                99250
_____
dense_2 (Dense)              (None, 6)                 306
=================================================================
Total params: 103,556
Trainable params: 103,556
Non-trainable params: 0
_____
```

In [27]:
```python
model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
```

In [28]:
```python
model.fit(X_train_sc,Y_train, epochs=30, batch_size=16,validation_data=(X_val_sc, Y_val), verbose=1)
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
7352/7352 [==============================] - 6s 764us/step - loss: 0.4207 - acc: 0.8403 - val_loss: 0.3384 -
val_acc: 0.8748
Epoch 2/30
7352/7352 [==============================] - 5s 685us/step - loss: 0.1448 - acc: 0.9411 - val_loss: 0.3163 -
val_acc: 0.8799
Epoch 3/30
7352/7352 [==============================] - 5s 672us/step - loss: 0.1177 - acc: 0.9486 - val_loss: 0.2963 -
val_acc: 0.9226
Epoch 4/30
7352/7352 [==============================] - 5s 686us/step - loss: 0.0912 - acc: 0.9566 - val_loss: 0.2926 -
val_acc: 0.9097
Epoch 5/30
7352/7352 [==============================] - 5s 691us/step - loss: 0.0987 - acc: 0.9567 - val_loss: 0.3676 -
val_acc: 0.9036
Epoch 6/30
7352/7352 [==============================] - 5s 678us/step - loss: 0.0841 - acc: 0.9619 - val_loss: 0.3184 -
val_acc: 0.9036
Epoch 7/30
7352/7352 [==============================] - 5s 695us/step - loss: 0.0727 - acc: 0.9659 - val_loss: 0.3215 -
val_acc: 0.9169
Epoch 8/30
7352/7352 [==============================] - 5s 671us/step - loss: 0.0827 - acc: 0.9630 - val_loss: 0.3346 -
val_acc: 0.9199
Epoch 9/30
7352/7352 [==============================] - 5s 695us/step - loss: 0.0726 - acc: 0.9690 - val_loss: 0.3988 -
val_acc: 0.8958
Epoch 10/30
7352/7352 [==============================] - 5s 678us/step - loss: 0.0724 - acc: 0.9694 - val_loss: 0.4881 -
val_acc: 0.8948
Epoch 11/30
7352/7352 [==============================] - 5s 667us/step - loss: 0.0585 - acc: 0.9746 - val_loss: 0.3294 -
val_acc: 0.9148
Epoch 12/30
7352/7352 [==============================] - 5s 669us/step - loss: 0.0529 - acc: 0.9767 - val_loss: 0.4145 -
val_acc: 0.9074
Epoch 13/30
7352/7352 [==============================] - 5s 685us/step - loss: 0.0578 - acc: 0.9742 - val_loss: 0.4447 -
val_acc: 0.9084
Epoch 14/30
7352/7352 [==============================] - 5s 689us/step - loss: 0.0559 - acc: 0.9751 - val_loss: 0.4771 -
val_acc: 0.8935
```

```
Epoch 15/30
7352/7352 [==============================] - 5s 676us/step - loss: 0.0529 - acc: 0.9771 - val_loss: 0.4165 -
val_acc: 0.9060
Epoch 16/30
7352/7352 [==============================] - 5s 663us/step - loss: 0.0498 - acc: 0.9785 - val_loss: 0.4710 -
val_acc: 0.8979
Epoch 17/30
7352/7352 [==============================] - 5s 678us/step - loss: 0.0427 - acc: 0.9833 - val_loss: 0.4036 -
val_acc: 0.9155
Epoch 18/30
7352/7352 [==============================] - 5s 675us/step - loss: 0.0397 - acc: 0.9841 - val_loss: 0.4978 -
val_acc: 0.9141
Epoch 19/30
7352/7352 [==============================] - 5s 651us/step - loss: 0.0475 - acc: 0.9804 - val_loss: 0.4573 -
val_acc: 0.9060
Epoch 20/30
7352/7352 [==============================] - 5s 699us/step - loss: 0.0378 - acc: 0.9831 - val_loss: 0.5176 -
val_acc: 0.9111
Epoch 21/30
7352/7352 [==============================] - 5s 691us/step - loss: 0.0353 - acc: 0.9867 - val_loss: 0.5103 -
val_acc: 0.9111
Epoch 22/30
7352/7352 [==============================] - 5s 692us/step - loss: 0.0427 - acc: 0.9827 - val_loss: 0.5969 -
val_acc: 0.9148
Epoch 23/30
7352/7352 [==============================] - 5s 669us/step - loss: 0.0379 - acc: 0.9837 - val_loss: 0.6271 -
val_acc: 0.9046
Epoch 24/30
7352/7352 [==============================] - 5s 674us/step - loss: 0.0331 - acc: 0.9871 - val_loss: 0.5575 -
val_acc: 0.9152
Epoch 25/30
7352/7352 [==============================] - 5s 687us/step - loss: 0.0259 - acc: 0.9883 - val_loss: 0.5731 -
val_acc: 0.9141
Epoch 26/30
7352/7352 [==============================] - 5s 695us/step - loss: 0.0530 - acc: 0.9834 - val_loss: 0.5450 -
val_acc: 0.9186
Epoch 27/30
7352/7352 [==============================] - 5s 674us/step - loss: 0.0692 - acc: 0.9822 - val_loss: 0.5904 -
val_acc: 0.9026
Epoch 28/30
7352/7352 [==============================] - 5s 676us/step - loss: 0.0664 - acc: 0.9849 - val_loss: 0.4807 -
val_acc: 0.9250
Epoch 29/30
```

```
7352/7352 [==============================] - 5s 673us/step - loss: 0.0675 - acc: 0.9845 - val_loss: 0.5125 -
val_acc: 0.9264
Epoch 30/30
7352/7352 [==============================] - 5s 671us/step - loss: 0.0531 - acc: 0.9897 - val_loss: 0.6342 -
val_acc: 0.9152
```

Out[28]: <keras.callbacks.History at 0x14761b299ac8>

it is giving some good score in train as well as test but it is overfitting so much. i will try some regularization in below models.

In [3]:
```python
from keras.regularizers import l2,l1
import keras
from keras.layers import BatchNormalization
```

In [117]:
```python
model = Sequential()
model.add(Conv1D(filters=32, kernel_size=3, activation='relu',kernel_initializer='he_uniform',
                 kernel_regularizer=l2(0.1),input_shape=(128,9)))
model.add(Conv1D(filters=16, kernel_size=3, activation='relu',kernel_regularizer=l2(0.06),kernel_initializer=
'he_uniform'))
model.add(Dropout(0.65))
model.add(MaxPooling1D(pool_size=2))
model.add(Flatten())
model.add(Dense(32, activation='relu'))
model.add(Dense(6, activation='softmax'))
model.summary()
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_67 (Conv1D)           (None, 126, 32)           896
_____
conv1d_68 (Conv1D)           (None, 124, 16)           1552
_____
dropout_39 (Dropout)         (None, 124, 16)           0
_____
max_pooling1d_34 (MaxPooling (None, 62, 16)            0
_____
flatten_34 (Flatten)         (None, 992)               0
_____
dense_67 (Dense)             (None, 32)                31776
_____
dense_68 (Dense)             (None, 6)                 198
=================================================================
Total params: 34,422
Trainable params: 34,422
Non-trainable params: 0
_____
```

In [118]:
```python
import math
adam = keras.optimizers.Adam(lr=0.001)
rmsprop = keras.optimizers.RMSprop(lr=0.001)
def step_decay(epoch):
    return float(0.001 * math.pow(0.6, math.floor((1+epoch)/10)))
from keras.callbacks import LearningRateScheduler
lrate = LearningRateScheduler(step_decay)
callbacks_list = [lrate]

model.compile(loss='categorical_crossentropy', optimizer=adam, metrics=['accuracy'])
```

In [119]:
```python
model.fit(X_train_sc,Y_train, epochs=30, batch_size=16,validation_data=(X_val_sc, Y_val), verbose=1)
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
7352/7352 [==============================] - 6s 879us/step - loss: 4.3454 - acc: 0.7266 - val_loss: 1.5457 -
val_acc: 0.7815
Epoch 2/30
7352/7352 [==============================] - 5s 676us/step - loss: 0.7579 - acc: 0.9121 - val_loss: 0.6360 -
val_acc: 0.8935
Epoch 3/30
7352/7352 [==============================] - 5s 668us/step - loss: 0.3876 - acc: 0.9286 - val_loss: 0.5337 -
val_acc: 0.8772
Epoch 4/30
7352/7352 [==============================] - 5s 673us/step - loss: 0.3123 - acc: 0.9283 - val_loss: 0.4940 -
val_acc: 0.8673
Epoch 5/30
7352/7352 [==============================] - 5s 680us/step - loss: 0.2729 - acc: 0.9336 - val_loss: 0.4439 -
val_acc: 0.8901
Epoch 6/30
7352/7352 [==============================] - 5s 676us/step - loss: 0.2629 - acc: 0.9327 - val_loss: 0.4330 -
val_acc: 0.8775
Epoch 7/30
7352/7352 [==============================] - 5s 664us/step - loss: 0.2423 - acc: 0.9393 - val_loss: 0.4225 -
val_acc: 0.8711
Epoch 8/30
7352/7352 [==============================] - 5s 681us/step - loss: 0.2327 - acc: 0.9380 - val_loss: 0.3889 -
val_acc: 0.8992
Epoch 9/30
7352/7352 [==============================] - 5s 670us/step - loss: 0.2237 - acc: 0.9372 - val_loss: 0.3994 -
val_acc: 0.8928
Epoch 10/30
7352/7352 [==============================] - 5s 687us/step - loss: 0.2221 - acc: 0.9377 - val_loss: 0.3850 -
val_acc: 0.8880
Epoch 11/30
7352/7352 [==============================] - 5s 676us/step - loss: 0.2216 - acc: 0.9377 - val_loss: 0.4274 -
val_acc: 0.8914
Epoch 12/30
7352/7352 [==============================] - 5s 684us/step - loss: 0.2085 - acc: 0.9416 - val_loss: 0.3917 -
val_acc: 0.8887
Epoch 13/30
7352/7352 [==============================] - 5s 646us/step - loss: 0.2005 - acc: 0.9448 - val_loss: 0.3987 -
val_acc: 0.8843
Epoch 14/30
7352/7352 [==============================] - 5s 687us/step - loss: 0.2075 - acc: 0.9446 - val_loss: 0.4501 -
val_acc: 0.8337
```

```
Epoch 15/30
7352/7352 [==============================] - 5s 678us/step - loss: 0.1980 - acc: 0.9434 - val_loss: 0.3589 -
val_acc: 0.8860
Epoch 16/30
7352/7352 [==============================] - 5s 696us/step - loss: 0.1891 - acc: 0.9449 - val_loss: 0.3954 -
val_acc: 0.8931
Epoch 17/30
7352/7352 [==============================] - 5s 660us/step - loss: 0.1909 - acc: 0.9434 - val_loss: 0.4015 -
val_acc: 0.8778
Epoch 18/30
7352/7352 [==============================] - 5s 689us/step - loss: 0.1893 - acc: 0.9429 - val_loss: 0.3641 -
val_acc: 0.8853
Epoch 19/30
7352/7352 [==============================] - 5s 661us/step - loss: 0.2002 - acc: 0.9389 - val_loss: 0.4151 -
val_acc: 0.8728
Epoch 20/30
7352/7352 [==============================] - 5s 664us/step - loss: 0.1817 - acc: 0.9486 - val_loss: 0.3662 -
val_acc: 0.8768
Epoch 21/30
7352/7352 [==============================] - 5s 670us/step - loss: 0.1828 - acc: 0.9472 - val_loss: 0.3892 -
val_acc: 0.8819
Epoch 22/30
7352/7352 [==============================] - 5s 661us/step - loss: 0.1851 - acc: 0.9449 - val_loss: 0.3684 -
val_acc: 0.8907
Epoch 23/30
7352/7352 [==============================] - 5s 672us/step - loss: 0.1841 - acc: 0.9456 - val_loss: 0.3256 -
val_acc: 0.8924
Epoch 24/30
7352/7352 [==============================] - 5s 674us/step - loss: 0.1777 - acc: 0.9463 - val_loss: 0.3316 -
val_acc: 0.8816
Epoch 25/30
7352/7352 [==============================] - 5s 683us/step - loss: 0.1785 - acc: 0.9448 - val_loss: 0.4006 -
val_acc: 0.8622
Epoch 26/30
7352/7352 [==============================] - 5s 678us/step - loss: 0.1751 - acc: 0.9459 - val_loss: 0.5416 -
val_acc: 0.8493
Epoch 27/30
7352/7352 [==============================] - 5s 697us/step - loss: 0.1773 - acc: 0.9476 - val_loss: 0.3382 -
val_acc: 0.8989
Epoch 28/30
7352/7352 [==============================] - 5s 672us/step - loss: 0.1692 - acc: 0.9506 - val_loss: 0.3668 -
val_acc: 0.8826
Epoch 29/30
```

```
7352/7352 [==============================] - 5s 677us/step - loss: 0.1742 - acc: 0.9478 - val_loss: 0.3855 -
val_acc: 0.8904
Epoch 30/30
7352/7352 [==============================] - 5s 679us/step - loss: 0.1754 - acc: 0.9467 - val_loss: 0.3478 -
val_acc: 0.8958
```

Out[119]: <keras.callbacks.History at 0x14757856a6d8>

Hyper Parameter Tuning Using Hyperas

```python
In [4]: def data_scaled():
            """
            Obtain the dataset from multiple files.
            Returns: X_train, X_test, y_train, y_test
            """
            # Data directory
            DATADIR = 'UCI_HAR_Dataset'
            # Raw data signals
            # Signals are from Accelerometer and Gyroscope
            # The signals are in x,y,z directions
            # Sensor signals are filtered to have only body acceleration
            # excluding the acceleration due to gravity
            # Triaxial acceleration from the accelerometer is total acceleration
            SIGNALS = [
                "body_acc_x",
                "body_acc_y",
                "body_acc_z",
                "body_gyro_x",
                "body_gyro_y",
                "body_gyro_z",
                "total_acc_x",
                "total_acc_y",
                "total_acc_z"
                ]
            from sklearn.base import BaseEstimator, TransformerMixin
            class scaling_tseries_data(BaseEstimator, TransformerMixin):
                from sklearn.preprocessing import StandardScaler
                def __init__(self):
                    self.scale = None

                def transform(self, X):
                    temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
                    temp_X1 = self.scale.transform(temp_X1)
                    return temp_X1.reshape(X.shape)

                def fit(self, X):
                    # remove overlaping
                    remove = int(X.shape[1] / 2)
                    temp_X = X[:, -remove:, :]
                    # flatten data
                    temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
                    scale = StandardScaler()
```

```python
            scale.fit(temp_X)
            self.scale = scale
            return self

    # Utility function to read the data from csv file
    def _read_csv(filename):
        return pd.read_csv(filename, delim_whitespace=True, header=None)

    # Utility function to load the load
    def load_signals(subset):
        signals_data = []

        for signal in SIGNALS:
            filename = f'UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
            signals_data.append( _read_csv(filename).as_matrix())

        # Transpose is used to change the dimensionality of the output,
        # aggregating the signals by combination of sample/timestep.
        # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
        return np.transpose(signals_data, (1, 2, 0))

    def load_y(subset):
        """
        The objective that we are trying to predict is a integer, from 1 to 6,
        that represents a human activity. We return a binary representation of
        every sample objective as a 6 bits vector using One Hot Encoding
        (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
        """
        filename = f'UCI_HAR_Dataset/{subset}/y_{subset}.txt'
        y = _read_csv(filename)[0]
        return pd.get_dummies(y).as_matrix()

    X_train, X_val = load_signals('train'), load_signals('test')
    Y_train, Y_val = load_y('train'), load_y('test')
    ###Scling data
    Scale = scaling_tseries_data()
    Scale.fit(X_train)
    X_train = Scale.transform(X_train)
    X_val = Scale.transform(X_val)

    return X_train, Y_train, X_val,  Y_val
```

In [5]:
```python
X_train, Y_train, X_val,  Y_val = data_scaled()
```

```python
In [6]: def model_cnn(X_train, Y_train, X_val, Y_val):
            # Importing tensorflow
            np.random.seed(36)
            import tensorflow as tf
            tf.set_random_seed(36)
            # Initiliazing the sequential model
            model = Sequential()

            model.add(Conv1D(filters={{choice([28,32,42])}}, kernel_size={{choice([3,5,7])}},activation='relu',kernel
        _initializer='he_uniform',
                        kernel_regularizer=l2({{uniform(0,2.5)}}),input_shape=(128,9)))

            model.add(Conv1D(filters={{choice([16,24,32])}}, kernel_size={{choice([3,5,7])}},
                        activation='relu',kernel_regularizer=l2({{uniform(0,1.5)}}),kernel_initializer='he_unifo
        rm'))
            model.add(Dropout({{uniform(0.45,0.7)}}))
            model.add(MaxPooling1D(pool_size={{choice([2,3])}}))
            model.add(Flatten())
            model.add(Dense({{choice([32,64])}}, activation='relu'))
            model.add(Dense(6, activation='softmax'))

            adam = keras.optimizers.Adam(lr={{uniform(0.00065,0.004)}})
            rmsprop = keras.optimizers.RMSprop(lr={{uniform(0.00065,0.004)}})

            choiceval = {{choice(['adam', 'rmsprop'])}}

            if choiceval == 'adam':
                optim = adam
            else:
                optim = rmsprop

            print(model.summary())

            model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)

            result = model.fit(X_train, Y_train,
                    batch_size={{choice([16,32,64])}},
                    nb_epoch={{choice([25,30,35])}},
                    verbose=2,
                    validation_data=(X_val, Y_val))

            score, acc = model.evaluate(X_val, Y_val, verbose=0)
```

```python
    score1, acc1 = model.evaluate(X_train, Y_train, verbose=0)
    print('Train accuracy',acc1,'Test accuracy:', acc)
    print('--------------------------------------------------------------------------')
    return {'loss': -acc, 'status': STATUS_OK, 'model': model,'train_acc':acc1}
```

```
In [25]: X_train, Y_train, X_val, Y_val = data_scaled()
         trials = Trials()
         best_run, best_model, space = optim.minimize(model=model_cnn,
                                                       data=data_scaled,
                                                       algo=tpe.suggest,
                                                       max_evals=100,
                                                       trials=trials,notebook_name = 'Human Activity Detection',
                                                       return_space = True)
```

```
>>> Imports:
#coding=utf-8

try:
    import numpy as np
except:
    pass

try:
    import tensorflow as tf
except:
    pass

try:
    import random as rn
except:
    pass

try:
    from keras import backend as K
except:
    pass

try:
    import pickle
except:
    pass

try:
    import keras
except:
    pass

try:
    from keras.models import Sequential
except:
    pass

try:
    from keras.layers import LSTM
except:
    pass
```

```
try:
    from keras.layers.core import Dense, Dropout
except:
    pass

try:
    from hyperopt import Trials, STATUS_OK, tpe
except:
    pass

try:
    from hyperas import optim
except:
    pass

try:
    from hyperas.distributions import choice, uniform
except:
    pass

try:
    import pandas as pd
except:
    pass

try:
    from matplotlib import pyplot
except:
    pass

try:
    from sklearn.preprocessing import StandardScaler
except:
    pass

try:
    from keras.models import Sequential
except:
    pass

try:
    from keras.layers import Flatten
except:
```

```
            pass

        try:
            from keras.regularizers import l2
        except:
            pass

        try:
            from keras.layers.convolutional import Conv1D
        except:
            pass

        try:
            from keras.layers.convolutional import MaxPooling1D
        except:
            pass

        try:
            from keras.utils import to_categorical
        except:
            pass

        try:
            from sklearn.base import BaseEstimator, TransformerMixin
        except:
            pass

        try:
            from sklearn.preprocessing import StandardScaler
        except:
            pass

>>> Hyperas search space:

def get_space():
    return {
        'filters': hp.choice('filters', [28,32,42]),
        'kernel_size': hp.choice('kernel_size', [3,5,7]),
        'l2': hp.uniform('l2', 0,2.5),
        'filters_1': hp.choice('filters_1', [16,24,32]),
        'kernel_size_1': hp.choice('kernel_size_1', [3,5,7]),
        'l2_1': hp.uniform('l2_1', 0,1.5),
        'Dropout': hp.uniform('Dropout', 0.45,0.7),
```

```
         'pool_size': hp.choice('pool_size', [2,3]),
         'Dense': hp.choice('Dense', [32,64]),
         'lr': hp.uniform('lr', 0.00065,0.004),
         'lr_1': hp.uniform('lr_1', 0.00065,0.004),
         'choiceval': hp.choice('choiceval', ['adam', 'rmsprop']),
         'batch_size': hp.choice('batch_size', [16,32,64]),
         'nb_epoch': hp.choice('nb_epoch', [25,30,35]),
     }
```

>>> Data

```
 1:
 2: """
 3: Obtain the dataset from multiple files.
 4: Returns: X_train, X_test, y_train, y_test
 5: """
 6: # Data directory
 7: DATADIR = 'UCI_HAR_Dataset'
 8: # Raw data signals
 9: # Signals are from Accelerometer and Gyroscope
10: # The signals are in x,y,z directions
11: # Sensor signals are filtered to have only body acceleration
12: # excluding the acceleration due to gravity
13: # Triaxial acceleration from the accelerometer is total acceleration
14: SIGNALS = [
15:     "body_acc_x",
16:     "body_acc_y",
17:     "body_acc_z",
18:     "body_gyro_x",
19:     "body_gyro_y",
20:     "body_gyro_z",
21:     "total_acc_x",
22:     "total_acc_y",
23:     "total_acc_z"
24:     ]
25: from sklearn.base import BaseEstimator, TransformerMixin
26: class scaling_tseries_data(BaseEstimator, TransformerMixin):
27:     from sklearn.preprocessing import StandardScaler
28:     def __init__(self):
29:         self.scale = None
30:
31:     def transform(self, X):
32:         temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
33:         temp_X1 = self.scale.transform(temp_X1)
```

```
34:            return temp_X1.reshape(X.shape)
35:
36:    def fit(self, X):
37:        # remove overlaping
38:        remove = int(X.shape[1] / 2)
39:        temp_X = X[:, -remove:, :]
40:        # flatten data
41:        temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
42:        scale = StandardScaler()
43:        scale.fit(temp_X)
44:        self.scale = scale
45:        return self
46:
47: # Utility function to read the data from csv file
48: def _read_csv(filename):
49:    return pd.read_csv(filename, delim_whitespace=True, header=None)
50:
51: # Utility function to load the load
52: def load_signals(subset):
53:    signals_data = []
54:
55:    for signal in SIGNALS:
56:        filename = f'HAR/UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
57:        signals_data.append( _read_csv(filename).as_matrix())
58:
59:    # Transpose is used to change the dimensionality of the output,
60:    # aggregating the signals by combination of sample/timestep.
61:    # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
62:    return np.transpose(signals_data, (1, 2, 0))
63:
64: def load_y(subset):
65:    """
66:    The objective that we are trying to predict is a integer, from 1 to 6,
67:    that represents a human activity. We return a binary representation of
68:    every sample objective as a 6 bits vector using One Hot Encoding
69:    (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
70:    """
71:    filename = f'HAR/UCI_HAR_Dataset/{subset}/y_{subset}.txt'
72:    y = _read_csv(filename)[0]
73:    return pd.get_dummies(y).as_matrix()
74:
75: X_train, X_val = load_signals('train'), load_signals('test')
76: Y_train, Y_val = load_y('train'), load_y('test')
```

```
77: ###Scling data
78: Scale = scaling_tseries_data()
79: Scale.fit(X_train)
80: X_train = Scale.transform(X_train)
81: X_val = Scale.transform(X_val)
82:
83:
84:
85:
```

>>> Resulting replaced keras model:

```
 1: def keras_fmin_fnct(space):
 2:
 3:     # Initiliazing the sequential model
 4:     model = Sequential()
 5:
 6:     model.add(Conv1D(filters=space['filters'], kernel_size=space['kernel_size'],activation='relu',kerne
l_initializer='he_uniform',
 7:                  kernel_regularizer=l2(space['l2']),input_shape=(128,9)))
 8:
 9:     model.add(Conv1D(filters=space['filters_1'], kernel_size=space['kernel_size_1'],
10:                  activation='relu',kernel_regularizer=l2(space['l2_1']),kernel_initializer='he_unif
orm'))
11:     model.add(Dropout(space['Dropout']))
12:     model.add(MaxPooling1D(pool_size=space['pool_size']))
13:     model.add(Flatten())
14:     model.add(Dense(space['Dense'], activation='relu'))
15:     model.add(Dense(6, activation='softmax'))
16:
17:     adam = keras.optimizers.Adam(lr=space['lr'])
18:     rmsprop = keras.optimizers.RMSprop(lr=space['lr_1'])
19:
20:     choiceval = space['choiceval']
21:
22:     if choiceval == 'adam':
23:         optim = adam
24:     else:
25:         optim = rmsprop
26:
27:     print(model.summary())
28:
29:     model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
30:
```

```
31:       result = model.fit(X_train, Y_train,
32:               batch_size=space['batch_size'],
33:               nb_epoch=space['nb_epoch'],
34:               verbose=2,
35:               validation_data=(X_val, Y_val))
36:
37:       score, acc = model.evaluate(X_val, Y_val, verbose=0)
38:       score1, acc1 = model.evaluate(X_train, Y_train, verbose=0)
39:       print('Train accuracy',acc1,'Test accuracy:', acc)
40:       print('----------------------------------------------------------------------------------')
41:       return {'loss': -acc, 'status': STATUS_OK, 'model': model,'train_acc':acc1}
42:
```

```
_____
Layer (type)                  Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)             (None, 124, 32)           1472
_____
conv1d_2 (Conv1D)             (None, 118, 24)           5400
_____
dropout_1 (Dropout)           (None, 118, 24)           0
_____
max_pooling1d_1 (MaxPooling1  (None, 59, 24)            0
_____
flatten_1 (Flatten)           (None, 1416)              0
_____
dense_1 (Dense)               (None, 64)                90688
_____
dense_2 (Dense)               (None, 6)                 390
===============================================================
Total params: 97,950
Trainable params: 97,950
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 3s - loss: 45.3420 - acc: 0.7704 - val_loss: 3.6639 - val_acc: 0.7991
Epoch 2/30
 - 3s - loss: 1.2333 - acc: 0.8358 - val_loss: 0.7950 - val_acc: 0.8205
Epoch 3/30
 - 2s - loss: 0.5870 - acc: 0.8638 - val_loss: 0.8045 - val_acc: 0.7984
Epoch 4/30
 - 2s - loss: 0.5209 - acc: 0.8730 - val_loss: 0.6645 - val_acc: 0.8568
```

```
Epoch 5/30
 - 2s - loss: 0.4995 - acc: 0.8732 - val_loss: 0.6564 - val_acc: 0.8392
Epoch 6/30
 - 2s - loss: 0.4606 - acc: 0.8889 - val_loss: 0.6165 - val_acc: 0.8337
Epoch 7/30
 - 2s - loss: 0.4613 - acc: 0.8870 - val_loss: 0.6127 - val_acc: 0.8473
Epoch 8/30
 - 3s - loss: 0.4429 - acc: 0.8902 - val_loss: 0.6595 - val_acc: 0.8015
Epoch 9/30
 - 2s - loss: 0.4288 - acc: 0.8932 - val_loss: 0.6231 - val_acc: 0.8415
Epoch 10/30
 - 2s - loss: 0.3960 - acc: 0.9019 - val_loss: 0.5389 - val_acc: 0.8744
Epoch 11/30
 - 2s - loss: 0.3759 - acc: 0.9055 - val_loss: 0.5346 - val_acc: 0.8670
Epoch 12/30
 - 2s - loss: 0.3689 - acc: 0.9091 - val_loss: 0.6860 - val_acc: 0.8093
Epoch 13/30
 - 3s - loss: 0.3888 - acc: 0.9027 - val_loss: 0.5244 - val_acc: 0.8571
Epoch 14/30
 - 2s - loss: 0.3829 - acc: 0.9071 - val_loss: 0.4928 - val_acc: 0.8636
Epoch 15/30
 - 2s - loss: 0.3538 - acc: 0.9127 - val_loss: 0.5904 - val_acc: 0.8144
Epoch 16/30
 - 2s - loss: 0.3931 - acc: 0.8998 - val_loss: 0.5092 - val_acc: 0.8432
Epoch 17/30
 - 2s - loss: 0.3480 - acc: 0.9117 - val_loss: 0.5083 - val_acc: 0.8551
Epoch 18/30
 - 3s - loss: 0.3612 - acc: 0.9079 - val_loss: 0.5626 - val_acc: 0.8537
Epoch 19/30
 - 2s - loss: 0.4131 - acc: 0.8972 - val_loss: 0.4857 - val_acc: 0.8554
Epoch 20/30
 - 2s - loss: 0.3518 - acc: 0.9115 - val_loss: 0.4884 - val_acc: 0.8717
Epoch 21/30
 - 2s - loss: 0.3645 - acc: 0.9132 - val_loss: 0.5522 - val_acc: 0.8334
Epoch 22/30
 - 2s - loss: 0.3398 - acc: 0.9155 - val_loss: 0.5387 - val_acc: 0.8439
Epoch 23/30
 - 3s - loss: 0.3558 - acc: 0.9108 - val_loss: 0.5040 - val_acc: 0.8663
Epoch 24/30
 - 2s - loss: 0.3462 - acc: 0.9149 - val_loss: 0.4547 - val_acc: 0.8673
Epoch 25/30
 - 2s - loss: 0.3410 - acc: 0.9134 - val_loss: 0.4967 - val_acc: 0.8371
Epoch 26/30
```

```
  - 2s - loss: 0.3301 - acc: 0.9170 - val_loss: 0.5228 - val_acc: 0.8215
Epoch 27/30
  - 2s - loss: 0.3193 - acc: 0.9168 - val_loss: 0.4587 - val_acc: 0.8734
Epoch 28/30
  - 3s - loss: 0.3374 - acc: 0.9157 - val_loss: 0.4538 - val_acc: 0.8531
Epoch 29/30
  - 2s - loss: 0.3182 - acc: 0.9155 - val_loss: 0.5331 - val_acc: 0.8327
Epoch 30/30
  - 2s - loss: 0.3405 - acc: 0.9136 - val_loss: 0.5148 - val_acc: 0.8636
Train accuracy 0.9110446137105549 Test accuracy: 0.8635900916185952
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_3 (Conv1D)	(None, 126, 28)	784
conv1d_4 (Conv1D)	(None, 122, 24)	3384
dropout_2 (Dropout)	(None, 122, 24)	0
max_pooling1d_2 (MaxPooling1	(None, 61, 24)	0
flatten_2 (Flatten)	(None, 1464)	0
dense_3 (Dense)	(None, 32)	46880
dense_4 (Dense)	(None, 6)	198

```
Total params: 51,246
Trainable params: 51,246
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
  - 3s - loss: 5.0640 - acc: 0.6525 - val_loss: 0.8492 - val_acc: 0.7553
Epoch 2/35
  - 2s - loss: 0.6052 - acc: 0.8453 - val_loss: 1.3102 - val_acc: 0.6607
Epoch 3/35
  - 2s - loss: 0.4757 - acc: 0.8845 - val_loss: 0.8982 - val_acc: 0.7129
Epoch 4/35
  - 2s - loss: 0.4345 - acc: 0.8940 - val_loss: 0.5309 - val_acc: 0.8582
Epoch 5/35
```

```
         - 2s - loss: 0.3960 - acc: 0.9042 - val_loss: 0.5224 - val_acc: 0.8629
Epoch 6/35
         - 2s - loss: 0.3763 - acc: 0.9098 - val_loss: 0.5749 - val_acc: 0.8242
Epoch 7/35
         - 2s - loss: 0.3645 - acc: 0.9100 - val_loss: 1.2467 - val_acc: 0.6240
Epoch 8/35
         - 2s - loss: 0.3542 - acc: 0.9115 - val_loss: 0.4757 - val_acc: 0.8833
Epoch 9/35
         - 2s - loss: 0.3406 - acc: 0.9162 - val_loss: 0.9492 - val_acc: 0.6943
Epoch 10/35
         - 2s - loss: 0.3411 - acc: 0.9163 - val_loss: 0.4281 - val_acc: 0.8823
Epoch 11/35
         - 2s - loss: 0.3302 - acc: 0.9210 - val_loss: 0.4763 - val_acc: 0.8504
Epoch 12/35
         - 2s - loss: 0.3207 - acc: 0.9207 - val_loss: 0.4172 - val_acc: 0.8697
Epoch 13/35
         - 2s - loss: 0.3269 - acc: 0.9155 - val_loss: 0.9915 - val_acc: 0.6753
Epoch 14/35
         - 2s - loss: 0.3198 - acc: 0.9200 - val_loss: 0.4152 - val_acc: 0.8812
Epoch 15/35
         - 2s - loss: 0.3044 - acc: 0.9219 - val_loss: 0.4032 - val_acc: 0.8768
Epoch 16/35
         - 2s - loss: 0.3100 - acc: 0.9178 - val_loss: 0.9914 - val_acc: 0.6987
Epoch 17/35
         - 2s - loss: 0.3146 - acc: 0.9165 - val_loss: 0.3897 - val_acc: 0.8850
Epoch 18/35
         - 2s - loss: 0.3010 - acc: 0.9215 - val_loss: 0.4310 - val_acc: 0.8758
Epoch 19/35
         - 2s - loss: 0.3029 - acc: 0.9184 - val_loss: 0.4385 - val_acc: 0.8789
Epoch 20/35
         - 2s - loss: 0.2992 - acc: 0.9215 - val_loss: 0.4209 - val_acc: 0.8636
Epoch 21/35
         - 2s - loss: 0.2943 - acc: 0.9203 - val_loss: 0.3879 - val_acc: 0.8758
Epoch 22/35
         - 2s - loss: 0.2984 - acc: 0.9188 - val_loss: 0.4348 - val_acc: 0.8554
Epoch 23/35
         - 2s - loss: 0.3077 - acc: 0.9202 - val_loss: 0.4411 - val_acc: 0.8422
Epoch 24/35
         - 2s - loss: 0.2890 - acc: 0.9226 - val_loss: 0.4017 - val_acc: 0.8602
Epoch 25/35
         - 2s - loss: 0.3037 - acc: 0.9211 - val_loss: 0.4872 - val_acc: 0.8354
Epoch 26/35
         - 2s - loss: 0.3116 - acc: 0.9178 - val_loss: 0.4148 - val_acc: 0.8612
```

```
Epoch 27/35
 - 2s - loss: 0.2944 - acc: 0.9252 - val_loss: 0.4787 - val_acc: 0.8368
Epoch 28/35
 - 2s - loss: 0.2845 - acc: 0.9245 - val_loss: 0.5676 - val_acc: 0.8239
Epoch 29/35
 - 2s - loss: 0.2987 - acc: 0.9232 - val_loss: 0.4795 - val_acc: 0.8602
Epoch 30/35
 - 2s - loss: 0.2844 - acc: 0.9251 - val_loss: 0.5168 - val_acc: 0.8442
Epoch 31/35
 - 2s - loss: 0.3031 - acc: 0.9249 - val_loss: 0.4025 - val_acc: 0.8809
Epoch 32/35
 - 2s - loss: 0.2885 - acc: 0.9251 - val_loss: 0.3978 - val_acc: 0.8823
Epoch 33/35
 - 2s - loss: 0.2911 - acc: 0.9218 - val_loss: 0.6231 - val_acc: 0.8022
Epoch 34/35
 - 3s - loss: 0.2916 - acc: 0.9226 - val_loss: 1.4996 - val_acc: 0.6542
Epoch 35/35
 - 2s - loss: 0.3018 - acc: 0.9268 - val_loss: 0.5221 - val_acc: 0.8578
Train accuracy 0.941240478781284 Test accuracy: 0.8578215134034611
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_5 (Conv1D)	(None, 122, 28)	1792
conv1d_6 (Conv1D)	(None, 118, 32)	4512
dropout_3 (Dropout)	(None, 118, 32)	0
max_pooling1d_3 (MaxPooling1	(None, 39, 32)	0
flatten_3 (Flatten)	(None, 1248)	0
dense_5 (Dense)	(None, 64)	79936
dense_6 (Dense)	(None, 6)	390

```
Total params: 86,630
Trainable params: 86,630
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
```

```
Epoch 1/35
 - 3s - loss: 21.3175 - acc: 0.7323 - val_loss: 0.8292 - val_acc: 0.8157
Epoch 2/35
 - 3s - loss: 0.5440 - acc: 0.8694 - val_loss: 0.8706 - val_acc: 0.7370
Epoch 3/35
 - 3s - loss: 0.4467 - acc: 0.8900 - val_loss: 0.6157 - val_acc: 0.7805
Epoch 4/35
 - 3s - loss: 0.4128 - acc: 0.8957 - val_loss: 0.5928 - val_acc: 0.8124
Epoch 5/35
 - 3s - loss: 0.3966 - acc: 0.9017 - val_loss: 0.5419 - val_acc: 0.8721
Epoch 6/35
 - 3s - loss: 0.3660 - acc: 0.9060 - val_loss: 0.4645 - val_acc: 0.8717
Epoch 7/35
 - 3s - loss: 0.3549 - acc: 0.9112 - val_loss: 0.4408 - val_acc: 0.8863
Epoch 8/35
 - 3s - loss: 0.3403 - acc: 0.9138 - val_loss: 0.4832 - val_acc: 0.8599
Epoch 9/35
 - 3s - loss: 0.3311 - acc: 0.9185 - val_loss: 0.4378 - val_acc: 0.8636
Epoch 10/35
 - 3s - loss: 0.3359 - acc: 0.9146 - val_loss: 0.4415 - val_acc: 0.8931
Epoch 11/35
 - 3s - loss: 0.3241 - acc: 0.9173 - val_loss: 0.4128 - val_acc: 0.8890
Epoch 12/35
 - 3s - loss: 0.3287 - acc: 0.9142 - val_loss: 0.4476 - val_acc: 0.8778
Epoch 13/35
 - 3s - loss: 0.3242 - acc: 0.9144 - val_loss: 0.4104 - val_acc: 0.8965
Epoch 14/35
 - 3s - loss: 0.3155 - acc: 0.9193 - val_loss: 0.4258 - val_acc: 0.8846
Epoch 15/35
 - 3s - loss: 0.3211 - acc: 0.9191 - val_loss: 0.4041 - val_acc: 0.8856
Epoch 16/35
 - 3s - loss: 0.3082 - acc: 0.9170 - val_loss: 0.5309 - val_acc: 0.8575
Epoch 17/35
 - 3s - loss: 0.3101 - acc: 0.9188 - val_loss: 0.4276 - val_acc: 0.8935
Epoch 18/35
 - 3s - loss: 0.3127 - acc: 0.9188 - val_loss: 0.4314 - val_acc: 0.8968
Epoch 19/35
 - 3s - loss: 0.3093 - acc: 0.9206 - val_loss: 0.4253 - val_acc: 0.8782
Epoch 20/35
 - 3s - loss: 0.2990 - acc: 0.9212 - val_loss: 0.5731 - val_acc: 0.8310
Epoch 21/35
 - 3s - loss: 0.3052 - acc: 0.9193 - val_loss: 0.3815 - val_acc: 0.8982
Epoch 22/35
```

```
 - 3s - loss: 0.3042 - acc: 0.9169 - val_loss: 0.4525 - val_acc: 0.8558
Epoch 23/35
 - 3s - loss: 0.3085 - acc: 0.9178 - val_loss: 0.3837 - val_acc: 0.8935
Epoch 24/35
 - 3s - loss: 0.2984 - acc: 0.9210 - val_loss: 0.4201 - val_acc: 0.8826
Epoch 25/35
 - 3s - loss: 0.2980 - acc: 0.9237 - val_loss: 0.4196 - val_acc: 0.8911
Epoch 26/35
 - 3s - loss: 0.2898 - acc: 0.9185 - val_loss: 0.4015 - val_acc: 0.8782
Epoch 27/35
 - 3s - loss: 0.2882 - acc: 0.9200 - val_loss: 1.0529 - val_acc: 0.6569
Epoch 28/35
 - 3s - loss: 0.3073 - acc: 0.9211 - val_loss: 0.5184 - val_acc: 0.8249
Epoch 29/35
 - 3s - loss: 0.2951 - acc: 0.9180 - val_loss: 0.3777 - val_acc: 0.8972
Epoch 30/35
 - 3s - loss: 0.2878 - acc: 0.9236 - val_loss: 0.4222 - val_acc: 0.8870
Epoch 31/35
 - 3s - loss: 0.2895 - acc: 0.9230 - val_loss: 0.3646 - val_acc: 0.8928
Epoch 32/35
 - 3s - loss: 0.2946 - acc: 0.9177 - val_loss: 0.4072 - val_acc: 0.8700
Epoch 33/35
 - 3s - loss: 0.2943 - acc: 0.9222 - val_loss: 0.4008 - val_acc: 0.8653
Epoch 34/35
 - 3s - loss: 0.2857 - acc: 0.9232 - val_loss: 0.4046 - val_acc: 0.8873
Epoch 35/35
 - 3s - loss: 0.2878 - acc: 0.9210 - val_loss: 0.4164 - val_acc: 0.8697
Train accuracy 0.9110446137105549 Test accuracy: 0.8696979979640312
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_7 (Conv1D)	(None, 122, 32)	2048
conv1d_8 (Conv1D)	(None, 120, 24)	2328
dropout_4 (Dropout)	(None, 120, 24)	0
max_pooling1d_4 (MaxPooling1	(None, 40, 24)	0
flatten_4 (Flatten)	(None, 960)	0
dense_7 (Dense)	(None, 64)	61504

```
_____
dense_8 (Dense)                    (None, 6)                    390
======================================================================
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 4s - loss: 27.7956 - acc: 0.6970 - val_loss: 0.9407 - val_acc: 0.8090
Epoch 2/30
 - 3s - loss: 0.7369 - acc: 0.7890 - val_loss: 0.8387 - val_acc: 0.7486
Epoch 3/30
 - 4s - loss: 0.6319 - acc: 0.8303 - val_loss: 0.7569 - val_acc: 0.8324
Epoch 4/30
 - 3s - loss: 0.5590 - acc: 0.8555 - val_loss: 0.6682 - val_acc: 0.8683
Epoch 5/30
 - 3s - loss: 0.5298 - acc: 0.8640 - val_loss: 0.6922 - val_acc: 0.8263
Epoch 6/30
 - 4s - loss: 0.5146 - acc: 0.8678 - val_loss: 0.7644 - val_acc: 0.7190
Epoch 7/30
 - 3s - loss: 0.4868 - acc: 0.8798 - val_loss: 0.5707 - val_acc: 0.8626
Epoch 8/30
 - 3s - loss: 0.4804 - acc: 0.8774 - val_loss: 0.6694 - val_acc: 0.8256
Epoch 9/30
 - 4s - loss: 0.4777 - acc: 0.8811 - val_loss: 0.9647 - val_acc: 0.6434
Epoch 10/30
 - 4s - loss: 0.4602 - acc: 0.8878 - val_loss: 0.9447 - val_acc: 0.6854
Epoch 11/30
 - 3s - loss: 0.4603 - acc: 0.8822 - val_loss: 0.6184 - val_acc: 0.8426
Epoch 12/30
 - 3s - loss: 0.4482 - acc: 0.8928 - val_loss: 0.5112 - val_acc: 0.8792
Epoch 13/30
 - 4s - loss: 0.4455 - acc: 0.8870 - val_loss: 0.5271 - val_acc: 0.8534
Epoch 14/30
 - 4s - loss: 0.4454 - acc: 0.8897 - val_loss: 0.4992 - val_acc: 0.8646
Epoch 15/30
 - 3s - loss: 0.4389 - acc: 0.8902 - val_loss: 0.6000 - val_acc: 0.8541
Epoch 16/30
 - 4s - loss: 0.4299 - acc: 0.8913 - val_loss: 0.5878 - val_acc: 0.8534
Epoch 17/30
 - 4s - loss: 0.4258 - acc: 0.8945 - val_loss: 0.4728 - val_acc: 0.8704
```

```
Epoch 18/30
 - 3s - loss: 0.4263 - acc: 0.8921 - val_loss: 0.6675 - val_acc: 0.7991
Epoch 19/30
 - 4s - loss: 0.4179 - acc: 0.8919 - val_loss: 0.6103 - val_acc: 0.7957
Epoch 20/30
 - 4s - loss: 0.4225 - acc: 0.8962 - val_loss: 0.7398 - val_acc: 0.7591
Epoch 21/30
 - 4s - loss: 0.4227 - acc: 0.8935 - val_loss: 0.9899 - val_acc: 0.6688
Epoch 22/30
 - 3s - loss: 0.4179 - acc: 0.8953 - val_loss: 0.8645 - val_acc: 0.6325
Epoch 23/30
 - 3s - loss: 0.4091 - acc: 0.8942 - val_loss: 0.9141 - val_acc: 0.7170
Epoch 24/30
 - 4s - loss: 0.4173 - acc: 0.8913 - val_loss: 0.6336 - val_acc: 0.7781
Epoch 25/30
 - 3s - loss: 0.4212 - acc: 0.8923 - val_loss: 0.7610 - val_acc: 0.7631
Epoch 26/30
 - 4s - loss: 0.4149 - acc: 0.8947 - val_loss: 0.5665 - val_acc: 0.8463
Epoch 27/30
 - 3s - loss: 0.4025 - acc: 0.8979 - val_loss: 0.8253 - val_acc: 0.7645
Epoch 28/30
 - 3s - loss: 0.3960 - acc: 0.8993 - val_loss: 1.1675 - val_acc: 0.6909
Epoch 29/30
 - 3s - loss: 0.4050 - acc: 0.8980 - val_loss: 0.9959 - val_acc: 0.5694
Epoch 30/30
 - 3s - loss: 0.3913 - acc: 0.8964 - val_loss: 0.5740 - val_acc: 0.8079
Train accuracy 0.9038356909035858 Test accuracy: 0.8079402782490669
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_9 (Conv1D)	(None, 126, 32)	896
conv1d_10 (Conv1D)	(None, 120, 24)	5400
dropout_5 (Dropout)	(None, 120, 24)	0
max_pooling1d_5 (MaxPooling1	(None, 40, 24)	0
flatten_5 (Flatten)	(None, 960)	0
dense_9 (Dense)	(None, 32)	30752

```
dense_10 (Dense)                 (None, 6)                    198
=================================================================
Total params: 37,246
Trainable params: 37,246
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 13.6495 - acc: 0.6700 - val_loss: 2.2101 - val_acc: 0.7024
Epoch 2/25
 - 2s - loss: 0.9645 - acc: 0.8139 - val_loss: 0.7633 - val_acc: 0.8076
Epoch 3/25
 - 2s - loss: 0.5302 - acc: 0.8664 - val_loss: 0.6662 - val_acc: 0.8015
Epoch 4/25
 - 2s - loss: 0.4578 - acc: 0.8852 - val_loss: 0.5661 - val_acc: 0.8782
Epoch 5/25
 - 2s - loss: 0.4317 - acc: 0.8848 - val_loss: 0.5911 - val_acc: 0.8442
Epoch 6/25
 - 2s - loss: 0.4064 - acc: 0.8947 - val_loss: 0.4967 - val_acc: 0.8809
Epoch 7/25
 - 2s - loss: 0.3851 - acc: 0.8973 - val_loss: 0.5429 - val_acc: 0.8578
Epoch 8/25
 - 2s - loss: 0.3750 - acc: 0.8991 - val_loss: 0.5994 - val_acc: 0.8015
Epoch 9/25
 - 2s - loss: 0.3684 - acc: 0.9007 - val_loss: 0.4789 - val_acc: 0.8609
Epoch 10/25
 - 2s - loss: 0.3561 - acc: 0.9013 - val_loss: 0.5707 - val_acc: 0.8585
Epoch 11/25
 - 2s - loss: 0.3543 - acc: 0.9056 - val_loss: 0.4566 - val_acc: 0.8836
Epoch 12/25
 - 2s - loss: 0.3396 - acc: 0.9055 - val_loss: 0.4830 - val_acc: 0.8656
Epoch 13/25
 - 2s - loss: 0.3503 - acc: 0.9074 - val_loss: 0.4316 - val_acc: 0.8795
Epoch 14/25
 - 2s - loss: 0.3309 - acc: 0.9068 - val_loss: 0.4449 - val_acc: 0.8802
Epoch 15/25
 - 2s - loss: 0.3322 - acc: 0.9125 - val_loss: 0.4143 - val_acc: 0.8924
Epoch 16/25
 - 2s - loss: 0.3220 - acc: 0.9149 - val_loss: 0.4309 - val_acc: 0.8734
Epoch 17/25
 - 2s - loss: 0.3141 - acc: 0.9187 - val_loss: 0.4351 - val_acc: 0.8724
Epoch 18/25
```

```
 - 2s - loss: 0.3185 - acc: 0.9168 - val_loss: 0.4605 - val_acc: 0.8819
Epoch 19/25
 - 2s - loss: 0.3022 - acc: 0.9191 - val_loss: 0.4243 - val_acc: 0.8972
Epoch 20/25
 - 2s - loss: 0.3184 - acc: 0.9191 - val_loss: 0.4000 - val_acc: 0.8901
Epoch 21/25
 - 2s - loss: 0.3062 - acc: 0.9192 - val_loss: 0.4130 - val_acc: 0.8972
Epoch 22/25
 - 2s - loss: 0.3039 - acc: 0.9199 - val_loss: 0.4041 - val_acc: 0.8839
Epoch 23/25
 - 2s - loss: 0.2902 - acc: 0.9237 - val_loss: 0.4928 - val_acc: 0.8347
Epoch 24/25
 - 2s - loss: 0.3003 - acc: 0.9222 - val_loss: 0.4102 - val_acc: 0.8856
Epoch 25/25
 - 2s - loss: 0.2946 - acc: 0.9195 - val_loss: 0.4074 - val_acc: 0.8680
Train accuracy 0.9387921653971708 Test accuracy: 0.8680013573125213
------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_11 (Conv1D)           (None, 124, 42)           1932
_____
conv1d_12 (Conv1D)           (None, 118, 16)           4720
_____
dropout_6 (Dropout)          (None, 118, 16)           0
_____
max_pooling1d_6 (MaxPooling1 (None, 59, 16)            0
_____
flatten_6 (Flatten)          (None, 944)               0
_____
dense_11 (Dense)             (None, 32)                30240
_____
dense_12 (Dense)             (None, 6)                 198
=================================================================
Total params: 37,090
Trainable params: 37,090
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 2s - loss: 25.2198 - acc: 0.5997 - val_loss: 1.3637 - val_acc: 0.6871
Epoch 2/35
```

```
          - 2s - loss: 0.9933 - acc: 0.7115 - val_loss: 0.9844 - val_acc: 0.7628
Epoch 3/35
          - 2s - loss: 0.7523 - acc: 0.7973 - val_loss: 0.8828 - val_acc: 0.7163
Epoch 4/35
          - 2s - loss: 0.6736 - acc: 0.8230 - val_loss: 0.8566 - val_acc: 0.7197
Epoch 5/35
          - 2s - loss: 0.6361 - acc: 0.8368 - val_loss: 0.7387 - val_acc: 0.7947
Epoch 6/35
          - 2s - loss: 0.5801 - acc: 0.8526 - val_loss: 0.6935 - val_acc: 0.8174
Epoch 7/35
          - 2s - loss: 0.5439 - acc: 0.8656 - val_loss: 0.6103 - val_acc: 0.8524
Epoch 8/35
          - 2s - loss: 0.5533 - acc: 0.8659 - val_loss: 0.6724 - val_acc: 0.8185
Epoch 9/35
          - 2s - loss: 0.5151 - acc: 0.8731 - val_loss: 0.7260 - val_acc: 0.8344
Epoch 10/35
          - 2s - loss: 0.4970 - acc: 0.8762 - val_loss: 0.5632 - val_acc: 0.8839
Epoch 11/35
          - 2s - loss: 0.4946 - acc: 0.8803 - val_loss: 0.7838 - val_acc: 0.7431
Epoch 12/35
          - 2s - loss: 0.4858 - acc: 0.8803 - val_loss: 0.5702 - val_acc: 0.8890
Epoch 13/35
          - 2s - loss: 0.4654 - acc: 0.8853 - val_loss: 0.5218 - val_acc: 0.8806
Epoch 14/35
          - 2s - loss: 0.4581 - acc: 0.8875 - val_loss: 0.5284 - val_acc: 0.8463
Epoch 15/35
          - 2s - loss: 0.4683 - acc: 0.8841 - val_loss: 0.5082 - val_acc: 0.8823
Epoch 16/35
          - 2s - loss: 0.4459 - acc: 0.8939 - val_loss: 0.4947 - val_acc: 0.8704
Epoch 17/35
          - 2s - loss: 0.4483 - acc: 0.8871 - val_loss: 0.6061 - val_acc: 0.8473
Epoch 18/35
          - 2s - loss: 0.4473 - acc: 0.8938 - val_loss: 0.5074 - val_acc: 0.8622
Epoch 19/35
          - 2s - loss: 0.4354 - acc: 0.8936 - val_loss: 0.4657 - val_acc: 0.8836
Epoch 20/35
          - 2s - loss: 0.4473 - acc: 0.8946 - val_loss: 0.5476 - val_acc: 0.8195
Epoch 21/35
          - 2s - loss: 0.4366 - acc: 0.8938 - val_loss: 1.3489 - val_acc: 0.5935
Epoch 22/35
          - 2s - loss: 0.4414 - acc: 0.8930 - val_loss: 0.5112 - val_acc: 0.8677
Epoch 23/35
          - 2s - loss: 0.4413 - acc: 0.8924 - val_loss: 0.4837 - val_acc: 0.8704
```

```
Epoch 24/35
 - 2s - loss: 0.4361 - acc: 0.8912 - val_loss: 0.5776 - val_acc: 0.8337
Epoch 25/35
 - 2s - loss: 0.4351 - acc: 0.8919 - val_loss: 0.5578 - val_acc: 0.8517
Epoch 26/35
 - 2s - loss: 0.4286 - acc: 0.8946 - val_loss: 0.4881 - val_acc: 0.8809
Epoch 27/35
 - 2s - loss: 0.4097 - acc: 0.9023 - val_loss: 0.4758 - val_acc: 0.8616
Epoch 28/35
 - 2s - loss: 0.4181 - acc: 0.8999 - val_loss: 0.5165 - val_acc: 0.8565
Epoch 29/35
 - 2s - loss: 0.4073 - acc: 0.9023 - val_loss: 0.7345 - val_acc: 0.7662
Epoch 30/35
 - 2s - loss: 0.4152 - acc: 0.8996 - val_loss: 0.4742 - val_acc: 0.8673
Epoch 31/35
 - 2s - loss: 0.4051 - acc: 0.9022 - val_loss: 0.5644 - val_acc: 0.8537
Epoch 32/35
 - 2s - loss: 0.4050 - acc: 0.9025 - val_loss: 0.4509 - val_acc: 0.8748
Epoch 33/35
 - 2s - loss: 0.4093 - acc: 0.9032 - val_loss: 0.7338 - val_acc: 0.7822
Epoch 34/35
 - 2s - loss: 0.4097 - acc: 0.8976 - val_loss: 0.8234 - val_acc: 0.7248
Epoch 35/35
 - 2s - loss: 0.4103 - acc: 0.9013 - val_loss: 0.6074 - val_acc: 0.8290
Train accuracy 0.8925462459194777 Test accuracy: 0.828978622327791
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_13 (Conv1D)	(None, 122, 42)	2688
conv1d_14 (Conv1D)	(None, 120, 24)	3048
dropout_7 (Dropout)	(None, 120, 24)	0
max_pooling1d_7 (MaxPooling1	(None, 40, 24)	0
flatten_7 (Flatten)	(None, 960)	0
dense_13 (Dense)	(None, 64)	61504
dense_14 (Dense)	(None, 6)	390

```
Total params: 67,630
Trainable params: 67,630
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 25.9652 - acc: 0.7650 - val_loss: 1.0548 - val_acc: 0.6362
Epoch 2/25
 - 2s - loss: 0.5701 - acc: 0.8569 - val_loss: 0.6099 - val_acc: 0.8700
Epoch 3/25
 - 3s - loss: 0.4239 - acc: 0.8919 - val_loss: 0.6441 - val_acc: 0.8093
Epoch 4/25
 - 2s - loss: 0.3803 - acc: 0.9021 - val_loss: 0.4727 - val_acc: 0.9013
Epoch 5/25
 - 2s - loss: 0.3610 - acc: 0.9045 - val_loss: 0.5091 - val_acc: 0.8612
Epoch 6/25
 - 2s - loss: 0.3496 - acc: 0.9104 - val_loss: 0.4285 - val_acc: 0.9006
Epoch 7/25
 - 3s - loss: 0.3377 - acc: 0.9121 - val_loss: 0.4248 - val_acc: 0.8877
Epoch 8/25
 - 2s - loss: 0.3349 - acc: 0.9142 - val_loss: 0.4144 - val_acc: 0.8816
Epoch 9/25
 - 2s - loss: 0.3324 - acc: 0.9132 - val_loss: 0.4128 - val_acc: 0.8972
Epoch 10/25
 - 2s - loss: 0.3209 - acc: 0.9168 - val_loss: 0.4122 - val_acc: 0.8975
Epoch 11/25
 - 2s - loss: 0.3224 - acc: 0.9169 - val_loss: 0.4426 - val_acc: 0.8860
Epoch 12/25
 - 2s - loss: 0.3195 - acc: 0.9154 - val_loss: 0.4198 - val_acc: 0.8897
Epoch 13/25
 - 2s - loss: 0.3098 - acc: 0.9129 - val_loss: 0.4413 - val_acc: 0.8731
Epoch 14/25
 - 2s - loss: 0.3108 - acc: 0.9163 - val_loss: 0.7179 - val_acc: 0.7078
Epoch 15/25
 - 2s - loss: 0.3072 - acc: 0.9165 - val_loss: 0.6628 - val_acc: 0.7523
Epoch 16/25
 - 3s - loss: 0.3074 - acc: 0.9188 - val_loss: 0.4272 - val_acc: 0.8602
Epoch 17/25
 - 2s - loss: 0.3041 - acc: 0.9177 - val_loss: 0.3638 - val_acc: 0.8999
Epoch 18/25
 - 2s - loss: 0.2989 - acc: 0.9195 - val_loss: 0.3717 - val_acc: 0.8951
Epoch 19/25
```

```
 - 3s - loss: 0.3021 - acc: 0.9207 - val_loss: 0.4031 - val_acc: 0.8802
Epoch 20/25
 - 2s - loss: 0.2961 - acc: 0.9223 - val_loss: 0.4189 - val_acc: 0.8833
Epoch 21/25
 - 2s - loss: 0.2964 - acc: 0.9189 - val_loss: 0.4126 - val_acc: 0.8856
Epoch 22/25
 - 2s - loss: 0.2916 - acc: 0.9221 - val_loss: 0.4405 - val_acc: 0.8616
Epoch 23/25
 - 2s - loss: 0.2979 - acc: 0.9204 - val_loss: 0.5049 - val_acc: 0.8219
Epoch 24/25
 - 2s - loss: 0.2910 - acc: 0.9233 - val_loss: 0.4327 - val_acc: 0.8622
Epoch 25/25
 - 2s - loss: 0.2908 - acc: 0.9208 - val_loss: 0.3847 - val_acc: 0.9033
Train accuracy 0.9319912948208873 Test accuracy: 0.9032914828639295
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_15 (Conv1D)	(None, 124, 32)	1472
conv1d_16 (Conv1D)	(None, 122, 16)	1552
dropout_8 (Dropout)	(None, 122, 16)	0
max_pooling1d_8 (MaxPooling1	(None, 61, 16)	0
flatten_8 (Flatten)	(None, 976)	0
dense_15 (Dense)	(None, 32)	31264
dense_16 (Dense)	(None, 6)	198

```
Total params: 34,486
Trainable params: 34,486
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 8s - loss: 12.3182 - acc: 0.7433 - val_loss: 0.9290 - val_acc: 0.7886
Epoch 2/30
 - 7s - loss: 0.6339 - acc: 0.8519 - val_loss: 0.7639 - val_acc: 0.8473
Epoch 3/30
```

```
    - 6s - loss: 0.5438 - acc: 0.8746 - val_loss: 0.8724 - val_acc: 0.7408
Epoch 4/30
    - 7s - loss: 0.4897 - acc: 0.8864 - val_loss: 0.6148 - val_acc: 0.8666
Epoch 5/30
    - 7s - loss: 0.4750 - acc: 0.8842 - val_loss: 0.6477 - val_acc: 0.8633
Epoch 6/30
    - 7s - loss: 0.4304 - acc: 0.8942 - val_loss: 0.6484 - val_acc: 0.8246
Epoch 7/30
    - 6s - loss: 0.4311 - acc: 0.8953 - val_loss: 0.5412 - val_acc: 0.8683
Epoch 8/30
    - 7s - loss: 0.4064 - acc: 0.9008 - val_loss: 0.6210 - val_acc: 0.8449
Epoch 9/30
    - 6s - loss: 0.3902 - acc: 0.9034 - val_loss: 0.5972 - val_acc: 0.8741
Epoch 10/30
    - 7s - loss: 0.3913 - acc: 0.9042 - val_loss: 0.5147 - val_acc: 0.8772
Epoch 11/30
    - 7s - loss: 0.3697 - acc: 0.9095 - val_loss: 0.5122 - val_acc: 0.8724
Epoch 12/30
    - 7s - loss: 0.3836 - acc: 0.9055 - val_loss: 0.5635 - val_acc: 0.8666
Epoch 13/30
    - 7s - loss: 0.3538 - acc: 0.9143 - val_loss: 0.4843 - val_acc: 0.8833
Epoch 14/30
    - 6s - loss: 0.3529 - acc: 0.9140 - val_loss: 0.5295 - val_acc: 0.8690
Epoch 15/30
    - 7s - loss: 0.3402 - acc: 0.9184 - val_loss: 0.5248 - val_acc: 0.8629
Epoch 16/30
    - 6s - loss: 0.3382 - acc: 0.9211 - val_loss: 0.5409 - val_acc: 0.8711
Epoch 17/30
    - 7s - loss: 0.3530 - acc: 0.9180 - val_loss: 0.5157 - val_acc: 0.8935
Epoch 18/30
    - 6s - loss: 0.3384 - acc: 0.9184 - val_loss: 0.4540 - val_acc: 0.8918
Epoch 19/30
    - 7s - loss: 0.3258 - acc: 0.9189 - val_loss: 0.4588 - val_acc: 0.8850
Epoch 20/30
    - 6s - loss: 0.3192 - acc: 0.9249 - val_loss: 0.4826 - val_acc: 0.8877
Epoch 21/30
    - 7s - loss: 0.3297 - acc: 0.9183 - val_loss: 0.4209 - val_acc: 0.8890
Epoch 22/30
    - 7s - loss: 0.3232 - acc: 0.9204 - val_loss: 0.4155 - val_acc: 0.8833
Epoch 23/30
    - 6s - loss: 0.3227 - acc: 0.9183 - val_loss: 0.4771 - val_acc: 0.8785
Epoch 24/30
    - 7s - loss: 0.3509 - acc: 0.9119 - val_loss: 0.5136 - val_acc: 0.8812
```

```
Epoch 25/30
 - 6s - loss: 0.3007 - acc: 0.9271 - val_loss: 0.4932 - val_acc: 0.8945
Epoch 26/30
 - 7s - loss: 0.3218 - acc: 0.9207 - val_loss: 0.4610 - val_acc: 0.8951
Epoch 27/30
 - 7s - loss: 0.3024 - acc: 0.9229 - val_loss: 0.3987 - val_acc: 0.9030
Epoch 28/30
 - 7s - loss: 0.2932 - acc: 0.9274 - val_loss: 0.4091 - val_acc: 0.8890
Epoch 29/30
 - 6s - loss: 0.3257 - acc: 0.9189 - val_loss: 0.4050 - val_acc: 0.9016
Epoch 30/30
 - 7s - loss: 0.3058 - acc: 0.9195 - val_loss: 0.4308 - val_acc: 0.8890
Train accuracy 0.9315832426550599 Test accuracy: 0.8890397013912453
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_17 (Conv1D)           (None, 126, 42)           1176

conv1d_18 (Conv1D)           (None, 122, 32)           6752

dropout_9 (Dropout)          (None, 122, 32)           0

max_pooling1d_9 (MaxPooling1 (None, 61, 32)            0

flatten_9 (Flatten)          (None, 1952)              0

dense_17 (Dense)             (None, 32)                62496

dense_18 (Dense)             (None, 6)                 198
=================================================================
Total params: 70,622
Trainable params: 70,622
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 5s - loss: 15.4657 - acc: 0.6742 - val_loss: 0.8693 - val_acc: 0.7472
Epoch 2/35
 - 4s - loss: 0.7068 - acc: 0.7807 - val_loss: 0.8246 - val_acc: 0.7214
Epoch 3/35
 - 4s - loss: 0.6686 - acc: 0.7942 - val_loss: 0.7972 - val_acc: 0.7917
```

```
Epoch 4/35
 - 4s - loss: 0.6442 - acc: 0.8092 - val_loss: 0.7068 - val_acc: 0.8307
Epoch 5/35
 - 4s - loss: 0.6183 - acc: 0.8218 - val_loss: 0.8885 - val_acc: 0.6980
Epoch 6/35
 - 4s - loss: 0.5963 - acc: 0.8324 - val_loss: 0.7499 - val_acc: 0.8056
Epoch 7/35
 - 4s - loss: 0.5940 - acc: 0.8364 - val_loss: 0.6955 - val_acc: 0.8395
Epoch 8/35
 - 4s - loss: 0.5829 - acc: 0.8409 - val_loss: 0.6824 - val_acc: 0.8276
Epoch 9/35
 - 4s - loss: 0.5757 - acc: 0.8448 - val_loss: 0.7829 - val_acc: 0.8107
Epoch 10/35
 - 4s - loss: 0.5558 - acc: 0.8481 - val_loss: 0.7201 - val_acc: 0.8144
Epoch 11/35
 - 4s - loss: 0.5525 - acc: 0.8554 - val_loss: 0.7835 - val_acc: 0.8025
Epoch 12/35
 - 4s - loss: 0.5384 - acc: 0.8592 - val_loss: 0.9675 - val_acc: 0.6807
Epoch 13/35
 - 4s - loss: 0.5349 - acc: 0.8625 - val_loss: 0.6919 - val_acc: 0.8432
Epoch 14/35
 - 4s - loss: 0.5206 - acc: 0.8689 - val_loss: 0.7597 - val_acc: 0.7995
Epoch 15/35
 - 4s - loss: 0.5238 - acc: 0.8677 - val_loss: 0.7964 - val_acc: 0.8015
Epoch 16/35
 - 4s - loss: 0.5120 - acc: 0.8655 - val_loss: 0.8578 - val_acc: 0.7106
Epoch 17/35
 - 4s - loss: 0.5068 - acc: 0.8723 - val_loss: 0.7589 - val_acc: 0.8100
Epoch 18/35
 - 4s - loss: 0.5082 - acc: 0.8720 - val_loss: 0.8592 - val_acc: 0.7625
Epoch 19/35
 - 4s - loss: 0.4990 - acc: 0.8721 - val_loss: 0.7058 - val_acc: 0.7465
Epoch 20/35
 - 4s - loss: 0.4949 - acc: 0.8742 - val_loss: 0.7608 - val_acc: 0.7638
Epoch 21/35
 - 4s - loss: 0.4969 - acc: 0.8753 - val_loss: 0.9662 - val_acc: 0.5714
Epoch 22/35
 - 4s - loss: 0.4729 - acc: 0.8853 - val_loss: 1.0824 - val_acc: 0.6997
Epoch 23/35
 - 4s - loss: 0.4722 - acc: 0.8784 - val_loss: 0.6847 - val_acc: 0.8090
Epoch 24/35
 - 4s - loss: 0.4729 - acc: 0.8808 - val_loss: 0.6892 - val_acc: 0.8154
Epoch 25/35
```

```
 - 4s - loss: 0.4691 - acc: 0.8837 - val_loss: 0.6156 - val_acc: 0.8001
Epoch 26/35
 - 4s - loss: 0.4665 - acc: 0.8818 - val_loss: 0.8563 - val_acc: 0.7207
Epoch 27/35
 - 4s - loss: 0.4594 - acc: 0.8817 - val_loss: 0.7700 - val_acc: 0.7574
Epoch 28/35
 - 4s - loss: 0.4559 - acc: 0.8819 - val_loss: 0.6305 - val_acc: 0.8680
Epoch 29/35
 - 4s - loss: 0.4624 - acc: 0.8860 - val_loss: 0.8539 - val_acc: 0.7024
Epoch 30/35
 - 4s - loss: 0.4462 - acc: 0.8894 - val_loss: 0.6595 - val_acc: 0.8320
Epoch 31/35
 - 4s - loss: 0.4444 - acc: 0.8901 - val_loss: 0.6202 - val_acc: 0.8154
Epoch 32/35
 - 4s - loss: 0.4506 - acc: 0.8867 - val_loss: 0.6456 - val_acc: 0.7842
Epoch 33/35
 - 4s - loss: 0.4506 - acc: 0.8848 - val_loss: 0.7049 - val_acc: 0.8402
Epoch 34/35
 - 4s - loss: 0.4471 - acc: 0.8866 - val_loss: 0.5752 - val_acc: 0.8666
Epoch 35/35
 - 4s - loss: 0.4595 - acc: 0.8826 - val_loss: 0.8860 - val_acc: 0.7041
Train accuracy 0.7135473340628131 Test accuracy: 0.7041058703766542
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_19 (Conv1D)	(None, 124, 32)	1472
conv1d_20 (Conv1D)	(None, 118, 16)	3600
dropout_10 (Dropout)	(None, 118, 16)	0
max_pooling1d_10 (MaxPooling	(None, 39, 16)	0
flatten_10 (Flatten)	(None, 624)	0
dense_19 (Dense)	(None, 32)	20000
dense_20 (Dense)	(None, 6)	198

```
Total params: 25,270
Trainable params: 25,270
Non-trainable params: 0
```

```
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 33.1583 - acc: 0.7077 - val_loss: 9.1590 - val_acc: 0.8463
Epoch 2/25
 - 4s - loss: 3.7155 - acc: 0.8868 - val_loss: 1.5044 - val_acc: 0.8436
Epoch 3/25
 - 4s - loss: 0.7515 - acc: 0.9047 - val_loss: 0.8519 - val_acc: 0.7855
Epoch 4/25
 - 4s - loss: 0.4972 - acc: 0.9057 - val_loss: 0.7259 - val_acc: 0.8103
Epoch 5/25
 - 5s - loss: 0.4501 - acc: 0.9052 - val_loss: 0.6605 - val_acc: 0.8653
Epoch 6/25
 - 4s - loss: 0.4197 - acc: 0.9106 - val_loss: 0.6046 - val_acc: 0.8782
Epoch 7/25
 - 4s - loss: 0.3938 - acc: 0.9128 - val_loss: 0.5528 - val_acc: 0.8877
Epoch 8/25
 - 4s - loss: 0.3883 - acc: 0.9115 - val_loss: 0.6221 - val_acc: 0.8551
Epoch 9/25
 - 4s - loss: 0.3514 - acc: 0.9196 - val_loss: 0.5976 - val_acc: 0.8079
Epoch 10/25
 - 4s - loss: 0.3569 - acc: 0.9165 - val_loss: 0.5430 - val_acc: 0.8778
Epoch 11/25
 - 5s - loss: 0.3253 - acc: 0.9245 - val_loss: 0.5598 - val_acc: 0.8677
Epoch 12/25
 - 4s - loss: 0.3208 - acc: 0.9252 - val_loss: 0.4985 - val_acc: 0.8785
Epoch 13/25
 - 4s - loss: 0.3355 - acc: 0.9200 - val_loss: 0.5307 - val_acc: 0.8734
Epoch 14/25
 - 5s - loss: 0.3039 - acc: 0.9287 - val_loss: 0.4901 - val_acc: 0.8938
Epoch 15/25
 - 4s - loss: 0.2934 - acc: 0.9300 - val_loss: 0.5767 - val_acc: 0.8392
Epoch 16/25
 - 4s - loss: 0.3100 - acc: 0.9211 - val_loss: 0.5113 - val_acc: 0.8459
Epoch 17/25
 - 5s - loss: 0.2956 - acc: 0.9282 - val_loss: 0.4581 - val_acc: 0.8744
Epoch 18/25
 - 4s - loss: 0.2838 - acc: 0.9312 - val_loss: 0.5231 - val_acc: 0.8761
Epoch 19/25
 - 4s - loss: 0.2789 - acc: 0.9316 - val_loss: 0.4493 - val_acc: 0.8765
Epoch 20/25
 - 4s - loss: 0.2712 - acc: 0.9350 - val_loss: 0.4607 - val_acc: 0.8592
```

```
Epoch 21/25
 - 4s - loss: 0.2739 - acc: 0.9312 - val_loss: 0.4213 - val_acc: 0.8951
Epoch 22/25
 - 5s - loss: 0.2609 - acc: 0.9338 - val_loss: 0.4548 - val_acc: 0.8758
Epoch 23/25
 - 4s - loss: 0.2554 - acc: 0.9350 - val_loss: 0.5415 - val_acc: 0.8076
Epoch 24/25
 - 4s - loss: 0.2650 - acc: 0.9327 - val_loss: 0.4351 - val_acc: 0.8897
Epoch 25/25
 - 4s - loss: 0.2926 - acc: 0.9290 - val_loss: 0.4154 - val_acc: 0.8924
Train accuracy 0.9402883569096845 Test accuracy: 0.8924329826942654
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_21 (Conv1D)	(None, 124, 28)	1288
conv1d_22 (Conv1D)	(None, 118, 24)	4728
dropout_11 (Dropout)	(None, 118, 24)	0
max_pooling1d_11 (MaxPooling	(None, 39, 24)	0
flatten_11 (Flatten)	(None, 936)	0
dense_21 (Dense)	(None, 32)	29984
dense_22 (Dense)	(None, 6)	198

```
Total params: 36,198
Trainable params: 36,198
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 3s - loss: 22.0003 - acc: 0.7575 - val_loss: 0.9952 - val_acc: 0.7954
Epoch 2/30
 - 2s - loss: 0.5749 - acc: 0.8625 - val_loss: 1.0222 - val_acc: 0.6698
Epoch 3/30
 - 2s - loss: 0.4590 - acc: 0.8875 - val_loss: 0.5730 - val_acc: 0.8870
Epoch 4/30
 - 2s - loss: 0.4050 - acc: 0.8964 - val_loss: 0.5849 - val_acc: 0.8666
```

```
Epoch 5/30
 - 2s - loss: 0.3764 - acc: 0.9083 - val_loss: 0.5224 - val_acc: 0.8582
Epoch 6/30
 - 2s - loss: 0.3698 - acc: 0.9109 - val_loss: 0.5335 - val_acc: 0.8534
Epoch 7/30
 - 2s - loss: 0.3426 - acc: 0.9131 - val_loss: 0.4697 - val_acc: 0.8795
Epoch 8/30
 - 2s - loss: 0.3304 - acc: 0.9169 - val_loss: 0.4343 - val_acc: 0.8982
Epoch 9/30
 - 2s - loss: 0.3292 - acc: 0.9134 - val_loss: 0.4552 - val_acc: 0.8704
Epoch 10/30
 - 2s - loss: 0.3313 - acc: 0.9146 - val_loss: 0.4631 - val_acc: 0.8799
Epoch 11/30
 - 2s - loss: 0.3203 - acc: 0.9177 - val_loss: 0.5109 - val_acc: 0.8364
Epoch 12/30
 - 2s - loss: 0.3042 - acc: 0.9221 - val_loss: 0.4424 - val_acc: 0.8748
Epoch 13/30
 - 2s - loss: 0.3095 - acc: 0.9204 - val_loss: 0.4410 - val_acc: 0.8792
Epoch 14/30
 - 2s - loss: 0.3130 - acc: 0.9173 - val_loss: 0.4639 - val_acc: 0.8599
Epoch 15/30
 - 2s - loss: 0.3084 - acc: 0.9207 - val_loss: 0.5122 - val_acc: 0.8297
Epoch 16/30
 - 2s - loss: 0.2898 - acc: 0.9229 - val_loss: 0.3869 - val_acc: 0.8897
Epoch 17/30
 - 2s - loss: 0.2976 - acc: 0.9180 - val_loss: 0.4307 - val_acc: 0.8744
Epoch 18/30
 - 2s - loss: 0.2923 - acc: 0.9217 - val_loss: 0.4364 - val_acc: 0.8571
Epoch 19/30
 - 2s - loss: 0.2950 - acc: 0.9251 - val_loss: 0.4431 - val_acc: 0.8785
Epoch 20/30
 - 2s - loss: 0.2935 - acc: 0.9245 - val_loss: 0.6502 - val_acc: 0.7852
Epoch 21/30
 - 2s - loss: 0.2951 - acc: 0.9236 - val_loss: 0.4068 - val_acc: 0.8738
Epoch 22/30
 - 2s - loss: 0.2870 - acc: 0.9257 - val_loss: 0.4662 - val_acc: 0.8510
Epoch 23/30
 - 2s - loss: 0.2911 - acc: 0.9215 - val_loss: 0.4477 - val_acc: 0.8388
Epoch 24/30
 - 2s - loss: 0.2883 - acc: 0.9244 - val_loss: 0.5285 - val_acc: 0.7991
Epoch 25/30
 - 2s - loss: 0.2867 - acc: 0.9257 - val_loss: 0.3972 - val_acc: 0.8911
Epoch 26/30
```

```
 - 2s - loss: 0.2849 - acc: 0.9242 - val_loss: 0.4130 - val_acc: 0.8741
Epoch 27/30
 - 2s - loss: 0.2880 - acc: 0.9218 - val_loss: 0.5486 - val_acc: 0.8137
Epoch 28/30
 - 2s - loss: 0.2804 - acc: 0.9287 - val_loss: 0.4059 - val_acc: 0.8656
Epoch 29/30
 - 2s - loss: 0.2889 - acc: 0.9226 - val_loss: 0.7382 - val_acc: 0.7747
Epoch 30/30
 - 2s - loss: 0.2833 - acc: 0.9291 - val_loss: 0.4879 - val_acc: 0.8219
Train accuracy 0.8803046789989118 Test accuracy: 0.8218527315914489
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_23 (Conv1D)	(None, 122, 42)	2688
conv1d_24 (Conv1D)	(None, 116, 32)	9440
dropout_12 (Dropout)	(None, 116, 32)	0
max_pooling1d_12 (MaxPooling	(None, 38, 32)	0
flatten_12 (Flatten)	(None, 1216)	0
dense_23 (Dense)	(None, 64)	77888
dense_24 (Dense)	(None, 6)	390

```
Total params: 90,406
Trainable params: 90,406
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 4.2436 - acc: 0.8079 - val_loss: 0.5711 - val_acc: 0.8636
Epoch 2/25
 - 4s - loss: 0.4683 - acc: 0.8844 - val_loss: 0.6810 - val_acc: 0.8093
Epoch 3/25
 - 4s - loss: 0.4119 - acc: 0.8973 - val_loss: 0.6572 - val_acc: 0.8412
Epoch 4/25
 - 4s - loss: 0.3911 - acc: 0.9026 - val_loss: 0.4871 - val_acc: 0.8588
Epoch 5/25
```

```
          - 4s - loss: 0.3806 - acc: 0.9027 - val_loss: 0.4511 - val_acc: 0.8721
        Epoch 6/25
          - 4s - loss: 0.3686 - acc: 0.9045 - val_loss: 0.5533 - val_acc: 0.8232
        Epoch 7/25
          - 4s - loss: 0.3675 - acc: 0.9057 - val_loss: 0.6532 - val_acc: 0.7703
        Epoch 8/25
          - 4s - loss: 0.3647 - acc: 0.9097 - val_loss: 0.4831 - val_acc: 0.8599
        Epoch 9/25
          - 4s - loss: 0.3650 - acc: 0.9106 - val_loss: 0.7605 - val_acc: 0.7469
        Epoch 10/25
          - 4s - loss: 0.3588 - acc: 0.9082 - val_loss: 0.7704 - val_acc: 0.7089
        Epoch 11/25
          - 4s - loss: 0.3535 - acc: 0.9095 - val_loss: 0.4914 - val_acc: 0.8680
        Epoch 12/25
          - 4s - loss: 0.3511 - acc: 0.9101 - val_loss: 0.5851 - val_acc: 0.7852
        Epoch 13/25
          - 4s - loss: 0.3507 - acc: 0.9091 - val_loss: 0.3763 - val_acc: 0.8904
        Epoch 14/25
          - 4s - loss: 0.3444 - acc: 0.9128 - val_loss: 0.4630 - val_acc: 0.8663
        Epoch 15/25
          - 4s - loss: 0.3669 - acc: 0.9081 - val_loss: 0.4374 - val_acc: 0.8521
        Epoch 16/25
          - 4s - loss: 0.3502 - acc: 0.9117 - val_loss: 0.4200 - val_acc: 0.8700
        Epoch 17/25
          - 4s - loss: 0.3462 - acc: 0.9149 - val_loss: 0.5515 - val_acc: 0.8039
        Epoch 18/25
          - 4s - loss: 0.3321 - acc: 0.9153 - val_loss: 0.5360 - val_acc: 0.8195
        Epoch 19/25
          - 4s - loss: 0.3365 - acc: 0.9154 - val_loss: 0.4456 - val_acc: 0.8459
        Epoch 20/25
          - 4s - loss: 0.3266 - acc: 0.9161 - val_loss: 0.3982 - val_acc: 0.8816
        Epoch 21/25
          - 4s - loss: 0.3478 - acc: 0.9128 - val_loss: 0.5870 - val_acc: 0.8032
        Epoch 22/25
          - 4s - loss: 0.3437 - acc: 0.9142 - val_loss: 0.4387 - val_acc: 0.8748
        Epoch 23/25
          - 4s - loss: 0.3247 - acc: 0.9144 - val_loss: 0.4087 - val_acc: 0.8856
        Epoch 24/25
          - 4s - loss: 0.3268 - acc: 0.9115 - val_loss: 0.3774 - val_acc: 0.8867
        Epoch 25/25
          - 4s - loss: 0.3255 - acc: 0.9176 - val_loss: 0.4234 - val_acc: 0.8622
        Train accuracy 0.9236942327969482 Test accuracy: 0.8622327790973872
        -------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
================================================================
conv1d_25 (Conv1D)           (None, 124, 32)           1472
_____
conv1d_26 (Conv1D)           (None, 120, 32)           5152
_____
dropout_13 (Dropout)         (None, 120, 32)           0
_____
max_pooling1d_13 (MaxPooling (None, 40, 32)            0
_____
flatten_13 (Flatten)         (None, 1280)              0
_____
dense_25 (Dense)             (None, 64)                81984
_____
dense_26 (Dense)             (None, 6)                 390
================================================================
Total params: 88,998
Trainable params: 88,998
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 4s - loss: 91.6109 - acc: 0.7274 - val_loss: 20.5480 - val_acc: 0.7713
Epoch 2/30
 - 2s - loss: 7.8445 - acc: 0.8384 - val_loss: 2.3996 - val_acc: 0.7431
Epoch 3/30
 - 2s - loss: 1.1033 - acc: 0.8599 - val_loss: 0.9668 - val_acc: 0.8415
Epoch 4/30
 - 2s - loss: 0.6050 - acc: 0.8774 - val_loss: 0.8111 - val_acc: 0.8527
Epoch 5/30
 - 2s - loss: 0.5668 - acc: 0.8747 - val_loss: 0.7943 - val_acc: 0.8442
Epoch 6/30
 - 2s - loss: 0.5385 - acc: 0.8828 - val_loss: 0.7514 - val_acc: 0.8429
Epoch 7/30
 - 3s - loss: 0.4746 - acc: 0.8919 - val_loss: 0.7028 - val_acc: 0.8225
Epoch 8/30
 - 2s - loss: 0.4651 - acc: 0.8912 - val_loss: 0.7666 - val_acc: 0.8151
Epoch 9/30
 - 2s - loss: 0.4642 - acc: 0.8900 - val_loss: 0.6762 - val_acc: 0.8588
Epoch 10/30
 - 2s - loss: 0.4537 - acc: 0.8893 - val_loss: 0.6286 - val_acc: 0.8666
```

```
Epoch 11/30
 - 2s - loss: 0.4080 - acc: 0.9045 - val_loss: 0.6110 - val_acc: 0.8633
Epoch 12/30
 - 3s - loss: 0.4068 - acc: 0.8998 - val_loss: 0.6332 - val_acc: 0.8463
Epoch 13/30
 - 2s - loss: 0.4012 - acc: 0.9017 - val_loss: 0.6238 - val_acc: 0.8364
Epoch 14/30
 - 2s - loss: 0.3900 - acc: 0.9033 - val_loss: 0.5950 - val_acc: 0.8521
Epoch 15/30
 - 2s - loss: 0.3884 - acc: 0.9015 - val_loss: 0.6049 - val_acc: 0.8568
Epoch 16/30
 - 2s - loss: 0.3807 - acc: 0.9036 - val_loss: 0.6256 - val_acc: 0.8531
Epoch 17/30
 - 3s - loss: 0.4079 - acc: 0.9015 - val_loss: 0.5884 - val_acc: 0.8636
Epoch 18/30
 - 2s - loss: 0.3759 - acc: 0.9076 - val_loss: 0.6103 - val_acc: 0.8616
Epoch 19/30
 - 2s - loss: 0.4024 - acc: 0.8961 - val_loss: 0.5990 - val_acc: 0.8144
Epoch 20/30
 - 2s - loss: 0.3695 - acc: 0.9075 - val_loss: 0.5853 - val_acc: 0.8571
Epoch 21/30
 - 2s - loss: 0.3759 - acc: 0.9060 - val_loss: 0.5910 - val_acc: 0.8419
Epoch 22/30
 - 3s - loss: 0.3784 - acc: 0.9030 - val_loss: 0.5485 - val_acc: 0.8823
Epoch 23/30
 - 2s - loss: 0.3656 - acc: 0.9081 - val_loss: 0.5569 - val_acc: 0.8901
Epoch 24/30
 - 2s - loss: 0.3383 - acc: 0.9199 - val_loss: 0.5249 - val_acc: 0.8585
Epoch 25/30
 - 2s - loss: 0.4042 - acc: 0.8985 - val_loss: 0.5675 - val_acc: 0.8599
Epoch 26/30
 - 2s - loss: 0.3456 - acc: 0.9188 - val_loss: 0.5822 - val_acc: 0.8626
Epoch 27/30
 - 2s - loss: 0.3543 - acc: 0.9161 - val_loss: 0.5797 - val_acc: 0.8364
Epoch 28/30
 - 3s - loss: 0.3425 - acc: 0.9154 - val_loss: 0.5437 - val_acc: 0.8622
Epoch 29/30
 - 2s - loss: 0.3220 - acc: 0.9246 - val_loss: 0.5397 - val_acc: 0.8694
Epoch 30/30
 - 2s - loss: 0.3443 - acc: 0.9161 - val_loss: 0.4974 - val_acc: 0.8639
Train accuracy 0.9197497279651795 Test accuracy: 0.8639294197488971
--------------------------------------------------------------------------------
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_27 (Conv1D)           (None, 126, 42)           1176

conv1d_28 (Conv1D)           (None, 124, 24)           3048

dropout_14 (Dropout)         (None, 124, 24)           0

max_pooling1d_14 (MaxPooling (None, 62, 24)            0

flatten_14 (Flatten)         (None, 1488)              0

dense_27 (Dense)             (None, 64)                95296

dense_28 (Dense)             (None, 6)                 390
=================================================================
Total params: 99,910
Trainable params: 99,910
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 4s - loss: 35.4818 - acc: 0.7365 - val_loss: 1.2519 - val_acc: 0.7645
Epoch 2/30
 - 3s - loss: 0.7410 - acc: 0.8230 - val_loss: 0.7950 - val_acc: 0.7811
Epoch 3/30
 - 3s - loss: 0.6246 - acc: 0.8414 - val_loss: 0.7543 - val_acc: 0.8069
Epoch 4/30
 - 3s - loss: 0.5642 - acc: 0.8576 - val_loss: 0.7985 - val_acc: 0.7557
Epoch 5/30
 - 3s - loss: 0.5363 - acc: 0.8637 - val_loss: 0.6684 - val_acc: 0.8195
Epoch 6/30
 - 3s - loss: 0.4955 - acc: 0.8762 - val_loss: 0.7244 - val_acc: 0.7771
Epoch 7/30
 - 3s - loss: 0.5006 - acc: 0.8686 - val_loss: 0.7676 - val_acc: 0.8042
Epoch 8/30
 - 3s - loss: 0.4527 - acc: 0.8879 - val_loss: 0.5642 - val_acc: 0.8493
Epoch 9/30
 - 3s - loss: 0.4582 - acc: 0.8853 - val_loss: 0.6889 - val_acc: 0.8314
Epoch 10/30
 - 3s - loss: 0.4547 - acc: 0.8864 - val_loss: 0.6378 - val_acc: 0.8517
Epoch 11/30
```

```
          - 3s - loss: 0.4442 - acc: 0.8886 - val_loss: 0.5697 - val_acc: 0.8599
         Epoch 12/30
          - 3s - loss: 0.4211 - acc: 0.8930 - val_loss: 0.5194 - val_acc: 0.8785
         Epoch 13/30
          - 3s - loss: 0.4081 - acc: 0.9002 - val_loss: 0.6659 - val_acc: 0.7727
         Epoch 14/30
          - 3s - loss: 0.4002 - acc: 0.8995 - val_loss: 0.6751 - val_acc: 0.7615
         Epoch 15/30
          - 3s - loss: 0.3853 - acc: 0.9071 - val_loss: 0.5253 - val_acc: 0.8734
         Epoch 16/30
          - 3s - loss: 0.3952 - acc: 0.9003 - val_loss: 0.5621 - val_acc: 0.8677
         Epoch 17/30
          - 3s - loss: 0.4270 - acc: 0.8984 - val_loss: 0.4994 - val_acc: 0.8921
         Epoch 18/30
          - 3s - loss: 0.3933 - acc: 0.9007 - val_loss: 0.6029 - val_acc: 0.8490
         Epoch 19/30
          - 3s - loss: 0.3689 - acc: 0.9090 - val_loss: 0.5713 - val_acc: 0.8300
         Epoch 20/30
          - 3s - loss: 0.3653 - acc: 0.9110 - val_loss: 0.4760 - val_acc: 0.8833
         Epoch 21/30
          - 3s - loss: 0.3713 - acc: 0.9056 - val_loss: 0.4707 - val_acc: 0.8683
         Epoch 22/30
          - 3s - loss: 0.3936 - acc: 0.9068 - val_loss: 0.5288 - val_acc: 0.8846
         Epoch 23/30
          - 3s - loss: 0.3470 - acc: 0.9162 - val_loss: 0.4120 - val_acc: 0.8816
         Epoch 24/30
          - 3s - loss: 0.3585 - acc: 0.9087 - val_loss: 0.4459 - val_acc: 0.8833
         Epoch 25/30
          - 3s - loss: 0.3368 - acc: 0.9185 - val_loss: 0.4237 - val_acc: 0.8792
         Epoch 26/30
          - 3s - loss: 0.3483 - acc: 0.9128 - val_loss: 0.4607 - val_acc: 0.8755
         Epoch 27/30
          - 3s - loss: 0.3311 - acc: 0.9189 - val_loss: 0.4189 - val_acc: 0.8921
         Epoch 28/30
          - 3s - loss: 0.3116 - acc: 0.9232 - val_loss: 0.4055 - val_acc: 0.8938
         Epoch 29/30
          - 3s - loss: 0.3375 - acc: 0.9154 - val_loss: 0.5142 - val_acc: 0.8419
         Epoch 30/30
          - 3s - loss: 0.3531 - acc: 0.9113 - val_loss: 0.4770 - val_acc: 0.8514
         Train accuracy 0.9139009793253536 Test accuracy: 0.8513742789277231
         --------------------------------------------------------------------------------

         _____
         Layer (type)                 Output Shape              Param #
```

```
================================================================
conv1d_29 (Conv1D)              (None, 124, 32)             1472

_____
conv1d_30 (Conv1D)              (None, 118, 24)             5400

_____
dropout_15 (Dropout)            (None, 118, 24)             0

_____
max_pooling1d_15 (MaxPooling    (None, 39, 24)              0

_____
flatten_15 (Flatten)            (None, 936)                 0

_____
dense_29 (Dense)                (None, 32)                  29984

_____
dense_30 (Dense)                (None, 6)                   198
================================================================
Total params: 37,054
Trainable params: 37,054
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 20.3809 - acc: 0.7291 - val_loss: 2.9204 - val_acc: 0.8090
Epoch 2/25
 - 4s - loss: 1.0833 - acc: 0.8726 - val_loss: 0.8612 - val_acc: 0.8426
Epoch 3/25
 - 4s - loss: 0.5268 - acc: 0.8875 - val_loss: 0.7121 - val_acc: 0.8548
Epoch 4/25
 - 3s - loss: 0.4572 - acc: 0.8966 - val_loss: 0.7138 - val_acc: 0.8738
Epoch 5/25
 - 4s - loss: 0.4335 - acc: 0.8970 - val_loss: 0.6639 - val_acc: 0.8364
Epoch 6/25
 - 4s - loss: 0.4060 - acc: 0.9007 - val_loss: 0.6129 - val_acc: 0.8873
Epoch 7/25
 - 4s - loss: 0.4219 - acc: 0.8995 - val_loss: 0.5754 - val_acc: 0.9002
Epoch 8/25
 - 4s - loss: 0.3727 - acc: 0.9115 - val_loss: 0.5795 - val_acc: 0.8568
Epoch 9/25
 - 4s - loss: 0.3573 - acc: 0.9104 - val_loss: 0.6117 - val_acc: 0.8351
Epoch 10/25
 - 3s - loss: 0.3441 - acc: 0.9162 - val_loss: 0.5354 - val_acc: 0.8948
Epoch 11/25
 - 4s - loss: 0.3478 - acc: 0.9116 - val_loss: 0.5007 - val_acc: 0.9019
```

```
Epoch 12/25
 - 4s - loss: 0.3180 - acc: 0.9197 - val_loss: 0.5056 - val_acc: 0.8989
Epoch 13/25
 - 4s - loss: 0.3130 - acc: 0.9236 - val_loss: 0.4728 - val_acc: 0.8955
Epoch 14/25
 - 4s - loss: 0.3097 - acc: 0.9211 - val_loss: 0.4581 - val_acc: 0.9104
Epoch 15/25
 - 4s - loss: 0.2956 - acc: 0.9234 - val_loss: 0.4555 - val_acc: 0.9053
Epoch 16/25
 - 4s - loss: 0.3036 - acc: 0.9214 - val_loss: 0.4797 - val_acc: 0.8938
Epoch 17/25
 - 4s - loss: 0.3032 - acc: 0.9230 - val_loss: 0.4508 - val_acc: 0.8819
Epoch 18/25
 - 4s - loss: 0.2848 - acc: 0.9279 - val_loss: 0.4111 - val_acc: 0.9192
Epoch 19/25
 - 4s - loss: 0.2817 - acc: 0.9275 - val_loss: 0.4110 - val_acc: 0.9128
Epoch 20/25
 - 4s - loss: 0.2917 - acc: 0.9226 - val_loss: 0.4152 - val_acc: 0.9050
Epoch 21/25
 - 4s - loss: 0.2715 - acc: 0.9314 - val_loss: 0.4112 - val_acc: 0.8938
Epoch 22/25
 - 4s - loss: 0.2868 - acc: 0.9193 - val_loss: 0.4240 - val_acc: 0.9002
Epoch 23/25
 - 4s - loss: 0.2637 - acc: 0.9329 - val_loss: 0.4017 - val_acc: 0.9002
Epoch 24/25
 - 4s - loss: 0.2576 - acc: 0.9313 - val_loss: 0.4015 - val_acc: 0.9084
Epoch 25/25
 - 4s - loss: 0.2557 - acc: 0.9331 - val_loss: 0.3854 - val_acc: 0.9080
Train accuracy 0.948721436343852 Test accuracy: 0.9080420766881574
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_31 (Conv1D)	(None, 124, 28)	1288
conv1d_32 (Conv1D)	(None, 118, 16)	3152
dropout_16 (Dropout)	(None, 118, 16)	0
max_pooling1d_16 (MaxPooling	(None, 39, 16)	0
flatten_16 (Flatten)	(None, 624)	0

```
dense_31 (Dense)                    (None, 32)                  20000
_____
dense_32 (Dense)                    (None, 6)                   198
=================================================================
Total params: 24,638
Trainable params: 24,638
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 3s - loss: 15.3245 - acc: 0.7458 - val_loss: 1.2714 - val_acc: 0.7805
Epoch 2/30
 - 1s - loss: 0.6392 - acc: 0.8550 - val_loss: 0.7413 - val_acc: 0.8409
Epoch 3/30
 - 1s - loss: 0.4923 - acc: 0.8857 - val_loss: 0.6626 - val_acc: 0.8622
Epoch 4/30
 - 1s - loss: 0.4680 - acc: 0.8860 - val_loss: 0.6297 - val_acc: 0.8473
Epoch 5/30
 - 1s - loss: 0.4677 - acc: 0.8882 - val_loss: 0.6407 - val_acc: 0.8656
Epoch 6/30
 - 1s - loss: 0.4308 - acc: 0.8950 - val_loss: 0.7057 - val_acc: 0.7842
Epoch 7/30
 - 1s - loss: 0.4097 - acc: 0.9008 - val_loss: 0.6249 - val_acc: 0.8344
Epoch 8/30
 - 1s - loss: 0.4138 - acc: 0.8966 - val_loss: 0.5428 - val_acc: 0.8595
Epoch 9/30
 - 1s - loss: 0.3861 - acc: 0.9086 - val_loss: 0.6079 - val_acc: 0.8398
Epoch 10/30
 - 1s - loss: 0.3920 - acc: 0.9053 - val_loss: 0.5732 - val_acc: 0.8476
Epoch 11/30
 - 1s - loss: 0.3687 - acc: 0.9100 - val_loss: 0.5987 - val_acc: 0.8398
Epoch 12/30
 - 1s - loss: 0.3888 - acc: 0.8998 - val_loss: 0.5543 - val_acc: 0.8738
Epoch 13/30
 - 1s - loss: 0.3739 - acc: 0.9051 - val_loss: 0.5441 - val_acc: 0.8609
Epoch 14/30
 - 2s - loss: 0.3720 - acc: 0.9051 - val_loss: 0.5179 - val_acc: 0.8609
Epoch 15/30
 - 1s - loss: 0.3505 - acc: 0.9115 - val_loss: 0.5880 - val_acc: 0.8229
Epoch 16/30
 - 1s - loss: 0.3415 - acc: 0.9138 - val_loss: 0.4769 - val_acc: 0.8884
Epoch 17/30
```

```
         - 1s - loss: 0.3342 - acc: 0.9123 - val_loss: 0.4564 - val_acc: 0.8951
        Epoch 18/30
         - 1s - loss: 0.3228 - acc: 0.9214 - val_loss: 0.4618 - val_acc: 0.8985
        Epoch 19/30
         - 1s - loss: 0.3444 - acc: 0.9149 - val_loss: 0.4618 - val_acc: 0.9019
        Epoch 20/30
         - 1s - loss: 0.3535 - acc: 0.9087 - val_loss: 0.4896 - val_acc: 0.8931
        Epoch 21/30
         - 1s - loss: 0.3269 - acc: 0.9174 - val_loss: 0.4670 - val_acc: 0.8799
        Epoch 22/30
         - 2s - loss: 0.3380 - acc: 0.9136 - val_loss: 0.5943 - val_acc: 0.8476
        Epoch 23/30
         - 1s - loss: 0.3278 - acc: 0.9157 - val_loss: 0.5482 - val_acc: 0.8673
        Epoch 24/30
         - 1s - loss: 0.3038 - acc: 0.9259 - val_loss: 0.4524 - val_acc: 0.8816
        Epoch 25/30
         - 1s - loss: 0.2950 - acc: 0.9256 - val_loss: 0.4678 - val_acc: 0.8673
        Epoch 26/30
         - 1s - loss: 0.2893 - acc: 0.9271 - val_loss: 0.4022 - val_acc: 0.8921
        Epoch 27/30
         - 1s - loss: 0.3299 - acc: 0.9168 - val_loss: 0.6079 - val_acc: 0.8663
        Epoch 28/30
         - 1s - loss: 0.3191 - acc: 0.9233 - val_loss: 0.3898 - val_acc: 0.8921
        Epoch 29/30
         - 1s - loss: 0.3074 - acc: 0.9208 - val_loss: 0.6789 - val_acc: 0.7703
        Epoch 30/30
         - 1s - loss: 0.3375 - acc: 0.9166 - val_loss: 0.4229 - val_acc: 0.9077
        Train accuracy 0.9439608269858542 Test accuracy: 0.9077027485578555
        -----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
==================================	====================	=========
conv1d_33 (Conv1D)	(None, 126, 28)	784
conv1d_34 (Conv1D)	(None, 124, 16)	1360
dropout_17 (Dropout)	(None, 124, 16)	0
max_pooling1d_17 (MaxPooling	(None, 41, 16)	0
flatten_17 (Flatten)	(None, 656)	0
dense_33 (Dense)	(None, 64)	42048

```
_____
dense_34 (Dense)                  (None, 6)                    390
==============================================================
Total params: 44,582
Trainable params: 44,582
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 3s - loss: 67.7185 - acc: 0.6288 - val_loss: 49.4894 - val_acc: 0.7367
Epoch 2/30
 - 1s - loss: 37.1992 - acc: 0.8252 - val_loss: 27.4454 - val_acc: 0.7659
Epoch 3/30
 - 1s - loss: 20.4884 - acc: 0.8706 - val_loss: 15.2680 - val_acc: 0.7689
Epoch 4/30
 - 1s - loss: 11.2570 - acc: 0.8902 - val_loss: 8.5185 - val_acc: 0.8174
Epoch 5/30
 - 1s - loss: 6.1733 - acc: 0.8919 - val_loss: 4.8209 - val_acc: 0.8181
Epoch 6/30
 - 1s - loss: 3.4088 - acc: 0.8977 - val_loss: 2.8336 - val_acc: 0.8266
Epoch 7/30
 - 1s - loss: 1.9367 - acc: 0.9032 - val_loss: 1.8325 - val_acc: 0.7869
Epoch 8/30
 - 2s - loss: 1.1843 - acc: 0.9022 - val_loss: 1.3294 - val_acc: 0.7933
Epoch 9/30
 - 1s - loss: 0.8109 - acc: 0.9091 - val_loss: 1.0191 - val_acc: 0.8497
Epoch 10/30
 - 1s - loss: 0.6267 - acc: 0.9106 - val_loss: 0.8913 - val_acc: 0.8347
Epoch 11/30
 - 1s - loss: 0.5430 - acc: 0.9087 - val_loss: 0.7963 - val_acc: 0.8646
Epoch 12/30
 - 1s - loss: 0.4968 - acc: 0.9079 - val_loss: 0.7564 - val_acc: 0.8609
Epoch 13/30
 - 1s - loss: 0.4760 - acc: 0.9081 - val_loss: 0.7551 - val_acc: 0.8588
Epoch 14/30
 - 1s - loss: 0.4512 - acc: 0.9115 - val_loss: 0.7723 - val_acc: 0.8164
Epoch 15/30
 - 1s - loss: 0.4325 - acc: 0.9132 - val_loss: 0.7058 - val_acc: 0.8612
Epoch 16/30
 - 2s - loss: 0.4363 - acc: 0.9041 - val_loss: 0.6773 - val_acc: 0.8677
Epoch 17/30
 - 1s - loss: 0.4068 - acc: 0.9149 - val_loss: 0.6637 - val_acc: 0.8687
```

```
Epoch 18/30
 - 1s - loss: 0.4053 - acc: 0.9138 - val_loss: 0.6468 - val_acc: 0.8673
Epoch 19/30
 - 1s - loss: 0.3873 - acc: 0.9180 - val_loss: 0.6441 - val_acc: 0.8653
Epoch 20/30
 - 1s - loss: 0.3779 - acc: 0.9237 - val_loss: 0.6258 - val_acc: 0.8748
Epoch 21/30
 - 1s - loss: 0.3672 - acc: 0.9204 - val_loss: 0.6213 - val_acc: 0.8744
Epoch 22/30
 - 1s - loss: 0.3643 - acc: 0.9226 - val_loss: 0.6147 - val_acc: 0.8748
Epoch 23/30
 - 1s - loss: 0.3581 - acc: 0.9249 - val_loss: 0.5916 - val_acc: 0.8680
Epoch 24/30
 - 1s - loss: 0.3521 - acc: 0.9253 - val_loss: 0.5863 - val_acc: 0.8690
Epoch 25/30
 - 1s - loss: 0.3434 - acc: 0.9270 - val_loss: 0.6174 - val_acc: 0.8398
Epoch 26/30
 - 1s - loss: 0.3382 - acc: 0.9283 - val_loss: 0.5705 - val_acc: 0.8694
Epoch 27/30
 - 1s - loss: 0.3360 - acc: 0.9260 - val_loss: 0.5708 - val_acc: 0.8683
Epoch 28/30
 - 1s - loss: 0.3264 - acc: 0.9270 - val_loss: 0.5596 - val_acc: 0.8744
Epoch 29/30
 - 1s - loss: 0.3165 - acc: 0.9294 - val_loss: 0.5545 - val_acc: 0.8809
Epoch 30/30
 - 1s - loss: 0.3167 - acc: 0.9276 - val_loss: 0.5340 - val_acc: 0.8744
Train accuracy 0.933215451577802 Test accuracy: 0.8744485917882593
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_35 (Conv1D)	(None, 122, 42)	2688
conv1d_36 (Conv1D)	(None, 120, 16)	2032
dropout_18 (Dropout)	(None, 120, 16)	0
max_pooling1d_18 (MaxPooling	(None, 40, 16)	0
flatten_18 (Flatten)	(None, 640)	0
dense_35 (Dense)	(None, 32)	20512

```
dense_36 (Dense)                    (None, 6)                       198
=================================================================
Total params: 25,430
Trainable params: 25,430
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 11.7904 - acc: 0.7391 - val_loss: 0.8701 - val_acc: 0.7788
Epoch 2/25
 - 4s - loss: 0.6442 - acc: 0.8328 - val_loss: 0.7829 - val_acc: 0.8164
Epoch 3/25
 - 4s - loss: 0.5658 - acc: 0.8569 - val_loss: 0.6739 - val_acc: 0.8453
Epoch 4/25
 - 3s - loss: 0.5517 - acc: 0.8618 - val_loss: 0.8972 - val_acc: 0.7027
Epoch 5/25
 - 3s - loss: 0.5117 - acc: 0.8708 - val_loss: 0.6253 - val_acc: 0.8412
Epoch 6/25
 - 4s - loss: 0.4780 - acc: 0.8788 - val_loss: 0.6040 - val_acc: 0.8280
Epoch 7/25
 - 3s - loss: 0.4720 - acc: 0.8844 - val_loss: 0.6061 - val_acc: 0.8466
Epoch 8/25
 - 3s - loss: 0.4509 - acc: 0.8906 - val_loss: 0.5511 - val_acc: 0.8514
Epoch 9/25
 - 4s - loss: 0.4468 - acc: 0.8901 - val_loss: 0.5676 - val_acc: 0.8466
Epoch 10/25
 - 3s - loss: 0.4462 - acc: 0.8881 - val_loss: 0.6952 - val_acc: 0.8144
Epoch 11/25
 - 4s - loss: 0.4389 - acc: 0.8939 - val_loss: 0.5627 - val_acc: 0.8694
Epoch 12/25
 - 3s - loss: 0.4341 - acc: 0.8906 - val_loss: 0.5739 - val_acc: 0.8575
Epoch 13/25
 - 3s - loss: 0.4189 - acc: 0.8980 - val_loss: 0.6106 - val_acc: 0.8171
Epoch 14/25
 - 3s - loss: 0.4243 - acc: 0.9018 - val_loss: 0.6372 - val_acc: 0.8341
Epoch 15/25
 - 4s - loss: 0.4123 - acc: 0.8976 - val_loss: 0.6017 - val_acc: 0.8463
Epoch 16/25
 - 4s - loss: 0.3796 - acc: 0.9070 - val_loss: 0.4965 - val_acc: 0.8626
Epoch 17/25
 - 3s - loss: 0.3946 - acc: 0.9004 - val_loss: 0.4797 - val_acc: 0.8609
Epoch 18/25
```

```
 - 3s - loss: 0.3904 - acc: 0.9048 - val_loss: 0.6900 - val_acc: 0.7967
Epoch 19/25
 - 3s - loss: 0.3939 - acc: 0.9052 - val_loss: 0.5635 - val_acc: 0.8215
Epoch 20/25
 - 3s - loss: 0.3781 - acc: 0.9057 - val_loss: 0.6522 - val_acc: 0.8134
Epoch 21/25
 - 3s - loss: 0.3945 - acc: 0.9061 - val_loss: 0.4607 - val_acc: 0.8748
Epoch 22/25
 - 4s - loss: 0.3641 - acc: 0.9128 - val_loss: 0.4994 - val_acc: 0.8466
Epoch 23/25
 - 4s - loss: 0.4095 - acc: 0.9017 - val_loss: 0.6645 - val_acc: 0.7855
Epoch 24/25
 - 3s - loss: 0.3662 - acc: 0.9106 - val_loss: 0.4692 - val_acc: 0.8911
Epoch 25/25
 - 4s - loss: 0.3860 - acc: 0.9087 - val_loss: 0.5268 - val_acc: 0.8320
Train accuracy 0.8769042437431991 Test accuracy: 0.832032575500509
-----------------------------------------------------------------------------


_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_37 (Conv1D)           (None, 122, 28)           1792
_____
conv1d_38 (Conv1D)           (None, 116, 24)           4728
_____
dropout_19 (Dropout)         (None, 116, 24)           0
_____
max_pooling1d_19 (MaxPooling (None, 58, 24)            0
_____
flatten_19 (Flatten)         (None, 1392)              0
_____
dense_37 (Dense)             (None, 32)                44576
_____
dense_38 (Dense)             (None, 6)                 198
=================================================================
Total params: 51,294
Trainable params: 51,294
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 4.6101 - acc: 0.7229 - val_loss: 0.8567 - val_acc: 0.8575
Epoch 2/25
```

```
              - 2s - loss: 0.5960 - acc: 0.8694 - val_loss: 0.5388 - val_acc: 0.8999
          Epoch 3/25
              - 2s - loss: 0.4529 - acc: 0.8985 - val_loss: 0.4633 - val_acc: 0.8873
          Epoch 4/25
              - 2s - loss: 0.3815 - acc: 0.9074 - val_loss: 0.4082 - val_acc: 0.8931
          Epoch 5/25
              - 2s - loss: 0.3394 - acc: 0.9135 - val_loss: 0.3843 - val_acc: 0.9013
          Epoch 6/25
              - 2s - loss: 0.3315 - acc: 0.9181 - val_loss: 0.4065 - val_acc: 0.8911
          Epoch 7/25
              - 2s - loss: 0.3237 - acc: 0.9184 - val_loss: 0.3902 - val_acc: 0.8870
          Epoch 8/25
              - 2s - loss: 0.2985 - acc: 0.9226 - val_loss: 0.3657 - val_acc: 0.8968
          Epoch 9/25
              - 2s - loss: 0.3158 - acc: 0.9248 - val_loss: 0.3911 - val_acc: 0.9006
          Epoch 10/25
              - 2s - loss: 0.3041 - acc: 0.9225 - val_loss: 0.4590 - val_acc: 0.8782
          Epoch 11/25
              - 2s - loss: 0.2902 - acc: 0.9240 - val_loss: 0.3727 - val_acc: 0.8951
          Epoch 12/25
              - 2s - loss: 0.2983 - acc: 0.9246 - val_loss: 0.6372 - val_acc: 0.7903
          Epoch 13/25
              - 2s - loss: 0.3210 - acc: 0.9218 - val_loss: 0.3795 - val_acc: 0.8924
          Epoch 14/25
              - 2s - loss: 0.2750 - acc: 0.9285 - val_loss: 0.3721 - val_acc: 0.8928
          Epoch 15/25
              - 2s - loss: 0.3241 - acc: 0.9199 - val_loss: 0.4096 - val_acc: 0.8806
          Epoch 16/25
              - 2s - loss: 0.2881 - acc: 0.9283 - val_loss: 0.3993 - val_acc: 0.8829
          Epoch 17/25
              - 2s - loss: 0.2935 - acc: 0.9283 - val_loss: 0.4347 - val_acc: 0.8768
          Epoch 18/25
              - 2s - loss: 0.2857 - acc: 0.9274 - val_loss: 0.4402 - val_acc: 0.8768
          Epoch 19/25
              - 2s - loss: 0.3183 - acc: 0.9218 - val_loss: 0.3732 - val_acc: 0.8863
          Epoch 20/25
              - 2s - loss: 0.2959 - acc: 0.9278 - val_loss: 0.3438 - val_acc: 0.9002
          Epoch 21/25
              - 2s - loss: 0.3066 - acc: 0.9229 - val_loss: 0.3859 - val_acc: 0.8853
          Epoch 22/25
              - 2s - loss: 0.2850 - acc: 0.9272 - val_loss: 0.3951 - val_acc: 0.8795
          Epoch 23/25
              - 2s - loss: 0.2920 - acc: 0.9259 - val_loss: 0.3742 - val_acc: 0.8809
```

```
Epoch 24/25
 - 2s - loss: 0.2962 - acc: 0.9242 - val_loss: 0.4072 - val_acc: 0.8738
Epoch 25/25
 - 2s - loss: 0.2963 - acc: 0.9249 - val_loss: 0.4095 - val_acc: 0.8761
Train accuracy 0.9345756256152289 Test accuracy: 0.8761452324397693
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_39 (Conv1D)	(None, 124, 28)	1288
conv1d_40 (Conv1D)	(None, 122, 32)	2720
dropout_20 (Dropout)	(None, 122, 32)	0
max_pooling1d_20 (MaxPooling	(None, 40, 32)	0
flatten_20 (Flatten)	(None, 1280)	0
dense_39 (Dense)	(None, 64)	81984
dense_40 (Dense)	(None, 6)	390

```
Total params: 86,382
Trainable params: 86,382
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 3s - loss: 22.7968 - acc: 0.7855 - val_loss: 4.4245 - val_acc: 0.8269
Epoch 2/35
 - 2s - loss: 1.5498 - acc: 0.9135 - val_loss: 0.7672 - val_acc: 0.8829
Epoch 3/35
 - 2s - loss: 0.4640 - acc: 0.9123 - val_loss: 0.6182 - val_acc: 0.8836
Epoch 4/35
 - 2s - loss: 0.3827 - acc: 0.9218 - val_loss: 0.5272 - val_acc: 0.8734
Epoch 5/35
 - 2s - loss: 0.3322 - acc: 0.9304 - val_loss: 0.4792 - val_acc: 0.8982
Epoch 6/35
 - 2s - loss: 0.3333 - acc: 0.9245 - val_loss: 0.4604 - val_acc: 0.8867
Epoch 7/35
 - 2s - loss: 0.2905 - acc: 0.9358 - val_loss: 0.4597 - val_acc: 0.8795
```

```
Epoch 8/35
 - 2s - loss: 0.3223 - acc: 0.9245 - val_loss: 0.4677 - val_acc: 0.8958
Epoch 9/35
 - 2s - loss: 0.3260 - acc: 0.9217 - val_loss: 0.4409 - val_acc: 0.8928
Epoch 10/35
 - 2s - loss: 0.2870 - acc: 0.9350 - val_loss: 0.4316 - val_acc: 0.8775
Epoch 11/35
 - 2s - loss: 0.2716 - acc: 0.9347 - val_loss: 0.3952 - val_acc: 0.9040
Epoch 12/35
 - 2s - loss: 0.2982 - acc: 0.9274 - val_loss: 0.4363 - val_acc: 0.8904
Epoch 13/35
 - 2s - loss: 0.2594 - acc: 0.9362 - val_loss: 0.3815 - val_acc: 0.9006
Epoch 14/35
 - 2s - loss: 0.2630 - acc: 0.9369 - val_loss: 0.4391 - val_acc: 0.8802
Epoch 15/35
 - 2s - loss: 0.2667 - acc: 0.9340 - val_loss: 0.4025 - val_acc: 0.8968
Epoch 16/35
 - 2s - loss: 0.2682 - acc: 0.9312 - val_loss: 0.3907 - val_acc: 0.8884
Epoch 17/35
 - 2s - loss: 0.2627 - acc: 0.9323 - val_loss: 0.4910 - val_acc: 0.8660
Epoch 18/35
 - 2s - loss: 0.2572 - acc: 0.9363 - val_loss: 0.4170 - val_acc: 0.8921
Epoch 19/35
 - 2s - loss: 0.2512 - acc: 0.9350 - val_loss: 0.4513 - val_acc: 0.8819
Epoch 20/35
 - 2s - loss: 0.2498 - acc: 0.9372 - val_loss: 0.3645 - val_acc: 0.8877
Epoch 21/35
 - 2s - loss: 0.2725 - acc: 0.9328 - val_loss: 0.4023 - val_acc: 0.8694
Epoch 22/35
 - 2s - loss: 0.2370 - acc: 0.9418 - val_loss: 0.3780 - val_acc: 0.8907
Epoch 23/35
 - 2s - loss: 0.2295 - acc: 0.9403 - val_loss: 0.3392 - val_acc: 0.8914
Epoch 24/35
 - 2s - loss: 0.2422 - acc: 0.9369 - val_loss: 0.3856 - val_acc: 0.8985
Epoch 25/35
 - 2s - loss: 0.2517 - acc: 0.9368 - val_loss: 0.3717 - val_acc: 0.8938
Epoch 26/35
 - 2s - loss: 0.2607 - acc: 0.9343 - val_loss: 0.3326 - val_acc: 0.9050
Epoch 27/35
 - 2s - loss: 0.2248 - acc: 0.9430 - val_loss: 0.3536 - val_acc: 0.9006
Epoch 28/35
 - 2s - loss: 0.2193 - acc: 0.9433 - val_loss: 0.3477 - val_acc: 0.8914
Epoch 29/35
```

```
 - 2s - loss: 0.2229 - acc: 0.9396 - val_loss: 0.3520 - val_acc: 0.8965
Epoch 30/35
 - 2s - loss: 0.2261 - acc: 0.9402 - val_loss: 0.3448 - val_acc: 0.9030
Epoch 31/35
 - 2s - loss: 0.2981 - acc: 0.9268 - val_loss: 0.3279 - val_acc: 0.9067
Epoch 32/35
 - 2s - loss: 0.2337 - acc: 0.9366 - val_loss: 0.4004 - val_acc: 0.8853
Epoch 33/35
 - 2s - loss: 0.2216 - acc: 0.9389 - val_loss: 0.3564 - val_acc: 0.8921
Epoch 34/35
 - 2s - loss: 0.2160 - acc: 0.9404 - val_loss: 0.3425 - val_acc: 0.9002
Epoch 35/35
 - 2s - loss: 0.2206 - acc: 0.9388 - val_loss: 0.4076 - val_acc: 0.8714
Train accuracy 0.9360718171926007 Test accuracy: 0.8713946386155412
---------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_41 (Conv1D)           (None, 124, 28)           1288
_____
conv1d_42 (Conv1D)           (None, 118, 16)           3152
_____
dropout_21 (Dropout)         (None, 118, 16)           0
_____
max_pooling1d_21 (MaxPooling (None, 39, 16)            0
_____
flatten_21 (Flatten)         (None, 624)               0
_____
dense_41 (Dense)             (None, 32)                20000
_____
dense_42 (Dense)             (None, 6)                 198
=================================================================
Total params: 24,638
Trainable params: 24,638
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 24.7607 - acc: 0.6374 - val_loss: 12.1744 - val_acc: 0.6956
Epoch 2/25
 - 1s - loss: 6.9210 - acc: 0.8572 - val_loss: 3.8338 - val_acc: 0.8571
Epoch 3/25
```

```
          - 1s - loss: 2.1890 - acc: 0.8977 - val_loss: 1.5053 - val_acc: 0.8541
        Epoch 4/25
          - 1s - loss: 0.8775 - acc: 0.9068 - val_loss: 0.8604 - val_acc: 0.8721
        Epoch 5/25
          - 2s - loss: 0.5256 - acc: 0.9143 - val_loss: 0.7066 - val_acc: 0.8751
        Epoch 6/25
          - 1s - loss: 0.4235 - acc: 0.9238 - val_loss: 0.6280 - val_acc: 0.8809
        Epoch 7/25
          - 1s - loss: 0.3802 - acc: 0.9272 - val_loss: 0.5760 - val_acc: 0.8931
        Epoch 8/25
          - 1s - loss: 0.3511 - acc: 0.9297 - val_loss: 0.5842 - val_acc: 0.8843
        Epoch 9/25
          - 1s - loss: 0.3254 - acc: 0.9347 - val_loss: 0.5243 - val_acc: 0.8999
        Epoch 10/25
          - 1s - loss: 0.3131 - acc: 0.9347 - val_loss: 0.5206 - val_acc: 0.8996
        Epoch 11/25
          - 1s - loss: 0.3041 - acc: 0.9372 - val_loss: 0.5029 - val_acc: 0.8748
        Epoch 12/25
          - 1s - loss: 0.2853 - acc: 0.9365 - val_loss: 0.4875 - val_acc: 0.9002
        Epoch 13/25
          - 1s - loss: 0.2826 - acc: 0.9391 - val_loss: 0.4586 - val_acc: 0.8951
        Epoch 14/25
          - 2s - loss: 0.2819 - acc: 0.9388 - val_loss: 0.4434 - val_acc: 0.9074
        Epoch 15/25
          - 1s - loss: 0.2633 - acc: 0.9414 - val_loss: 0.4804 - val_acc: 0.8646
        Epoch 16/25
          - 1s - loss: 0.2555 - acc: 0.9411 - val_loss: 0.4194 - val_acc: 0.9121
        Epoch 17/25
          - 1s - loss: 0.2678 - acc: 0.9351 - val_loss: 0.4557 - val_acc: 0.9002
        Epoch 18/25
          - 1s - loss: 0.2576 - acc: 0.9407 - val_loss: 0.4430 - val_acc: 0.8955
        Epoch 19/25
          - 1s - loss: 0.2494 - acc: 0.9395 - val_loss: 0.4019 - val_acc: 0.8907
        Epoch 20/25
          - 1s - loss: 0.2348 - acc: 0.9437 - val_loss: 0.4034 - val_acc: 0.8968
        Epoch 21/25
          - 1s - loss: 0.2536 - acc: 0.9339 - val_loss: 0.4443 - val_acc: 0.8907
        Epoch 22/25
          - 1s - loss: 0.2338 - acc: 0.9441 - val_loss: 0.3991 - val_acc: 0.8863
        Epoch 23/25
          - 1s - loss: 0.2265 - acc: 0.9453 - val_loss: 0.3730 - val_acc: 0.9050
        Epoch 24/25
          - 1s - loss: 0.2398 - acc: 0.9402 - val_loss: 0.3804 - val_acc: 0.9006
```

```
Epoch 25/25
 - 1s - loss: 0.2188 - acc: 0.9445 - val_loss: 0.3689 - val_acc: 0.8955
Train accuracy 0.9522578890097932 Test accuracy: 0.8954869358669834
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_43 (Conv1D)	(None, 124, 32)	1472
conv1d_44 (Conv1D)	(None, 118, 16)	3600
dropout_22 (Dropout)	(None, 118, 16)	0
max_pooling1d_22 (MaxPooling	(None, 39, 16)	0
flatten_22 (Flatten)	(None, 624)	0
dense_43 (Dense)	(None, 32)	20000
dense_44 (Dense)	(None, 6)	198

```
Total params: 25,270
Trainable params: 25,270
Non-trainable params: 0

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 4s - loss: 15.8332 - acc: 0.6967 - val_loss: 3.0233 - val_acc: 0.7564
Epoch 2/30
 - 3s - loss: 1.1858 - acc: 0.8777 - val_loss: 0.8561 - val_acc: 0.8463
Epoch 3/30
 - 3s - loss: 0.5198 - acc: 0.8874 - val_loss: 0.7322 - val_acc: 0.8436
Epoch 4/30
 - 3s - loss: 0.4474 - acc: 0.8984 - val_loss: 0.6273 - val_acc: 0.8734
Epoch 5/30
 - 3s - loss: 0.4041 - acc: 0.9036 - val_loss: 0.6474 - val_acc: 0.8395
Epoch 6/30
 - 3s - loss: 0.3901 - acc: 0.9081 - val_loss: 0.7020 - val_acc: 0.8012
Epoch 7/30
 - 3s - loss: 0.3900 - acc: 0.9000 - val_loss: 0.5868 - val_acc: 0.8734
Epoch 8/30
 - 3s - loss: 0.3681 - acc: 0.9085 - val_loss: 0.5896 - val_acc: 0.8504
```

```
Epoch 9/30
 - 3s - loss: 0.3471 - acc: 0.9119 - val_loss: 0.5298 - val_acc: 0.8744
Epoch 10/30
 - 3s - loss: 0.3462 - acc: 0.9129 - val_loss: 0.5315 - val_acc: 0.8809
Epoch 11/30
 - 3s - loss: 0.3257 - acc: 0.9173 - val_loss: 0.5010 - val_acc: 0.8748
Epoch 12/30
 - 3s - loss: 0.3464 - acc: 0.9076 - val_loss: 0.5478 - val_acc: 0.8772
Epoch 13/30
 - 3s - loss: 0.3178 - acc: 0.9162 - val_loss: 0.5697 - val_acc: 0.8666
Epoch 14/30
 - 3s - loss: 0.3070 - acc: 0.9207 - val_loss: 0.4851 - val_acc: 0.8880
Epoch 15/30
 - 3s - loss: 0.3045 - acc: 0.9226 - val_loss: 0.5191 - val_acc: 0.8812
Epoch 16/30
 - 3s - loss: 0.3009 - acc: 0.9199 - val_loss: 0.4661 - val_acc: 0.8958
Epoch 17/30
 - 2s - loss: 0.2988 - acc: 0.9217 - val_loss: 0.5313 - val_acc: 0.8317
Epoch 18/30
 - 3s - loss: 0.3013 - acc: 0.9206 - val_loss: 0.4925 - val_acc: 0.8853
Epoch 19/30
 - 3s - loss: 0.2734 - acc: 0.9314 - val_loss: 0.4544 - val_acc: 0.8738
Epoch 20/30
 - 3s - loss: 0.2791 - acc: 0.9259 - val_loss: 0.4652 - val_acc: 0.8755
Epoch 21/30
 - 3s - loss: 0.2842 - acc: 0.9237 - val_loss: 0.4821 - val_acc: 0.8823
Epoch 22/30
 - 3s - loss: 0.2662 - acc: 0.9272 - val_loss: 0.4415 - val_acc: 0.8924
Epoch 23/30
 - 2s - loss: 0.2693 - acc: 0.9289 - val_loss: 0.4626 - val_acc: 0.8758
Epoch 24/30
 - 2s - loss: 0.2812 - acc: 0.9255 - val_loss: 0.4210 - val_acc: 0.8904
Epoch 25/30
 - 3s - loss: 0.2672 - acc: 0.9276 - val_loss: 0.4201 - val_acc: 0.8816
Epoch 26/30
 - 3s - loss: 0.2574 - acc: 0.9291 - val_loss: 0.4177 - val_acc: 0.8962
Epoch 27/30
 - 2s - loss: 0.2570 - acc: 0.9323 - val_loss: 0.4297 - val_acc: 0.8918
Epoch 28/30
 - 2s - loss: 0.2668 - acc: 0.9293 - val_loss: 0.4282 - val_acc: 0.8839
Epoch 29/30
 - 2s - loss: 0.2485 - acc: 0.9365 - val_loss: 0.4765 - val_acc: 0.8480
Epoch 30/30
```

```
 - 3s - loss: 0.2482 - acc: 0.9366 - val_loss: 0.4277 - val_acc: 0.8945
Train accuracy 0.9328073993471164 Test accuracy: 0.8944689514760774
--------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_45 (Conv1D)           (None, 124, 28)           1288

conv1d_46 (Conv1D)           (None, 118, 16)           3152

dropout_23 (Dropout)         (None, 118, 16)           0

max_pooling1d_23 (MaxPooling (None, 39, 16)            0

flatten_23 (Flatten)         (None, 624)               0

dense_45 (Dense)             (None, 32)                20000

dense_46 (Dense)             (None, 6)                 198
=================================================================
Total params: 24,638
Trainable params: 24,638
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 24.4915 - acc: 0.7338 - val_loss: 9.6958 - val_acc: 0.8449
Epoch 2/25
 - 2s - loss: 4.6933 - acc: 0.9143 - val_loss: 2.2316 - val_acc: 0.8833
Epoch 3/25
 - 2s - loss: 1.1098 - acc: 0.9204 - val_loss: 0.8986 - val_acc: 0.8836
Epoch 4/25
 - 2s - loss: 0.5101 - acc: 0.9234 - val_loss: 0.6771 - val_acc: 0.8561
Epoch 5/25
 - 2s - loss: 0.4005 - acc: 0.9267 - val_loss: 0.6104 - val_acc: 0.8819
Epoch 6/25
 - 2s - loss: 0.3578 - acc: 0.9308 - val_loss: 0.5528 - val_acc: 0.8856
Epoch 7/25
 - 2s - loss: 0.3387 - acc: 0.9286 - val_loss: 0.5336 - val_acc: 0.8945
Epoch 8/25
 - 2s - loss: 0.3173 - acc: 0.9353 - val_loss: 0.5215 - val_acc: 0.8894
Epoch 9/25
```

```
         - 2s - loss: 0.3061 - acc: 0.9324 - val_loss: 0.4767 - val_acc: 0.8904
        Epoch 10/25
         - 2s - loss: 0.2883 - acc: 0.9358 - val_loss: 0.5144 - val_acc: 0.8636
        Epoch 11/25
         - 2s - loss: 0.2748 - acc: 0.9380 - val_loss: 0.4526 - val_acc: 0.8894
        Epoch 12/25
         - 2s - loss: 0.2865 - acc: 0.9339 - val_loss: 0.4260 - val_acc: 0.9063
        Epoch 13/25
         - 2s - loss: 0.2607 - acc: 0.9392 - val_loss: 0.4267 - val_acc: 0.8924
        Epoch 14/25
         - 2s - loss: 0.2623 - acc: 0.9382 - val_loss: 0.4755 - val_acc: 0.8636
        Epoch 15/25
         - 2s - loss: 0.2596 - acc: 0.9357 - val_loss: 0.4522 - val_acc: 0.8938
        Epoch 16/25
         - 2s - loss: 0.2403 - acc: 0.9438 - val_loss: 0.3898 - val_acc: 0.9026
        Epoch 17/25
         - 2s - loss: 0.2386 - acc: 0.9421 - val_loss: 0.3915 - val_acc: 0.8982
        Epoch 18/25
         - 2s - loss: 0.2358 - acc: 0.9399 - val_loss: 0.4083 - val_acc: 0.8863
        Epoch 19/25
         - 2s - loss: 0.2376 - acc: 0.9389 - val_loss: 0.4044 - val_acc: 0.8867
        Epoch 20/25
         - 2s - loss: 0.2339 - acc: 0.9388 - val_loss: 0.3960 - val_acc: 0.8962
        Epoch 21/25
         - 2s - loss: 0.2294 - acc: 0.9403 - val_loss: 0.3983 - val_acc: 0.8907
        Epoch 22/25
         - 2s - loss: 0.2353 - acc: 0.9402 - val_loss: 0.3883 - val_acc: 0.8965
        Epoch 23/25
         - 2s - loss: 0.2266 - acc: 0.9412 - val_loss: 0.3833 - val_acc: 0.9002
        Epoch 24/25
         - 2s - loss: 0.2281 - acc: 0.9362 - val_loss: 0.3575 - val_acc: 0.9060
        Epoch 25/25
         - 2s - loss: 0.2098 - acc: 0.9444 - val_loss: 0.3773 - val_acc: 0.9087
        Train accuracy 0.9468171926006529 Test accuracy: 0.9087207329487614
        -----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
=======================	===================	=========
conv1d_47 (Conv1D)	(None, 124, 32)	1472
conv1d_48 (Conv1D)	(None, 118, 24)	5400
dropout_24 (Dropout)	(None, 118, 24)	0

```
_____
max_pooling1d_24 (MaxPooling (None, 39, 24)                0

_____
flatten_24 (Flatten)         (None, 936)                   0

_____
dense_47 (Dense)             (None, 32)                    29984

_____
dense_48 (Dense)             (None, 6)                     198
================================================================
Total params: 37,054
Trainable params: 37,054
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 30.7482 - acc: 0.6945 - val_loss: 12.6757 - val_acc: 0.7723
Epoch 2/25
 - 4s - loss: 6.4228 - acc: 0.8815 - val_loss: 3.1017 - val_acc: 0.8789
Epoch 3/25
 - 4s - loss: 1.5814 - acc: 0.9102 - val_loss: 1.1832 - val_acc: 0.8415
Epoch 4/25
 - 4s - loss: 0.6271 - acc: 0.9207 - val_loss: 0.7677 - val_acc: 0.8867
Epoch 5/25
 - 4s - loss: 0.4378 - acc: 0.9266 - val_loss: 0.6758 - val_acc: 0.8921
Epoch 6/25
 - 4s - loss: 0.3849 - acc: 0.9309 - val_loss: 0.6361 - val_acc: 0.8884
Epoch 7/25
 - 4s - loss: 0.3529 - acc: 0.9342 - val_loss: 0.6003 - val_acc: 0.8951
Epoch 8/25
 - 4s - loss: 0.3389 - acc: 0.9325 - val_loss: 0.5626 - val_acc: 0.8962
Epoch 9/25
 - 4s - loss: 0.3227 - acc: 0.9331 - val_loss: 0.5471 - val_acc: 0.8894
Epoch 10/25
 - 4s - loss: 0.3194 - acc: 0.9285 - val_loss: 0.5725 - val_acc: 0.8802
Epoch 11/25
 - 4s - loss: 0.2970 - acc: 0.9412 - val_loss: 0.5044 - val_acc: 0.8877
Epoch 12/25
 - 4s - loss: 0.2911 - acc: 0.9347 - val_loss: 0.4854 - val_acc: 0.9084
Epoch 13/25
 - 4s - loss: 0.2934 - acc: 0.9339 - val_loss: 0.5101 - val_acc: 0.8870
Epoch 14/25
 - 4s - loss: 0.2692 - acc: 0.9387 - val_loss: 0.4758 - val_acc: 0.8979
```

```
Epoch 15/25
 - 4s - loss: 0.2700 - acc: 0.9382 - val_loss: 0.4790 - val_acc: 0.8826
Epoch 16/25
 - 4s - loss: 0.2651 - acc: 0.9372 - val_loss: 0.4938 - val_acc: 0.8812
Epoch 17/25
 - 4s - loss: 0.2556 - acc: 0.9411 - val_loss: 0.4576 - val_acc: 0.8948
Epoch 18/25
 - 4s - loss: 0.2394 - acc: 0.9453 - val_loss: 0.4682 - val_acc: 0.8795
Epoch 19/25
 - 4s - loss: 0.2452 - acc: 0.9403 - val_loss: 0.4418 - val_acc: 0.8999
Epoch 20/25
 - 4s - loss: 0.2370 - acc: 0.9433 - val_loss: 0.4561 - val_acc: 0.8751
Epoch 21/25
 - 4s - loss: 0.2469 - acc: 0.9373 - val_loss: 0.4023 - val_acc: 0.9002
Epoch 22/25
 - 4s - loss: 0.2356 - acc: 0.9395 - val_loss: 0.4127 - val_acc: 0.9053
Epoch 23/25
 - 4s - loss: 0.2262 - acc: 0.9427 - val_loss: 0.3983 - val_acc: 0.8999
Epoch 24/25
 - 4s - loss: 0.2254 - acc: 0.9403 - val_loss: 0.4087 - val_acc: 0.9026
Epoch 25/25
 - 4s - loss: 0.2124 - acc: 0.9476 - val_loss: 0.4039 - val_acc: 0.9019
Train accuracy 0.9514417845484222 Test accuracy: 0.9019341703427214
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_49 (Conv1D)	(None, 124, 28)	1288
conv1d_50 (Conv1D)	(None, 118, 16)	3152
dropout_25 (Dropout)	(None, 118, 16)	0
max_pooling1d_25 (MaxPooling	(None, 39, 16)	0
flatten_25 (Flatten)	(None, 624)	0
dense_49 (Dense)	(None, 32)	20000
dense_50 (Dense)	(None, 6)	198

```
=================================================================
Total params: 24,638
Trainable params: 24,638
```

```
        Non-trainable params: 0

        _____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 8.6196 - acc: 0.7390 - val_loss: 3.7160 - val_acc: 0.8921
Epoch 2/25
 - 2s - loss: 1.9125 - acc: 0.9249 - val_loss: 1.1556 - val_acc: 0.8958
Epoch 3/25
 - 2s - loss: 0.6494 - acc: 0.9402 - val_loss: 0.6623 - val_acc: 0.9023
Epoch 4/25
 - 2s - loss: 0.3987 - acc: 0.9402 - val_loss: 0.5116 - val_acc: 0.8975
Epoch 5/25
 - 2s - loss: 0.3087 - acc: 0.9438 - val_loss: 0.4542 - val_acc: 0.8938
Epoch 6/25
 - 2s - loss: 0.2733 - acc: 0.9429 - val_loss: 0.4127 - val_acc: 0.9040
Epoch 7/25
 - 2s - loss: 0.2379 - acc: 0.9464 - val_loss: 0.4030 - val_acc: 0.9091
Epoch 8/25
 - 2s - loss: 0.2217 - acc: 0.9467 - val_loss: 0.3690 - val_acc: 0.9074
Epoch 9/25
 - 2s - loss: 0.2187 - acc: 0.9442 - val_loss: 0.3577 - val_acc: 0.9148
Epoch 10/25
 - 2s - loss: 0.2041 - acc: 0.9489 - val_loss: 0.3870 - val_acc: 0.8941
Epoch 11/25
 - 2s - loss: 0.1949 - acc: 0.9483 - val_loss: 0.3585 - val_acc: 0.8935
Epoch 12/25
 - 2s - loss: 0.1828 - acc: 0.9489 - val_loss: 0.3670 - val_acc: 0.8982
Epoch 13/25
 - 2s - loss: 0.2030 - acc: 0.9438 - val_loss: 0.3187 - val_acc: 0.9158
Epoch 14/25
 - 2s - loss: 0.1789 - acc: 0.9501 - val_loss: 0.3459 - val_acc: 0.8999
Epoch 15/25
 - 2s - loss: 0.1884 - acc: 0.9465 - val_loss: 0.3262 - val_acc: 0.9077
Epoch 16/25
 - 2s - loss: 0.1741 - acc: 0.9499 - val_loss: 0.4076 - val_acc: 0.8697
Epoch 17/25
 - 2s - loss: 0.1801 - acc: 0.9476 - val_loss: 0.3142 - val_acc: 0.9063
Epoch 18/25
 - 2s - loss: 0.1716 - acc: 0.9508 - val_loss: 0.3178 - val_acc: 0.9033
Epoch 19/25
 - 2s - loss: 0.1648 - acc: 0.9527 - val_loss: 0.3241 - val_acc: 0.8945
Epoch 20/25
```

```
 - 2s - loss: 0.1716 - acc: 0.9498 - val_loss: 0.3180 - val_acc: 0.9128
Epoch 21/25
 - 2s - loss: 0.1664 - acc: 0.9505 - val_loss: 0.3195 - val_acc: 0.8911
Epoch 22/25
 - 2s - loss: 0.1597 - acc: 0.9521 - val_loss: 0.3119 - val_acc: 0.8968
Epoch 23/25
 - 2s - loss: 0.1578 - acc: 0.9502 - val_loss: 0.3099 - val_acc: 0.8958
Epoch 24/25
 - 2s - loss: 0.1659 - acc: 0.9482 - val_loss: 0.2908 - val_acc: 0.9033
Epoch 25/25
 - 2s - loss: 0.1596 - acc: 0.9518 - val_loss: 0.3146 - val_acc: 0.8935
Train accuracy 0.9575625680087051 Test accuracy: 0.8934509670851714
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_51 (Conv1D)	(None, 124, 32)	1472
conv1d_52 (Conv1D)	(None, 118, 24)	5400
dropout_26 (Dropout)	(None, 118, 24)	0
max_pooling1d_26 (MaxPooling	(None, 39, 24)	0
flatten_26 (Flatten)	(None, 936)	0
dense_51 (Dense)	(None, 32)	29984
dense_52 (Dense)	(None, 6)	198

```
Total params: 37,054
Trainable params: 37,054
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 8.2183 - acc: 0.7568 - val_loss: 1.5245 - val_acc: 0.8459
Epoch 2/25
 - 4s - loss: 0.6555 - acc: 0.9153 - val_loss: 0.6685 - val_acc: 0.8860
Epoch 3/25
 - 4s - loss: 0.3905 - acc: 0.9204 - val_loss: 0.5843 - val_acc: 0.8666
Epoch 4/25
```

```
        - 4s - loss: 0.3311 - acc: 0.9283 - val_loss: 0.5501 - val_acc: 0.8799
Epoch 5/25
        - 4s - loss: 0.3065 - acc: 0.9280 - val_loss: 0.5932 - val_acc: 0.8005
Epoch 6/25
        - 4s - loss: 0.2766 - acc: 0.9357 - val_loss: 0.4405 - val_acc: 0.8890
Epoch 7/25
        - 4s - loss: 0.2612 - acc: 0.9365 - val_loss: 0.4637 - val_acc: 0.8731
Epoch 8/25
        - 4s - loss: 0.2752 - acc: 0.9316 - val_loss: 0.4310 - val_acc: 0.8894
Epoch 9/25
        - 4s - loss: 0.2395 - acc: 0.9377 - val_loss: 0.4556 - val_acc: 0.8714
Epoch 10/25
        - 4s - loss: 0.2419 - acc: 0.9385 - val_loss: 0.6264 - val_acc: 0.8137
Epoch 11/25
        - 4s - loss: 0.2520 - acc: 0.9359 - val_loss: 0.3904 - val_acc: 0.9033
Epoch 12/25
        - 4s - loss: 0.2366 - acc: 0.9422 - val_loss: 0.3757 - val_acc: 0.9016
Epoch 13/25
        - 4s - loss: 0.2257 - acc: 0.9410 - val_loss: 0.4105 - val_acc: 0.8911
Epoch 14/25
        - 4s - loss: 0.2392 - acc: 0.9376 - val_loss: 0.3785 - val_acc: 0.8826
Epoch 15/25
        - 4s - loss: 0.2316 - acc: 0.9381 - val_loss: 0.4930 - val_acc: 0.8761
Epoch 16/25
        - 4s - loss: 0.2187 - acc: 0.9445 - val_loss: 0.3751 - val_acc: 0.8904
Epoch 17/25
        - 4s - loss: 0.2327 - acc: 0.9397 - val_loss: 0.4270 - val_acc: 0.8894
Epoch 18/25
        - 4s - loss: 0.2185 - acc: 0.9434 - val_loss: 0.3625 - val_acc: 0.9043
Epoch 19/25
        - 4s - loss: 0.2102 - acc: 0.9448 - val_loss: 0.3493 - val_acc: 0.8979
Epoch 20/25
        - 4s - loss: 0.2091 - acc: 0.9461 - val_loss: 0.3420 - val_acc: 0.9019
Epoch 21/25
        - 4s - loss: 0.1945 - acc: 0.9480 - val_loss: 0.4161 - val_acc: 0.8616
Epoch 22/25
        - 4s - loss: 0.2100 - acc: 0.9427 - val_loss: 0.3706 - val_acc: 0.8897
Epoch 23/25
        - 4s - loss: 0.2017 - acc: 0.9438 - val_loss: 0.4271 - val_acc: 0.8853
Epoch 24/25
        - 4s - loss: 0.2043 - acc: 0.9440 - val_loss: 0.3463 - val_acc: 0.8968
Epoch 25/25
        - 4s - loss: 0.2002 - acc: 0.9445 - val_loss: 0.4215 - val_acc: 0.8907
```

```
Train accuracy 0.9416485309471114 Test accuracy: 0.8907363420427553
------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_53 (Conv1D)	(None, 124, 28)	1288
conv1d_54 (Conv1D)	(None, 118, 16)	3152
dropout_27 (Dropout)	(None, 118, 16)	0
max_pooling1d_27 (MaxPooling	(None, 39, 16)	0
flatten_27 (Flatten)	(None, 624)	0
dense_53 (Dense)	(None, 32)	20000
dense_54 (Dense)	(None, 6)	198

```
Total params: 24,638
Trainable params: 24,638
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 21.1995 - acc: 0.7001 - val_loss: 10.0623 - val_acc: 0.8171
Epoch 2/25
 - 2s - loss: 5.2907 - acc: 0.9090 - val_loss: 2.7035 - val_acc: 0.8785
Epoch 3/25
 - 2s - loss: 1.3800 - acc: 0.9195 - val_loss: 1.0836 - val_acc: 0.8728
Epoch 4/25
 - 2s - loss: 0.5472 - acc: 0.9278 - val_loss: 0.7491 - val_acc: 0.8670
Epoch 5/25
 - 2s - loss: 0.3920 - acc: 0.9264 - val_loss: 0.6373 - val_acc: 0.8816
Epoch 6/25
 - 2s - loss: 0.3393 - acc: 0.9320 - val_loss: 0.5626 - val_acc: 0.8907
Epoch 7/25
 - 2s - loss: 0.3163 - acc: 0.9339 - val_loss: 0.5400 - val_acc: 0.8999
Epoch 8/25
 - 2s - loss: 0.2926 - acc: 0.9351 - val_loss: 0.5653 - val_acc: 0.8717
Epoch 9/25
 - 2s - loss: 0.2879 - acc: 0.9351 - val_loss: 0.4906 - val_acc: 0.8802
```

```
Epoch 10/25
 - 2s - loss: 0.2761 - acc: 0.9351 - val_loss: 0.5171 - val_acc: 0.8870
Epoch 11/25
 - 2s - loss: 0.2649 - acc: 0.9373 - val_loss: 0.5018 - val_acc: 0.8724
Epoch 12/25
 - 2s - loss: 0.2614 - acc: 0.9359 - val_loss: 0.4748 - val_acc: 0.8731
Epoch 13/25
 - 2s - loss: 0.2491 - acc: 0.9402 - val_loss: 0.4643 - val_acc: 0.8945
Epoch 14/25
 - 2s - loss: 0.2494 - acc: 0.9396 - val_loss: 0.4874 - val_acc: 0.8765
Epoch 15/25
 - 2s - loss: 0.2330 - acc: 0.9440 - val_loss: 0.4579 - val_acc: 0.9036
Epoch 16/25
 - 2s - loss: 0.2394 - acc: 0.9393 - val_loss: 0.4404 - val_acc: 0.8897
Epoch 17/25
 - 2s - loss: 0.2232 - acc: 0.9448 - val_loss: 0.4375 - val_acc: 0.8931
Epoch 18/25
 - 2s - loss: 0.2202 - acc: 0.9436 - val_loss: 0.4440 - val_acc: 0.8833
Epoch 19/25
 - 2s - loss: 0.2301 - acc: 0.9393 - val_loss: 0.4260 - val_acc: 0.9053
Epoch 20/25
 - 2s - loss: 0.2273 - acc: 0.9399 - val_loss: 0.4500 - val_acc: 0.9033
Epoch 21/25
 - 2s - loss: 0.2151 - acc: 0.9422 - val_loss: 0.4379 - val_acc: 0.8816
Epoch 22/25
 - 2s - loss: 0.2092 - acc: 0.9464 - val_loss: 0.4113 - val_acc: 0.8972
Epoch 23/25
 - 2s - loss: 0.2051 - acc: 0.9448 - val_loss: 0.3817 - val_acc: 0.8989
Epoch 24/25
 - 2s - loss: 0.2300 - acc: 0.9369 - val_loss: 0.4581 - val_acc: 0.8904
Epoch 25/25
 - 2s - loss: 0.2039 - acc: 0.9455 - val_loss: 0.4044 - val_acc: 0.8853
Train accuracy 0.9494015233949945 Test accuracy: 0.8853070919579233
---------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_55 (Conv1D)	(None, 124, 32)	1472
conv1d_56 (Conv1D)	(None, 120, 16)	2576
dropout_28 (Dropout)	(None, 120, 16)	0

```
max_pooling1d_28 (MaxPooling (None, 40, 16)                0
_____
flatten_28 (Flatten)          (None, 640)                  0
_____
dense_55 (Dense)              (None, 32)                   20512
_____
dense_56 (Dense)              (None, 6)                    198
======================================================================
Total params: 24,758
Trainable params: 24,758
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 20.9253 - acc: 0.7541 - val_loss: 1.3615 - val_acc: 0.8137
Epoch 2/25
 - 3s - loss: 0.6803 - acc: 0.8592 - val_loss: 0.8534 - val_acc: 0.8263
Epoch 3/25
 - 3s - loss: 0.5249 - acc: 0.8800 - val_loss: 0.6695 - val_acc: 0.8463
Epoch 4/25
 - 3s - loss: 0.4987 - acc: 0.8794 - val_loss: 0.6479 - val_acc: 0.8721
Epoch 5/25
 - 2s - loss: 0.4581 - acc: 0.8832 - val_loss: 0.6530 - val_acc: 0.8280
Epoch 6/25
 - 3s - loss: 0.4513 - acc: 0.8852 - val_loss: 0.6092 - val_acc: 0.8765
Epoch 7/25
 - 3s - loss: 0.4057 - acc: 0.9044 - val_loss: 0.5580 - val_acc: 0.8619
Epoch 8/25
 - 3s - loss: 0.4046 - acc: 0.9015 - val_loss: 0.5896 - val_acc: 0.8527
Epoch 9/25
 - 3s - loss: 0.4048 - acc: 0.8999 - val_loss: 0.5836 - val_acc: 0.8629
Epoch 10/25
 - 3s - loss: 0.3715 - acc: 0.9117 - val_loss: 0.6280 - val_acc: 0.8174
Epoch 11/25
 - 3s - loss: 0.3650 - acc: 0.9104 - val_loss: 0.5921 - val_acc: 0.8449
Epoch 12/25
 - 3s - loss: 0.3500 - acc: 0.9138 - val_loss: 0.5282 - val_acc: 0.8636
Epoch 13/25
 - 3s - loss: 0.3516 - acc: 0.9105 - val_loss: 0.5432 - val_acc: 0.8680
Epoch 14/25
 - 3s - loss: 0.3617 - acc: 0.9134 - val_loss: 0.5011 - val_acc: 0.8687
Epoch 15/25
```

```
 - 2s - loss: 0.3414 - acc: 0.9129 - val_loss: 0.5325 - val_acc: 0.8768
Epoch 16/25
 - 3s - loss: 0.3380 - acc: 0.9142 - val_loss: 0.4699 - val_acc: 0.8775
Epoch 17/25
 - 3s - loss: 0.3194 - acc: 0.9214 - val_loss: 0.5342 - val_acc: 0.8453
Epoch 18/25
 - 3s - loss: 0.3163 - acc: 0.9211 - val_loss: 0.5421 - val_acc: 0.8368
Epoch 19/25
 - 2s - loss: 0.3047 - acc: 0.9230 - val_loss: 0.4552 - val_acc: 0.8761
Epoch 20/25
 - 3s - loss: 0.3207 - acc: 0.9183 - val_loss: 0.4877 - val_acc: 0.8561
Epoch 21/25
 - 3s - loss: 0.3187 - acc: 0.9187 - val_loss: 0.4502 - val_acc: 0.8714
Epoch 22/25
 - 3s - loss: 0.3164 - acc: 0.9180 - val_loss: 0.4595 - val_acc: 0.8812
Epoch 23/25
 - 3s - loss: 0.3084 - acc: 0.9211 - val_loss: 0.4473 - val_acc: 0.8772
Epoch 24/25
 - 3s - loss: 0.2982 - acc: 0.9255 - val_loss: 0.4461 - val_acc: 0.8938
Epoch 25/25
 - 3s - loss: 0.3228 - acc: 0.9177 - val_loss: 0.4827 - val_acc: 0.8656
Train accuracy 0.9287268770402611 Test accuracy: 0.8656260604004072
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_57 (Conv1D)	(None, 124, 32)	1472
conv1d_58 (Conv1D)	(None, 118, 24)	5400
dropout_29 (Dropout)	(None, 118, 24)	0
max_pooling1d_29 (MaxPooling	(None, 39, 24)	0
flatten_29 (Flatten)	(None, 936)	0
dense_57 (Dense)	(None, 32)	29984
dense_58 (Dense)	(None, 6)	198

```
Total params: 37,054
Trainable params: 37,054
Non-trainable params: 0
```

```
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 15.8902 - acc: 0.7901 - val_loss: 1.5902 - val_acc: 0.8619
Epoch 2/25
 - 4s - loss: 0.6730 - acc: 0.8917 - val_loss: 0.6986 - val_acc: 0.8599
Epoch 3/25
 - 4s - loss: 0.4482 - acc: 0.8988 - val_loss: 0.6891 - val_acc: 0.8375
Epoch 4/25
 - 4s - loss: 0.4055 - acc: 0.9061 - val_loss: 0.5604 - val_acc: 0.8792
Epoch 5/25
 - 4s - loss: 0.3848 - acc: 0.9143 - val_loss: 0.5358 - val_acc: 0.8928
Epoch 6/25
 - 4s - loss: 0.3572 - acc: 0.9187 - val_loss: 0.5392 - val_acc: 0.8846
Epoch 7/25
 - 4s - loss: 0.3428 - acc: 0.9166 - val_loss: 0.5019 - val_acc: 0.8856
Epoch 8/25
 - 4s - loss: 0.3173 - acc: 0.9268 - val_loss: 0.5586 - val_acc: 0.8361
Epoch 9/25
 - 4s - loss: 0.3008 - acc: 0.9256 - val_loss: 0.5069 - val_acc: 0.8527
Epoch 10/25
 - 4s - loss: 0.3155 - acc: 0.9222 - val_loss: 0.4887 - val_acc: 0.8826
Epoch 11/25
 - 4s - loss: 0.3025 - acc: 0.9255 - val_loss: 0.4418 - val_acc: 0.8911
Epoch 12/25
 - 4s - loss: 0.2945 - acc: 0.9276 - val_loss: 0.4566 - val_acc: 0.8782
Epoch 13/25
 - 4s - loss: 0.2833 - acc: 0.9282 - val_loss: 0.4643 - val_acc: 0.8670
Epoch 14/25
 - 4s - loss: 0.2811 - acc: 0.9268 - val_loss: 0.4348 - val_acc: 0.8785
Epoch 15/25
 - 4s - loss: 0.2736 - acc: 0.9316 - val_loss: 0.5820 - val_acc: 0.8005
Epoch 16/25
 - 4s - loss: 0.2745 - acc: 0.9300 - val_loss: 0.4390 - val_acc: 0.8867
Epoch 17/25
 - 4s - loss: 0.2730 - acc: 0.9280 - val_loss: 0.4034 - val_acc: 0.8897
Epoch 18/25
 - 4s - loss: 0.2631 - acc: 0.9329 - val_loss: 0.3644 - val_acc: 0.9006
Epoch 19/25
 - 4s - loss: 0.2693 - acc: 0.9280 - val_loss: 0.4187 - val_acc: 0.8714
Epoch 20/25
 - 4s - loss: 0.2544 - acc: 0.9338 - val_loss: 0.4191 - val_acc: 0.8744
```

```
Epoch 21/25
 - 4s - loss: 0.2605 - acc: 0.9304 - val_loss: 0.3695 - val_acc: 0.9087
Epoch 22/25
 - 4s - loss: 0.2488 - acc: 0.9366 - val_loss: 0.3962 - val_acc: 0.8751
Epoch 23/25
 - 4s - loss: 0.2472 - acc: 0.9350 - val_loss: 0.3843 - val_acc: 0.8918
Epoch 24/25
 - 4s - loss: 0.2666 - acc: 0.9301 - val_loss: 0.4031 - val_acc: 0.8731
Epoch 25/25
 - 4s - loss: 0.2480 - acc: 0.9358 - val_loss: 0.3756 - val_acc: 0.8778
Train accuracy 0.9447769314472253 Test accuracy: 0.8778418730912793
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_59 (Conv1D)	(None, 124, 28)	1288
conv1d_60 (Conv1D)	(None, 118, 24)	4728
dropout_30 (Dropout)	(None, 118, 24)	0
max_pooling1d_30 (MaxPooling	(None, 39, 24)	0
flatten_30 (Flatten)	(None, 936)	0
dense_59 (Dense)	(None, 32)	29984
dense_60 (Dense)	(None, 6)	198

```
Total params: 36,198
Trainable params: 36,198
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 9.9628 - acc: 0.7378 - val_loss: 0.9818 - val_acc: 0.8039
Epoch 2/25
 - 4s - loss: 0.5760 - acc: 0.8694 - val_loss: 0.7367 - val_acc: 0.8405
Epoch 3/25
 - 4s - loss: 0.4965 - acc: 0.8825 - val_loss: 0.8518 - val_acc: 0.7570
Epoch 4/25
 - 4s - loss: 0.4417 - acc: 0.8930 - val_loss: 0.8363 - val_acc: 0.7428
```

```
Epoch 5/25
 - 4s - loss: 0.4082 - acc: 0.9015 - val_loss: 0.6166 - val_acc: 0.8670
Epoch 6/25
 - 4s - loss: 0.4024 - acc: 0.8995 - val_loss: 0.6572 - val_acc: 0.8242
Epoch 7/25
 - 4s - loss: 0.3734 - acc: 0.9079 - val_loss: 0.6035 - val_acc: 0.8426
Epoch 8/25
 - 4s - loss: 0.3609 - acc: 0.9095 - val_loss: 0.5459 - val_acc: 0.8609
Epoch 9/25
 - 4s - loss: 0.3459 - acc: 0.9165 - val_loss: 0.5682 - val_acc: 0.8541
Epoch 10/25
 - 4s - loss: 0.3371 - acc: 0.9139 - val_loss: 0.5187 - val_acc: 0.8772
Epoch 11/25
 - 4s - loss: 0.3281 - acc: 0.9200 - val_loss: 0.5440 - val_acc: 0.8524
Epoch 12/25
 - 4s - loss: 0.3103 - acc: 0.9214 - val_loss: 0.5263 - val_acc: 0.8660
Epoch 13/25
 - 4s - loss: 0.3046 - acc: 0.9252 - val_loss: 0.4650 - val_acc: 0.8877
Epoch 14/25
 - 4s - loss: 0.2900 - acc: 0.9289 - val_loss: 0.5126 - val_acc: 0.8666
Epoch 15/25
 - 4s - loss: 0.2861 - acc: 0.9278 - val_loss: 0.4231 - val_acc: 0.8958
Epoch 16/25
 - 4s - loss: 0.2813 - acc: 0.9263 - val_loss: 0.5353 - val_acc: 0.8578
Epoch 17/25
 - 4s - loss: 0.2700 - acc: 0.9306 - val_loss: 0.4654 - val_acc: 0.8721
Epoch 18/25
 - 4s - loss: 0.2736 - acc: 0.9305 - val_loss: 0.4120 - val_acc: 0.8955
Epoch 19/25
 - 4s - loss: 0.2544 - acc: 0.9359 - val_loss: 0.4773 - val_acc: 0.8724
Epoch 20/25
 - 4s - loss: 0.2581 - acc: 0.9308 - val_loss: 0.4545 - val_acc: 0.8812
Epoch 21/25
 - 4s - loss: 0.2573 - acc: 0.9329 - val_loss: 0.4221 - val_acc: 0.8948
Epoch 22/25
 - 4s - loss: 0.2472 - acc: 0.9343 - val_loss: 0.4365 - val_acc: 0.8744
Epoch 23/25
 - 4s - loss: 0.2446 - acc: 0.9338 - val_loss: 0.4151 - val_acc: 0.8819
Epoch 24/25
 - 4s - loss: 0.2453 - acc: 0.9348 - val_loss: 0.4562 - val_acc: 0.8795
Epoch 25/25
 - 4s - loss: 0.2536 - acc: 0.9321 - val_loss: 0.3726 - val_acc: 0.9033
Train accuracy 0.9440968443960827 Test accuracy: 0.9032914828639295
```

```
----------------------------------------------------------------------
_____

Layer (type)                 Output Shape              Param #
=================================================================
conv1d_61 (Conv1D)           (None, 126, 32)           896
_____

conv1d_62 (Conv1D)           (None, 120, 24)           5400
_____

dropout_31 (Dropout)         (None, 120, 24)           0
_____

max_pooling1d_31 (MaxPooling (None, 60, 24)            0
_____

flatten_31 (Flatten)         (None, 1440)              0
_____

dense_61 (Dense)             (None, 32)                46112
_____

dense_62 (Dense)             (None, 6)                 198
=================================================================
Total params: 52,606
Trainable params: 52,606
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 32.2143 - acc: 0.7006 - val_loss: 12.4195 - val_acc: 0.8276
Epoch 2/25
 - 4s - loss: 6.3320 - acc: 0.8531 - val_loss: 2.9475 - val_acc: 0.8402
Epoch 3/25
 - 4s - loss: 1.5363 - acc: 0.8766 - val_loss: 1.0293 - val_acc: 0.8327
Epoch 4/25
 - 4s - loss: 0.6344 - acc: 0.8879 - val_loss: 0.7495 - val_acc: 0.7896
Epoch 5/25
 - 4s - loss: 0.4675 - acc: 0.9006 - val_loss: 0.6167 - val_acc: 0.8585
Epoch 6/25
 - 4s - loss: 0.4215 - acc: 0.9052 - val_loss: 0.5821 - val_acc: 0.8558
Epoch 7/25
 - 4s - loss: 0.3993 - acc: 0.9055 - val_loss: 0.5463 - val_acc: 0.8748
Epoch 8/25
 - 4s - loss: 0.3875 - acc: 0.9042 - val_loss: 0.5566 - val_acc: 0.8806
Epoch 9/25
 - 4s - loss: 0.3564 - acc: 0.9143 - val_loss: 0.5258 - val_acc: 0.8663
Epoch 10/25
```

```
     - 4s - loss: 0.3469 - acc: 0.9197 - val_loss: 0.4740 - val_acc: 0.9026
Epoch 11/25
     - 4s - loss: 0.3377 - acc: 0.9176 - val_loss: 0.4737 - val_acc: 0.8816
Epoch 12/25
     - 4s - loss: 0.3217 - acc: 0.9226 - val_loss: 0.4828 - val_acc: 0.8839
Epoch 13/25
     - 4s - loss: 0.3227 - acc: 0.9212 - val_loss: 0.4552 - val_acc: 0.9006
Epoch 14/25
     - 4s - loss: 0.3117 - acc: 0.9256 - val_loss: 0.4900 - val_acc: 0.8758
Epoch 15/25
     - 4s - loss: 0.2957 - acc: 0.9286 - val_loss: 0.4653 - val_acc: 0.8890
Epoch 16/25
     - 4s - loss: 0.2941 - acc: 0.9252 - val_loss: 0.4273 - val_acc: 0.8941
Epoch 17/25
     - 3s - loss: 0.2900 - acc: 0.9291 - val_loss: 0.4684 - val_acc: 0.8602
Epoch 18/25
     - 4s - loss: 0.2824 - acc: 0.9279 - val_loss: 0.4394 - val_acc: 0.8768
Epoch 19/25
     - 4s - loss: 0.2770 - acc: 0.9327 - val_loss: 0.4269 - val_acc: 0.8948
Epoch 20/25
     - 4s - loss: 0.2645 - acc: 0.9331 - val_loss: 0.4069 - val_acc: 0.8867
Epoch 21/25
     - 4s - loss: 0.2625 - acc: 0.9362 - val_loss: 0.4195 - val_acc: 0.8789
Epoch 22/25
     - 4s - loss: 0.2693 - acc: 0.9294 - val_loss: 0.4198 - val_acc: 0.8911
Epoch 23/25
     - 4s - loss: 0.2496 - acc: 0.9376 - val_loss: 0.3832 - val_acc: 0.8985
Epoch 24/25
     - 4s - loss: 0.2473 - acc: 0.9369 - val_loss: 0.4074 - val_acc: 0.8812
Epoch 25/25
     - 4s - loss: 0.2498 - acc: 0.9347 - val_loss: 0.4370 - val_acc: 0.8911
Train accuracy 0.9287268770402611 Test accuracy: 0.8910756701730573
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_63 (Conv1D)	(None, 124, 28)	1288
conv1d_64 (Conv1D)	(None, 120, 32)	4512
dropout_32 (Dropout)	(None, 120, 32)	0
max_pooling1d_32 (MaxPooling	(None, 40, 32)	0

```
flatten_32 (Flatten)              (None, 1280)              0
_____
dense_63 (Dense)                  (None, 32)                40992
_____
dense_64 (Dense)                  (None, 6)                 198
=================================================================
Total params: 46,990
Trainable params: 46,990
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 5s - loss: 20.4811 - acc: 0.7839 - val_loss: 3.7449 - val_acc: 0.7988
Epoch 2/35
 - 3s - loss: 1.2836 - acc: 0.9049 - val_loss: 0.8167 - val_acc: 0.8208
Epoch 3/35
 - 3s - loss: 0.4713 - acc: 0.9029 - val_loss: 0.6202 - val_acc: 0.8897
Epoch 4/35
 - 3s - loss: 0.4039 - acc: 0.9140 - val_loss: 0.6257 - val_acc: 0.8714
Epoch 5/35
 - 3s - loss: 0.3537 - acc: 0.9248 - val_loss: 0.5373 - val_acc: 0.8792
Epoch 6/35
 - 3s - loss: 0.3418 - acc: 0.9221 - val_loss: 0.5179 - val_acc: 0.8863
Epoch 7/35
 - 3s - loss: 0.3141 - acc: 0.9297 - val_loss: 0.4832 - val_acc: 0.9043
Epoch 8/35
 - 3s - loss: 0.3211 - acc: 0.9251 - val_loss: 0.4651 - val_acc: 0.8962
Epoch 9/35
 - 3s - loss: 0.2915 - acc: 0.9308 - val_loss: 0.4530 - val_acc: 0.9026
Epoch 10/35
 - 3s - loss: 0.2804 - acc: 0.9317 - val_loss: 0.4376 - val_acc: 0.8975
Epoch 11/35
 - 3s - loss: 0.2675 - acc: 0.9344 - val_loss: 0.4519 - val_acc: 0.8823
Epoch 12/35
 - 3s - loss: 0.2715 - acc: 0.9338 - val_loss: 0.5556 - val_acc: 0.8544
Epoch 13/35
 - 3s - loss: 0.2862 - acc: 0.9304 - val_loss: 0.4472 - val_acc: 0.8755
Epoch 14/35
 - 3s - loss: 0.2581 - acc: 0.9335 - val_loss: 0.4250 - val_acc: 0.8853
Epoch 15/35
 - 3s - loss: 0.2584 - acc: 0.9340 - val_loss: 0.4055 - val_acc: 0.9002
```

```
Epoch 16/35
 - 3s - loss: 0.2548 - acc: 0.9368 - val_loss: 0.3967 - val_acc: 0.8941
Epoch 17/35
 - 3s - loss: 0.2362 - acc: 0.9387 - val_loss: 0.3925 - val_acc: 0.8972
Epoch 18/35
 - 3s - loss: 0.2431 - acc: 0.9382 - val_loss: 0.4084 - val_acc: 0.8948
Epoch 19/35
 - 3s - loss: 0.2411 - acc: 0.9362 - val_loss: 0.3832 - val_acc: 0.9053
Epoch 20/35
 - 3s - loss: 0.2382 - acc: 0.9374 - val_loss: 0.4067 - val_acc: 0.8918
Epoch 21/35
 - 3s - loss: 0.2559 - acc: 0.9350 - val_loss: 0.4027 - val_acc: 0.8941
Epoch 22/35
 - 3s - loss: 0.2368 - acc: 0.9359 - val_loss: 0.4339 - val_acc: 0.8890
Epoch 23/35
 - 3s - loss: 0.2401 - acc: 0.9314 - val_loss: 0.3901 - val_acc: 0.8890
Epoch 24/35
 - 3s - loss: 0.2324 - acc: 0.9391 - val_loss: 0.3588 - val_acc: 0.8962
Epoch 25/35
 - 3s - loss: 0.2315 - acc: 0.9385 - val_loss: 0.4640 - val_acc: 0.8728
Epoch 26/35
 - 3s - loss: 0.2378 - acc: 0.9380 - val_loss: 0.3979 - val_acc: 0.8795
Epoch 27/35
 - 3s - loss: 0.2238 - acc: 0.9378 - val_loss: 0.3723 - val_acc: 0.8809
Epoch 28/35
 - 3s - loss: 0.2224 - acc: 0.9418 - val_loss: 0.3706 - val_acc: 0.8948
Epoch 29/35
 - 3s - loss: 0.2195 - acc: 0.9406 - val_loss: 0.3572 - val_acc: 0.8938
Epoch 30/35
 - 3s - loss: 0.2308 - acc: 0.9374 - val_loss: 0.3824 - val_acc: 0.8870
Epoch 31/35
 - 3s - loss: 0.2183 - acc: 0.9415 - val_loss: 0.4050 - val_acc: 0.8819
Epoch 32/35
 - 3s - loss: 0.2223 - acc: 0.9377 - val_loss: 0.3652 - val_acc: 0.8928
Epoch 33/35
 - 3s - loss: 0.2135 - acc: 0.9400 - val_loss: 0.3510 - val_acc: 0.9063
Epoch 34/35
 - 3s - loss: 0.2112 - acc: 0.9388 - val_loss: 0.3684 - val_acc: 0.8948
Epoch 35/35
 - 3s - loss: 0.2198 - acc: 0.9397 - val_loss: 0.3414 - val_acc: 0.9013
Train accuracy 0.9540261153427638 Test accuracy: 0.9012555140821175
--------------------------------------------------------------------------------
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_65 (Conv1D)           (None, 124, 32)           1472

conv1d_66 (Conv1D)           (None, 118, 16)           3600

dropout_33 (Dropout)         (None, 118, 16)           0

max_pooling1d_33 (MaxPooling (None, 59, 16)            0

flatten_33 (Flatten)         (None, 944)               0

dense_65 (Dense)             (None, 32)                30240

dense_66 (Dense)             (None, 6)                 198
=================================================================
Total params: 35,510
Trainable params: 35,510
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 2.4119 - acc: 0.8198 - val_loss: 0.7778 - val_acc: 0.8229
Epoch 2/25
 - 5s - loss: 0.4228 - acc: 0.9158 - val_loss: 0.5392 - val_acc: 0.8924
Epoch 3/25
 - 4s - loss: 0.3405 - acc: 0.9312 - val_loss: 0.5935 - val_acc: 0.8582
Epoch 4/25
 - 5s - loss: 0.2995 - acc: 0.9391 - val_loss: 0.6060 - val_acc: 0.8198
Epoch 5/25
 - 4s - loss: 0.2902 - acc: 0.9339 - val_loss: 0.3616 - val_acc: 0.8989
Epoch 6/25
 - 4s - loss: 0.2491 - acc: 0.9442 - val_loss: 0.3794 - val_acc: 0.8935
Epoch 7/25
 - 5s - loss: 0.2455 - acc: 0.9406 - val_loss: 0.3848 - val_acc: 0.8924
Epoch 8/25
 - 4s - loss: 0.2234 - acc: 0.9431 - val_loss: 0.4754 - val_acc: 0.8558
Epoch 9/25
 - 4s - loss: 0.2337 - acc: 0.9430 - val_loss: 0.3442 - val_acc: 0.9080
Epoch 10/25
 - 5s - loss: 0.2033 - acc: 0.9452 - val_loss: 0.3499 - val_acc: 0.9162
Epoch 11/25
```

```
      - 4s - loss: 0.1916 - acc: 0.9461 - val_loss: 0.3332 - val_acc: 0.8972
Epoch 12/25
      - 4s - loss: 0.1959 - acc: 0.9495 - val_loss: 0.3921 - val_acc: 0.8836
Epoch 13/25
      - 4s - loss: 0.2336 - acc: 0.9418 - val_loss: 0.3809 - val_acc: 0.8989
Epoch 14/25
      - 4s - loss: 0.1905 - acc: 0.9497 - val_loss: 0.3034 - val_acc: 0.9131
Epoch 15/25
      - 5s - loss: 0.1843 - acc: 0.9484 - val_loss: 0.3028 - val_acc: 0.8992
Epoch 16/25
      - 4s - loss: 0.1848 - acc: 0.9478 - val_loss: 0.4612 - val_acc: 0.8806
Epoch 17/25
      - 4s - loss: 0.1932 - acc: 0.9478 - val_loss: 0.3630 - val_acc: 0.9131
Epoch 18/25
      - 5s - loss: 0.1895 - acc: 0.9471 - val_loss: 0.3528 - val_acc: 0.8928
Epoch 19/25
      - 4s - loss: 0.1685 - acc: 0.9494 - val_loss: 0.3101 - val_acc: 0.9067
Epoch 20/25
      - 4s - loss: 0.1716 - acc: 0.9497 - val_loss: 0.2922 - val_acc: 0.9077
Epoch 21/25
      - 5s - loss: 0.1626 - acc: 0.9532 - val_loss: 0.2974 - val_acc: 0.8901
Epoch 22/25
      - 4s - loss: 0.1713 - acc: 0.9516 - val_loss: 0.3523 - val_acc: 0.8833
Epoch 23/25
      - 4s - loss: 0.1687 - acc: 0.9505 - val_loss: 0.3381 - val_acc: 0.8945
Epoch 24/25
      - 4s - loss: 0.1799 - acc: 0.9484 - val_loss: 0.2832 - val_acc: 0.9138
Epoch 25/25
      - 4s - loss: 0.1663 - acc: 0.9517 - val_loss: 0.3124 - val_acc: 0.9152
Train accuracy 0.9585146898803046 Test accuracy: 0.9151679674244995
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_67 (Conv1D)	(None, 122, 28)	1792
conv1d_68 (Conv1D)	(None, 118, 16)	2256
dropout_34 (Dropout)	(None, 118, 16)	0
max_pooling1d_34 (MaxPooling	(None, 59, 16)	0
flatten_34 (Flatten)	(None, 944)	0

```
_____
dense_67 (Dense)                  (None, 32)                  30240
_____
dense_68 (Dense)                  (None, 6)                   198
===============================================================
Total params: 34,486
Trainable params: 34,486
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 2.2122 - acc: 0.8433 - val_loss: 0.5873 - val_acc: 0.8965
Epoch 2/25
 - 2s - loss: 0.3555 - acc: 0.9280 - val_loss: 0.4135 - val_acc: 0.9046
Epoch 3/25
 - 2s - loss: 0.2836 - acc: 0.9344 - val_loss: 0.5157 - val_acc: 0.8544
Epoch 4/25
 - 2s - loss: 0.2740 - acc: 0.9355 - val_loss: 0.3735 - val_acc: 0.9040
Epoch 5/25
 - 2s - loss: 0.2601 - acc: 0.9325 - val_loss: 0.3419 - val_acc: 0.9226
Epoch 6/25
 - 2s - loss: 0.2409 - acc: 0.9418 - val_loss: 0.4031 - val_acc: 0.8795
Epoch 7/25
 - 2s - loss: 0.2663 - acc: 0.9344 - val_loss: 0.3566 - val_acc: 0.8924
Epoch 8/25
 - 2s - loss: 0.2545 - acc: 0.9355 - val_loss: 0.3538 - val_acc: 0.9074
Epoch 9/25
 - 2s - loss: 0.2184 - acc: 0.9423 - val_loss: 0.3228 - val_acc: 0.9158
Epoch 10/25
 - 2s - loss: 0.2392 - acc: 0.9380 - val_loss: 0.3983 - val_acc: 0.8887
Epoch 11/25
 - 2s - loss: 0.2166 - acc: 0.9396 - val_loss: 0.3430 - val_acc: 0.8992
Epoch 12/25
 - 2s - loss: 0.2218 - acc: 0.9414 - val_loss: 0.3157 - val_acc: 0.9125
Epoch 13/25
 - 2s - loss: 0.2486 - acc: 0.9331 - val_loss: 0.4027 - val_acc: 0.8972
Epoch 14/25
 - 2s - loss: 0.1996 - acc: 0.9471 - val_loss: 0.3472 - val_acc: 0.9009
Epoch 15/25
 - 2s - loss: 0.2281 - acc: 0.9397 - val_loss: 0.4514 - val_acc: 0.8823
Epoch 16/25
 - 2s - loss: 0.2149 - acc: 0.9430 - val_loss: 0.3734 - val_acc: 0.9009
```

```
Epoch 17/25
 - 2s - loss: 0.1987 - acc: 0.9427 - val_loss: 0.3768 - val_acc: 0.8884
Epoch 18/25
 - 2s - loss: 0.2461 - acc: 0.9332 - val_loss: 0.3856 - val_acc: 0.9002
Epoch 19/25
 - 2s - loss: 0.2026 - acc: 0.9445 - val_loss: 0.3621 - val_acc: 0.9050
Epoch 20/25
 - 2s - loss: 0.2095 - acc: 0.9445 - val_loss: 0.3526 - val_acc: 0.9023
Epoch 21/25
 - 2s - loss: 0.2152 - acc: 0.9415 - val_loss: 0.4049 - val_acc: 0.8890
Epoch 22/25
 - 2s - loss: 0.2125 - acc: 0.9431 - val_loss: 0.4043 - val_acc: 0.8935
Epoch 23/25
 - 2s - loss: 0.1983 - acc: 0.9425 - val_loss: 0.3984 - val_acc: 0.8636
Epoch 24/25
 - 2s - loss: 0.2078 - acc: 0.9423 - val_loss: 0.3213 - val_acc: 0.9040
Epoch 25/25
 - 2s - loss: 0.2058 - acc: 0.9430 - val_loss: 0.3594 - val_acc: 0.8938
Train accuracy 0.934031556039173 Test accuracy: 0.8937902952154734
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_69 (Conv1D)	(None, 126, 32)	896
conv1d_70 (Conv1D)	(None, 120, 16)	3600
dropout_35 (Dropout)	(None, 120, 16)	0
max_pooling1d_35 (MaxPooling	(None, 60, 16)	0
flatten_35 (Flatten)	(None, 960)	0
dense_69 (Dense)	(None, 32)	30752
dense_70 (Dense)	(None, 6)	198

```
Total params: 35,446
Trainable params: 35,446
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
```

```
Epoch 1/35
 - 6s - loss: 2.5612 - acc: 0.7599 - val_loss: 0.7490 - val_acc: 0.8018
Epoch 2/35
 - 5s - loss: 0.4629 - acc: 0.9034 - val_loss: 0.5412 - val_acc: 0.8799
Epoch 3/35
 - 4s - loss: 0.3807 - acc: 0.9203 - val_loss: 0.4479 - val_acc: 0.8914
Epoch 4/35
 - 4s - loss: 0.3636 - acc: 0.9270 - val_loss: 0.4425 - val_acc: 0.8853
Epoch 5/35
 - 5s - loss: 0.3062 - acc: 0.9295 - val_loss: 0.3972 - val_acc: 0.8846
Epoch 6/35
 - 4s - loss: 0.2649 - acc: 0.9384 - val_loss: 0.3870 - val_acc: 0.8962
Epoch 7/35
 - 4s - loss: 0.2820 - acc: 0.9362 - val_loss: 0.4678 - val_acc: 0.8806
Epoch 8/35
 - 4s - loss: 0.2970 - acc: 0.9304 - val_loss: 0.4722 - val_acc: 0.8867
Epoch 9/35
 - 4s - loss: 0.2377 - acc: 0.9436 - val_loss: 0.4379 - val_acc: 0.8704
Epoch 10/35
 - 5s - loss: 0.2221 - acc: 0.9407 - val_loss: 0.4688 - val_acc: 0.8636
Epoch 11/35
 - 4s - loss: 0.2250 - acc: 0.9423 - val_loss: 0.4391 - val_acc: 0.8656
Epoch 12/35
 - 4s - loss: 0.2381 - acc: 0.9431 - val_loss: 0.3621 - val_acc: 0.8996
Epoch 13/35
 - 5s - loss: 0.2137 - acc: 0.9442 - val_loss: 0.4561 - val_acc: 0.8877
Epoch 14/35
 - 4s - loss: 0.2428 - acc: 0.9430 - val_loss: 0.3843 - val_acc: 0.8955
Epoch 15/35
 - 4s - loss: 0.2032 - acc: 0.9476 - val_loss: 0.4148 - val_acc: 0.8839
Epoch 16/35
 - 5s - loss: 0.2330 - acc: 0.9427 - val_loss: 0.3740 - val_acc: 0.8958
Epoch 17/35
 - 4s - loss: 0.2696 - acc: 0.9374 - val_loss: 0.5510 - val_acc: 0.8829
Epoch 18/35
 - 4s - loss: 0.1959 - acc: 0.9508 - val_loss: 0.3538 - val_acc: 0.9043
Epoch 19/35
 - 4s - loss: 0.2249 - acc: 0.9470 - val_loss: 0.3870 - val_acc: 0.8996
Epoch 20/35
 - 4s - loss: 0.1939 - acc: 0.9494 - val_loss: 0.3746 - val_acc: 0.8968
Epoch 21/35
 - 4s - loss: 0.1891 - acc: 0.9498 - val_loss: 0.3758 - val_acc: 0.8951
Epoch 22/35
```

```
        - 4s - loss: 0.2256 - acc: 0.9452 - val_loss: 0.4527 - val_acc: 0.8724
       Epoch 23/35
        - 4s - loss: 0.2121 - acc: 0.9483 - val_loss: 0.3777 - val_acc: 0.8921
       Epoch 24/35
        - 4s - loss: 0.1988 - acc: 0.9482 - val_loss: 0.4232 - val_acc: 0.8921
       Epoch 25/35
        - 4s - loss: 0.1821 - acc: 0.9497 - val_loss: 0.4229 - val_acc: 0.8782
       Epoch 26/35
        - 4s - loss: 0.1841 - acc: 0.9525 - val_loss: 0.4539 - val_acc: 0.8612
       Epoch 27/35
        - 4s - loss: 0.1986 - acc: 0.9450 - val_loss: 0.4321 - val_acc: 0.8711
       Epoch 28/35
        - 4s - loss: 0.1956 - acc: 0.9479 - val_loss: 0.3892 - val_acc: 0.8836
       Epoch 29/35
        - 4s - loss: 0.1886 - acc: 0.9470 - val_loss: 0.5471 - val_acc: 0.8592
       Epoch 30/35
        - 5s - loss: 0.1883 - acc: 0.9493 - val_loss: 0.5066 - val_acc: 0.8599
       Epoch 31/35
        - 4s - loss: 0.2226 - acc: 0.9461 - val_loss: 0.4548 - val_acc: 0.8673
       Epoch 32/35
        - 4s - loss: 0.1762 - acc: 0.9516 - val_loss: 0.3916 - val_acc: 0.8795
       Epoch 33/35
        - 5s - loss: 0.1942 - acc: 0.9505 - val_loss: 0.4922 - val_acc: 0.8646
       Epoch 34/35
        - 4s - loss: 0.1785 - acc: 0.9502 - val_loss: 0.3825 - val_acc: 0.8955
       Epoch 35/35
        - 4s - loss: 0.2650 - acc: 0.9429 - val_loss: 0.4766 - val_acc: 0.8633
       Train accuracy 0.9304951033732318 Test accuracy: 0.8632507634882932
       ---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_71 (Conv1D)	(None, 124, 28)	1288
conv1d_72 (Conv1D)	(None, 118, 16)	3152
dropout_36 (Dropout)	(None, 118, 16)	0
max_pooling1d_36 (MaxPooling	(None, 59, 16)	0
flatten_36 (Flatten)	(None, 944)	0
dense_71 (Dense)	(None, 64)	60480

```
_____
dense_72 (Dense)              (None, 6)                 390
================================================================
Total params: 65,310
Trainable params: 65,310
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 5.5761 - acc: 0.8137 - val_loss: 0.7347 - val_acc: 0.7832
Epoch 2/25
 - 2s - loss: 0.4795 - acc: 0.8924 - val_loss: 0.5773 - val_acc: 0.8768
Epoch 3/25
 - 2s - loss: 0.4126 - acc: 0.9064 - val_loss: 0.5362 - val_acc: 0.8778
Epoch 4/25
 - 2s - loss: 0.4368 - acc: 0.8969 - val_loss: 0.5178 - val_acc: 0.8928
Epoch 5/25
 - 2s - loss: 0.3629 - acc: 0.9162 - val_loss: 0.5410 - val_acc: 0.8748
Epoch 6/25
 - 2s - loss: 0.3657 - acc: 0.9134 - val_loss: 0.5629 - val_acc: 0.8392
Epoch 7/25
 - 2s - loss: 0.3419 - acc: 0.9199 - val_loss: 0.5049 - val_acc: 0.8656
Epoch 8/25
 - 2s - loss: 0.3261 - acc: 0.9197 - val_loss: 0.4725 - val_acc: 0.8806
Epoch 9/25
 - 2s - loss: 0.3275 - acc: 0.9229 - val_loss: 0.4221 - val_acc: 0.8850
Epoch 10/25
 - 2s - loss: 0.3101 - acc: 0.9227 - val_loss: 0.4963 - val_acc: 0.8877
Epoch 11/25
 - 2s - loss: 0.3072 - acc: 0.9267 - val_loss: 0.4794 - val_acc: 0.8765
Epoch 12/25
 - 2s - loss: 0.3274 - acc: 0.9185 - val_loss: 0.4268 - val_acc: 0.8656
Epoch 13/25
 - 2s - loss: 0.3060 - acc: 0.9252 - val_loss: 0.5090 - val_acc: 0.8612
Epoch 14/25
 - 2s - loss: 0.3193 - acc: 0.9236 - val_loss: 0.4052 - val_acc: 0.8839
Epoch 15/25
 - 2s - loss: 0.3037 - acc: 0.9200 - val_loss: 0.4777 - val_acc: 0.8636
Epoch 16/25
 - 2s - loss: 0.3061 - acc: 0.9241 - val_loss: 0.3998 - val_acc: 0.8775
Epoch 17/25
 - 2s - loss: 0.2884 - acc: 0.9282 - val_loss: 0.7031 - val_acc: 0.7509
```

```
Epoch 18/25
 - 2s - loss: 0.3100 - acc: 0.9229 - val_loss: 0.7581 - val_acc: 0.7760
Epoch 19/25
 - 2s - loss: 0.3268 - acc: 0.9197 - val_loss: 0.5099 - val_acc: 0.8497
Epoch 20/25
 - 2s - loss: 0.2762 - acc: 0.9279 - val_loss: 0.4932 - val_acc: 0.8680
Epoch 21/25
 - 2s - loss: 0.3013 - acc: 0.9251 - val_loss: 0.4776 - val_acc: 0.8541
Epoch 22/25
 - 2s - loss: 0.2814 - acc: 0.9266 - val_loss: 0.5030 - val_acc: 0.8558
Epoch 23/25
 - 2s - loss: 0.3099 - acc: 0.9173 - val_loss: 0.5241 - val_acc: 0.8320
Epoch 24/25
 - 2s - loss: 0.2794 - acc: 0.9260 - val_loss: 0.4706 - val_acc: 0.8544
Epoch 25/25
 - 2s - loss: 0.2760 - acc: 0.9255 - val_loss: 0.5598 - val_acc: 0.8378
Train accuracy 0.891050054406964 Test accuracy: 0.837801153715643
---------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_73 (Conv1D)           (None, 122, 42)           2688

conv1d_74 (Conv1D)           (None, 116, 16)           4720

dropout_37 (Dropout)         (None, 116, 16)           0

max_pooling1d_37 (MaxPooling (None, 58, 16)            0

flatten_37 (Flatten)         (None, 928)               0

dense_73 (Dense)             (None, 32)                29728

dense_74 (Dense)             (None, 6)                 198
=================================================================
Total params: 37,334
Trainable params: 37,334
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 5s - loss: 2.5312 - acc: 0.7933 - val_loss: 0.5613 - val_acc: 0.8683
```

```
Epoch 2/35
 - 3s - loss: 0.4623 - acc: 0.8867 - val_loss: 0.5049 - val_acc: 0.8884
Epoch 3/35
 - 3s - loss: 0.4133 - acc: 0.9018 - val_loss: 0.4686 - val_acc: 0.8772
Epoch 4/35
 - 4s - loss: 0.3690 - acc: 0.9061 - val_loss: 0.4792 - val_acc: 0.8694
Epoch 5/35
 - 3s - loss: 0.3565 - acc: 0.9120 - val_loss: 0.5586 - val_acc: 0.8527
Epoch 6/35
 - 3s - loss: 0.3525 - acc: 0.9124 - val_loss: 1.8120 - val_acc: 0.6064
Epoch 7/35
 - 3s - loss: 0.3508 - acc: 0.9075 - val_loss: 0.8299 - val_acc: 0.8154
Epoch 8/35
 - 3s - loss: 0.3660 - acc: 0.9108 - val_loss: 0.5537 - val_acc: 0.8361
Epoch 9/35
 - 3s - loss: 0.3443 - acc: 0.9105 - val_loss: 0.5436 - val_acc: 0.8480
Epoch 10/35
 - 4s - loss: 0.3360 - acc: 0.9101 - val_loss: 0.4817 - val_acc: 0.8605
Epoch 11/35
 - 3s - loss: 0.3405 - acc: 0.9128 - val_loss: 0.7536 - val_acc: 0.7855
Epoch 12/35
 - 3s - loss: 0.3422 - acc: 0.9095 - val_loss: 0.3939 - val_acc: 0.8734
Epoch 13/35
 - 3s - loss: 0.3373 - acc: 0.9093 - val_loss: 0.4616 - val_acc: 0.8792
Epoch 14/35
 - 3s - loss: 0.3444 - acc: 0.9128 - val_loss: 0.4564 - val_acc: 0.8619
Epoch 15/35
 - 3s - loss: 0.3242 - acc: 0.9191 - val_loss: 0.4572 - val_acc: 0.8622
Epoch 16/35
 - 3s - loss: 0.3480 - acc: 0.9121 - val_loss: 0.4201 - val_acc: 0.8795
Epoch 17/35
 - 3s - loss: 0.3233 - acc: 0.9189 - val_loss: 0.5386 - val_acc: 0.8473
Epoch 18/35
 - 3s - loss: 0.3296 - acc: 0.9112 - val_loss: 0.4228 - val_acc: 0.8850
Epoch 19/35
 - 4s - loss: 0.3336 - acc: 0.9151 - val_loss: 0.4307 - val_acc: 0.8643
Epoch 20/35
 - 3s - loss: 0.3377 - acc: 0.9127 - val_loss: 0.5739 - val_acc: 0.8483
Epoch 21/35
 - 3s - loss: 0.3313 - acc: 0.9158 - val_loss: 0.5802 - val_acc: 0.8544
Epoch 22/35
 - 3s - loss: 0.3213 - acc: 0.9181 - val_loss: 0.5462 - val_acc: 0.8286
Epoch 23/35
```

```
        - 3s - loss: 0.3313 - acc: 0.9120 - val_loss: 0.3995 - val_acc: 0.8992
Epoch 24/35
        - 3s - loss: 0.3287 - acc: 0.9095 - val_loss: 0.4161 - val_acc: 0.8799
Epoch 25/35
        - 4s - loss: 0.3203 - acc: 0.9138 - val_loss: 0.4464 - val_acc: 0.8741
Epoch 26/35
        - 4s - loss: 0.3230 - acc: 0.9132 - val_loss: 0.5774 - val_acc: 0.8409
Epoch 27/35
        - 3s - loss: 0.3279 - acc: 0.9131 - val_loss: 0.7065 - val_acc: 0.8107
Epoch 28/35
        - 3s - loss: 0.3305 - acc: 0.9129 - val_loss: 0.3893 - val_acc: 0.9023
Epoch 29/35
        - 4s - loss: 0.3362 - acc: 0.9135 - val_loss: 0.5070 - val_acc: 0.8371
Epoch 30/35
        - 3s - loss: 0.3317 - acc: 0.9200 - val_loss: 0.4695 - val_acc: 0.8812
Epoch 31/35
        - 3s - loss: 0.3269 - acc: 0.9131 - val_loss: 1.2070 - val_acc: 0.7750
Epoch 32/35
        - 3s - loss: 0.3240 - acc: 0.9163 - val_loss: 0.4437 - val_acc: 0.8622
Epoch 33/35
        - 3s - loss: 0.3274 - acc: 0.9176 - val_loss: 0.6468 - val_acc: 0.8449
Epoch 34/35
        - 3s - loss: 0.3402 - acc: 0.9150 - val_loss: 0.3913 - val_acc: 0.8870
Epoch 35/35
        - 3s - loss: 0.3264 - acc: 0.9176 - val_loss: 0.4415 - val_acc: 0.8901
Train accuracy 0.9294069640914037 Test accuracy: 0.8900576857821514
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_75 (Conv1D)	(None, 124, 32)	1472
conv1d_76 (Conv1D)	(None, 120, 16)	2576
dropout_38 (Dropout)	(None, 120, 16)	0
max_pooling1d_38 (MaxPooling	(None, 60, 16)	0
flatten_38 (Flatten)	(None, 960)	0
dense_75 (Dense)	(None, 32)	30752
dense_76 (Dense)	(None, 6)	198

```
================================================================
Total params: 34,998
Trainable params: 34,998
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 5.6099 - acc: 0.7828 - val_loss: 0.6939 - val_acc: 0.8517
Epoch 2/25
 - 3s - loss: 0.5010 - acc: 0.8832 - val_loss: 0.6320 - val_acc: 0.8660
Epoch 3/25
 - 3s - loss: 0.4524 - acc: 0.8980 - val_loss: 0.6079 - val_acc: 0.8198
Epoch 4/25
 - 3s - loss: 0.4149 - acc: 0.9021 - val_loss: 0.6310 - val_acc: 0.8578
Epoch 5/25
 - 3s - loss: 0.3934 - acc: 0.9059 - val_loss: 0.5392 - val_acc: 0.8622
Epoch 6/25
 - 3s - loss: 0.3836 - acc: 0.9074 - val_loss: 0.5226 - val_acc: 0.8697
Epoch 7/25
 - 3s - loss: 0.3900 - acc: 0.9057 - val_loss: 0.6099 - val_acc: 0.8239
Epoch 8/25
 - 3s - loss: 0.3778 - acc: 0.9086 - val_loss: 0.5498 - val_acc: 0.8507
Epoch 9/25
 - 3s - loss: 0.3354 - acc: 0.9192 - val_loss: 0.5142 - val_acc: 0.8799
Epoch 10/25
 - 3s - loss: 0.3553 - acc: 0.9129 - val_loss: 0.5267 - val_acc: 0.8456
Epoch 11/25
 - 3s - loss: 0.3488 - acc: 0.9151 - val_loss: 0.4650 - val_acc: 0.8633
Epoch 12/25
 - 3s - loss: 0.3224 - acc: 0.9191 - val_loss: 0.6858 - val_acc: 0.8144
Epoch 13/25
 - 3s - loss: 0.3712 - acc: 0.9125 - val_loss: 0.5496 - val_acc: 0.8612
Epoch 14/25
 - 3s - loss: 0.3105 - acc: 0.9275 - val_loss: 0.4865 - val_acc: 0.8795
Epoch 15/25
 - 3s - loss: 0.3486 - acc: 0.9153 - val_loss: 0.4788 - val_acc: 0.8839
Epoch 16/25
 - 3s - loss: 0.3032 - acc: 0.9242 - val_loss: 0.4418 - val_acc: 0.8938
Epoch 17/25
 - 3s - loss: 0.2958 - acc: 0.9246 - val_loss: 0.4957 - val_acc: 0.8775
Epoch 18/25
 - 3s - loss: 0.3211 - acc: 0.9178 - val_loss: 0.4835 - val_acc: 0.8622
```

```
Epoch 19/25
 - 3s - loss: 0.3163 - acc: 0.9208 - val_loss: 0.4780 - val_acc: 0.8626
Epoch 20/25
 - 3s - loss: 0.2868 - acc: 0.9280 - val_loss: 0.5658 - val_acc: 0.8269
Epoch 21/25
 - 3s - loss: 0.2977 - acc: 0.9286 - val_loss: 0.4155 - val_acc: 0.8806
Epoch 22/25
 - 3s - loss: 0.2764 - acc: 0.9282 - val_loss: 0.4576 - val_acc: 0.8483
Epoch 23/25
 - 3s - loss: 0.3157 - acc: 0.9196 - val_loss: 0.5375 - val_acc: 0.8537
Epoch 24/25
 - 3s - loss: 0.2962 - acc: 0.9276 - val_loss: 0.6315 - val_acc: 0.8537
Epoch 25/25
 - 3s - loss: 0.2972 - acc: 0.9260 - val_loss: 0.4336 - val_acc: 0.8724
Train accuracy 0.941784548422198 Test accuracy: 0.8724126230064473
-----------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_77 (Conv1D)           (None, 126, 28)           784
_____
conv1d_78 (Conv1D)           (None, 120, 16)           3152
_____
dropout_39 (Dropout)         (None, 120, 16)           0
_____
max_pooling1d_39 (MaxPooling (None, 60, 16)            0
_____
flatten_39 (Flatten)         (None, 960)               0
_____
dense_77 (Dense)             (None, 32)                30752
_____
dense_78 (Dense)             (None, 6)                 198
=================================================================
Total params: 34,886
Trainable params: 34,886
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 3.5671 - acc: 0.7036 - val_loss: 0.7161 - val_acc: 0.8208
Epoch 2/25
 - 2s - loss: 0.5217 - acc: 0.8678 - val_loss: 0.6253 - val_acc: 0.8409
```

```
Epoch 3/25
 - 2s - loss: 0.4482 - acc: 0.8853 - val_loss: 0.5464 - val_acc: 0.8439
Epoch 4/25
 - 2s - loss: 0.4033 - acc: 0.8969 - val_loss: 0.4733 - val_acc: 0.8677
Epoch 5/25
 - 2s - loss: 0.3860 - acc: 0.9091 - val_loss: 0.4315 - val_acc: 0.8907
Epoch 6/25
 - 2s - loss: 0.3728 - acc: 0.9064 - val_loss: 0.5506 - val_acc: 0.8622
Epoch 7/25
 - 2s - loss: 0.3557 - acc: 0.9115 - val_loss: 0.4047 - val_acc: 0.8867
Epoch 8/25
 - 2s - loss: 0.3560 - acc: 0.9089 - val_loss: 0.4743 - val_acc: 0.8521
Epoch 9/25
 - 2s - loss: 0.3516 - acc: 0.9075 - val_loss: 0.4290 - val_acc: 0.8782
Epoch 10/25
 - 2s - loss: 0.3422 - acc: 0.9129 - val_loss: 0.4792 - val_acc: 0.8599
Epoch 11/25
 - 2s - loss: 0.3385 - acc: 0.9149 - val_loss: 0.5192 - val_acc: 0.8473
Epoch 12/25
 - 2s - loss: 0.3365 - acc: 0.9146 - val_loss: 0.4417 - val_acc: 0.8592
Epoch 13/25
 - 2s - loss: 0.3314 - acc: 0.9162 - val_loss: 0.4792 - val_acc: 0.8442
Epoch 14/25
 - 2s - loss: 0.3220 - acc: 0.9192 - val_loss: 0.3905 - val_acc: 0.8860
Epoch 15/25
 - 2s - loss: 0.3228 - acc: 0.9140 - val_loss: 0.3868 - val_acc: 0.8809
Epoch 16/25
 - 2s - loss: 0.3231 - acc: 0.9153 - val_loss: 0.4041 - val_acc: 0.8836
Epoch 17/25
 - 2s - loss: 0.3044 - acc: 0.9219 - val_loss: 0.7424 - val_acc: 0.8280
Epoch 18/25
 - 2s - loss: 0.3146 - acc: 0.9151 - val_loss: 0.5913 - val_acc: 0.8144
Epoch 19/25
 - 2s - loss: 0.3013 - acc: 0.9197 - val_loss: 0.3994 - val_acc: 0.8819
Epoch 20/25
 - 2s - loss: 0.2992 - acc: 0.9188 - val_loss: 0.5800 - val_acc: 0.8134
Epoch 21/25
 - 2s - loss: 0.2907 - acc: 0.9223 - val_loss: 0.6808 - val_acc: 0.8076
Epoch 22/25
 - 2s - loss: 0.3042 - acc: 0.9189 - val_loss: 0.4588 - val_acc: 0.8442
Epoch 23/25
 - 2s - loss: 0.2983 - acc: 0.9192 - val_loss: 0.4702 - val_acc: 0.8463
Epoch 24/25
```

```
  - 2s - loss: 0.2894 - acc: 0.9219 - val_loss: 0.4336 - val_acc: 0.8649
Epoch 25/25
  - 2s - loss: 0.2836 - acc: 0.9215 - val_loss: 0.4237 - val_acc: 0.8639
Train accuracy 0.9202937976060935 Test accuracy: 0.8639294197488971
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_79 (Conv1D)	(None, 124, 32)	1472
conv1d_80 (Conv1D)	(None, 122, 16)	1552
dropout_40 (Dropout)	(None, 122, 16)	0
max_pooling1d_40 (MaxPooling	(None, 61, 16)	0
flatten_40 (Flatten)	(None, 976)	0
dense_79 (Dense)	(None, 64)	62528
dense_80 (Dense)	(None, 6)	390

```
Total params: 65,942
Trainable params: 65,942
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
  - 9s - loss: 11.2076 - acc: 0.7520 - val_loss: 0.8034 - val_acc: 0.7920
Epoch 2/35
  - 7s - loss: 0.6549 - acc: 0.8127 - val_loss: 0.7062 - val_acc: 0.8178
Epoch 3/35
  - 7s - loss: 0.5877 - acc: 0.8346 - val_loss: 0.6881 - val_acc: 0.8100
Epoch 4/35
  - 7s - loss: 0.5794 - acc: 0.8387 - val_loss: 0.6425 - val_acc: 0.8049
Epoch 5/35
  - 7s - loss: 0.5203 - acc: 0.8555 - val_loss: 0.6667 - val_acc: 0.8045
Epoch 6/35
  - 7s - loss: 0.4922 - acc: 0.8615 - val_loss: 0.6576 - val_acc: 0.8157
Epoch 7/35
  - 7s - loss: 0.5112 - acc: 0.8581 - val_loss: 0.6307 - val_acc: 0.8266
Epoch 8/35
```

```
          - 7s - loss: 0.4910 - acc: 0.8675 - val_loss: 0.6155 - val_acc: 0.8548
        Epoch 9/35
          - 7s - loss: 0.4987 - acc: 0.8694 - val_loss: 0.5561 - val_acc: 0.8663
        Epoch 10/35
          - 7s - loss: 0.4598 - acc: 0.8799 - val_loss: 0.6157 - val_acc: 0.8344
        Epoch 11/35
          - 7s - loss: 0.4413 - acc: 0.8826 - val_loss: 0.6809 - val_acc: 0.7995
        Epoch 12/35
          - 7s - loss: 0.4368 - acc: 0.8837 - val_loss: 0.6414 - val_acc: 0.8042
        Epoch 13/35
          - 7s - loss: 0.4171 - acc: 0.8887 - val_loss: 0.5622 - val_acc: 0.8585
        Epoch 14/35
          - 7s - loss: 0.4180 - acc: 0.8913 - val_loss: 0.6346 - val_acc: 0.8147
        Epoch 15/35
          - 7s - loss: 0.3999 - acc: 0.9027 - val_loss: 0.4814 - val_acc: 0.8622
        Epoch 16/35
          - 7s - loss: 0.4157 - acc: 0.8939 - val_loss: 0.5273 - val_acc: 0.8470
        Epoch 17/35
          - 7s - loss: 0.3781 - acc: 0.9029 - val_loss: 0.4904 - val_acc: 0.8521
        Epoch 18/35
          - 7s - loss: 0.3856 - acc: 0.8980 - val_loss: 0.4701 - val_acc: 0.8751
        Epoch 19/35
          - 7s - loss: 0.3920 - acc: 0.9013 - val_loss: 0.5584 - val_acc: 0.8314
        Epoch 20/35
          - 7s - loss: 0.4000 - acc: 0.8968 - val_loss: 0.6300 - val_acc: 0.8185
        Epoch 21/35
          - 7s - loss: 0.4000 - acc: 0.8964 - val_loss: 0.5349 - val_acc: 0.8276
        Epoch 22/35
          - 7s - loss: 0.3756 - acc: 0.9036 - val_loss: 0.6662 - val_acc: 0.8049
        Epoch 23/35
          - 7s - loss: 0.3614 - acc: 0.9075 - val_loss: 0.4985 - val_acc: 0.8225
        Epoch 24/35
          - 7s - loss: 0.3590 - acc: 0.9095 - val_loss: 0.5227 - val_acc: 0.8381
        Epoch 25/35
          - 7s - loss: 0.3492 - acc: 0.9117 - val_loss: 0.6006 - val_acc: 0.8124
        Epoch 26/35
          - 7s - loss: 0.3557 - acc: 0.9124 - val_loss: 0.5154 - val_acc: 0.8446
        Epoch 27/35
          - 7s - loss: 0.3574 - acc: 0.9082 - val_loss: 0.5310 - val_acc: 0.8683
        Epoch 28/35
          - 7s - loss: 0.3736 - acc: 0.9087 - val_loss: 0.5884 - val_acc: 0.8076
        Epoch 29/35
          - 7s - loss: 0.3774 - acc: 0.9042 - val_loss: 0.5426 - val_acc: 0.8476
```

```
Epoch 30/35
 - 7s - loss: 0.3362 - acc: 0.9162 - val_loss: 0.5364 - val_acc: 0.8232
Epoch 31/35
 - 7s - loss: 0.3665 - acc: 0.9095 - val_loss: 0.5893 - val_acc: 0.8127
Epoch 32/35
 - 7s - loss: 0.3421 - acc: 0.9101 - val_loss: 0.4220 - val_acc: 0.8819
Epoch 33/35
 - 7s - loss: 0.3553 - acc: 0.9102 - val_loss: 0.5093 - val_acc: 0.8093
Epoch 34/35
 - 7s - loss: 0.3334 - acc: 0.9134 - val_loss: 0.5105 - val_acc: 0.8154
Epoch 35/35
 - 7s - loss: 0.3646 - acc: 0.9070 - val_loss: 0.4887 - val_acc: 0.8337
Train accuracy 0.8881936887921654 Test accuracy: 0.833729216152019
------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_81 (Conv1D)	(None, 124, 42)	1932
conv1d_82 (Conv1D)	(None, 118, 32)	9440
dropout_41 (Dropout)	(None, 118, 32)	0
max_pooling1d_41 (MaxPooling	(None, 59, 32)	0
flatten_41 (Flatten)	(None, 1888)	0
dense_81 (Dense)	(None, 32)	60448
dense_82 (Dense)	(None, 6)	198

```
Total params: 72,018
Trainable params: 72,018
Non-trainable params: 0


None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 11.1514 - acc: 0.7269 - val_loss: 0.8073 - val_acc: 0.7530
Epoch 2/25
 - 3s - loss: 0.5540 - acc: 0.8512 - val_loss: 0.5737 - val_acc: 0.8565
Epoch 3/25
 - 3s - loss: 0.4798 - acc: 0.8764 - val_loss: 0.5821 - val_acc: 0.8276
```

```
Epoch 4/25
 - 3s - loss: 0.4592 - acc: 0.8828 - val_loss: 0.5394 - val_acc: 0.8578
Epoch 5/25
 - 3s - loss: 0.4336 - acc: 0.8898 - val_loss: 0.5852 - val_acc: 0.8510
Epoch 6/25
 - 3s - loss: 0.4165 - acc: 0.8959 - val_loss: 0.4568 - val_acc: 0.8758
Epoch 7/25
 - 3s - loss: 0.3984 - acc: 0.9027 - val_loss: 0.4529 - val_acc: 0.8948
Epoch 8/25
 - 3s - loss: 0.3941 - acc: 0.9061 - val_loss: 0.4660 - val_acc: 0.8795
Epoch 9/25
 - 3s - loss: 0.3833 - acc: 0.9017 - val_loss: 0.4501 - val_acc: 0.8758
Epoch 10/25
 - 3s - loss: 0.3835 - acc: 0.9019 - val_loss: 0.3798 - val_acc: 0.9084
Epoch 11/25
 - 3s - loss: 0.3836 - acc: 0.9053 - val_loss: 0.4024 - val_acc: 0.8945
Epoch 12/25
 - 3s - loss: 0.3799 - acc: 0.9011 - val_loss: 0.4412 - val_acc: 0.8700
Epoch 13/25
 - 3s - loss: 0.3761 - acc: 0.9119 - val_loss: 0.4387 - val_acc: 0.8867
Epoch 14/25
 - 3s - loss: 0.3649 - acc: 0.9082 - val_loss: 0.4185 - val_acc: 0.8887
Epoch 15/25
 - 3s - loss: 0.3622 - acc: 0.9093 - val_loss: 0.5608 - val_acc: 0.8409
Epoch 16/25
 - 3s - loss: 0.3610 - acc: 0.9119 - val_loss: 0.4241 - val_acc: 0.8785
Epoch 17/25
 - 3s - loss: 0.3747 - acc: 0.9072 - val_loss: 0.4768 - val_acc: 0.8480
Epoch 18/25
 - 3s - loss: 0.3602 - acc: 0.9106 - val_loss: 0.3897 - val_acc: 0.8918
Epoch 19/25
 - 3s - loss: 0.3659 - acc: 0.9124 - val_loss: 0.4663 - val_acc: 0.8616
Epoch 20/25
 - 3s - loss: 0.3626 - acc: 0.9098 - val_loss: 0.4184 - val_acc: 0.8941
Epoch 21/25
 - 3s - loss: 0.3507 - acc: 0.9064 - val_loss: 0.4477 - val_acc: 0.8751
Epoch 22/25
 - 3s - loss: 0.3676 - acc: 0.9068 - val_loss: 0.5146 - val_acc: 0.8300
Epoch 23/25
 - 3s - loss: 0.3578 - acc: 0.9101 - val_loss: 0.4066 - val_acc: 0.8945
Epoch 24/25
 - 3s - loss: 0.3486 - acc: 0.9057 - val_loss: 0.8198 - val_acc: 0.7238
Epoch 25/25
```

```
 - 3s - loss: 0.3455 - acc: 0.9093 - val_loss: 0.4381 - val_acc: 0.8714
Train accuracy 0.9215179542981502 Test accuracy: 0.8713946386155412
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_83 (Conv1D)	(None, 122, 32)	2048
conv1d_84 (Conv1D)	(None, 118, 16)	2576
dropout_42 (Dropout)	(None, 118, 16)	0
max_pooling1d_42 (MaxPooling	(None, 59, 16)	0
flatten_42 (Flatten)	(None, 944)	0
dense_83 (Dense)	(None, 32)	30240
dense_84 (Dense)	(None, 6)	198

```
Total params: 35,062
Trainable params: 35,062
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 27.1762 - acc: 0.7277 - val_loss: 1.3614 - val_acc: 0.8324
Epoch 2/25
 - 5s - loss: 0.7013 - acc: 0.8685 - val_loss: 0.7475 - val_acc: 0.8286
Epoch 3/25
 - 4s - loss: 0.5337 - acc: 0.8848 - val_loss: 0.7020 - val_acc: 0.8042
Epoch 4/25
 - 4s - loss: 0.4675 - acc: 0.8973 - val_loss: 0.5805 - val_acc: 0.8639
Epoch 5/25
 - 5s - loss: 0.4652 - acc: 0.8923 - val_loss: 0.5888 - val_acc: 0.8870
Epoch 6/25
 - 4s - loss: 0.4253 - acc: 0.9034 - val_loss: 0.5460 - val_acc: 0.8914
Epoch 7/25
 - 5s - loss: 0.3952 - acc: 0.9076 - val_loss: 0.5269 - val_acc: 0.8907
Epoch 8/25
 - 4s - loss: 0.3785 - acc: 0.9125 - val_loss: 0.5370 - val_acc: 0.8551
Epoch 9/25
```

```
      - 4s - loss: 0.3821 - acc: 0.9037 - val_loss: 0.5373 - val_acc: 0.8463
     Epoch 10/25
      - 4s - loss: 0.3620 - acc: 0.9120 - val_loss: 0.4670 - val_acc: 0.8904
     Epoch 11/25
      - 4s - loss: 0.3776 - acc: 0.9095 - val_loss: 0.4725 - val_acc: 0.8918
     Epoch 12/25
      - 4s - loss: 0.3663 - acc: 0.9091 - val_loss: 0.4567 - val_acc: 0.8968
     Epoch 13/25
      - 5s - loss: 0.3628 - acc: 0.9068 - val_loss: 0.5204 - val_acc: 0.8521
     Epoch 14/25
      - 4s - loss: 0.3461 - acc: 0.9165 - val_loss: 0.4536 - val_acc: 0.8816
     Epoch 15/25
      - 4s - loss: 0.3321 - acc: 0.9173 - val_loss: 0.5775 - val_acc: 0.8432
     Epoch 16/25
      - 5s - loss: 0.3288 - acc: 0.9183 - val_loss: 0.4953 - val_acc: 0.8636
     Epoch 17/25
      - 4s - loss: 0.3338 - acc: 0.9159 - val_loss: 0.5608 - val_acc: 0.8174
     Epoch 18/25
      - 5s - loss: 0.3311 - acc: 0.9180 - val_loss: 0.4057 - val_acc: 0.9060
     Epoch 19/25
      - 5s - loss: 0.3323 - acc: 0.9178 - val_loss: 0.4332 - val_acc: 0.8833
     Epoch 20/25
      - 4s - loss: 0.3295 - acc: 0.9197 - val_loss: 0.4325 - val_acc: 0.8921
     Epoch 21/25
      - 5s - loss: 0.3137 - acc: 0.9245 - val_loss: 0.4407 - val_acc: 0.8968
     Epoch 22/25
      - 4s - loss: 0.3205 - acc: 0.9177 - val_loss: 0.4486 - val_acc: 0.8951
     Epoch 23/25
      - 4s - loss: 0.3210 - acc: 0.9226 - val_loss: 0.4261 - val_acc: 0.8894
     Epoch 24/25
      - 5s - loss: 0.3268 - acc: 0.9199 - val_loss: 0.5320 - val_acc: 0.8765
     Epoch 25/25
      - 4s - loss: 0.3123 - acc: 0.9233 - val_loss: 0.4226 - val_acc: 0.8836
     Train accuracy 0.9300870512074044 Test accuracy: 0.8836104513064132
     ---------------------------------------------------------------------------

     _____
     Layer (type)                 Output Shape              Param #
     =============================================================
     conv1d_85 (Conv1D)           (None, 126, 28)           784
     _____
     conv1d_86 (Conv1D)           (None, 120, 16)           3152
     _____
     dropout_43 (Dropout)         (None, 120, 16)           0
```

```
_____

max_pooling1d_43 (MaxPooling  (None, 60, 16)              0
_____

flatten_43 (Flatten)          (None, 960)                 0
_____

dense_85 (Dense)              (None, 64)                  61504
_____

dense_86 (Dense)              (None, 6)                   390
========================================================
Total params: 65,830
Trainable params: 65,830
Non-trainable params: 0

_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 3.9236 - acc: 0.7994 - val_loss: 0.6350 - val_acc: 0.8541
Epoch 2/25
 - 4s - loss: 0.4266 - acc: 0.9008 - val_loss: 0.5079 - val_acc: 0.8853
Epoch 3/25
 - 4s - loss: 0.3860 - acc: 0.9061 - val_loss: 0.6102 - val_acc: 0.8517
Epoch 4/25
 - 4s - loss: 0.3581 - acc: 0.9135 - val_loss: 0.4793 - val_acc: 0.8768
Epoch 5/25
 - 4s - loss: 0.3196 - acc: 0.9232 - val_loss: 0.4518 - val_acc: 0.8728
Epoch 6/25
 - 4s - loss: 0.3006 - acc: 0.9290 - val_loss: 0.4396 - val_acc: 0.8758
Epoch 7/25
 - 4s - loss: 0.3352 - acc: 0.9181 - val_loss: 0.4172 - val_acc: 0.9023
Epoch 8/25
 - 4s - loss: 0.2960 - acc: 0.9260 - val_loss: 0.3940 - val_acc: 0.8972
Epoch 9/25
 - 4s - loss: 0.2797 - acc: 0.9287 - val_loss: 0.4360 - val_acc: 0.8687
Epoch 10/25
 - 4s - loss: 0.2927 - acc: 0.9298 - val_loss: 0.4079 - val_acc: 0.8833
Epoch 11/25
 - 4s - loss: 0.2651 - acc: 0.9339 - val_loss: 0.3828 - val_acc: 0.8738
Epoch 12/25
 - 4s - loss: 0.2762 - acc: 0.9293 - val_loss: 0.3679 - val_acc: 0.8765
Epoch 13/25
 - 4s - loss: 0.2584 - acc: 0.9368 - val_loss: 0.3531 - val_acc: 0.8907
Epoch 14/25
 - 4s - loss: 0.2741 - acc: 0.9301 - val_loss: 0.4148 - val_acc: 0.8531
```

```
Epoch 15/25
 - 4s - loss: 0.2732 - acc: 0.9310 - val_loss: 0.3899 - val_acc: 0.8918
Epoch 16/25
 - 4s - loss: 0.2587 - acc: 0.9316 - val_loss: 0.3720 - val_acc: 0.8802
Epoch 17/25
 - 4s - loss: 0.2657 - acc: 0.9309 - val_loss: 0.4303 - val_acc: 0.8687
Epoch 18/25
 - 4s - loss: 0.2567 - acc: 0.9373 - val_loss: 0.4024 - val_acc: 0.8568
Epoch 19/25
 - 4s - loss: 0.2452 - acc: 0.9380 - val_loss: 0.3703 - val_acc: 0.8751
Epoch 20/25
 - 4s - loss: 0.2698 - acc: 0.9331 - val_loss: 0.4168 - val_acc: 0.8761
Epoch 21/25
 - 4s - loss: 0.2315 - acc: 0.9403 - val_loss: 0.5369 - val_acc: 0.8375
Epoch 22/25
 - 4s - loss: 0.2329 - acc: 0.9381 - val_loss: 0.4783 - val_acc: 0.8656
Epoch 23/25
 - 4s - loss: 0.2570 - acc: 0.9325 - val_loss: 0.3702 - val_acc: 0.9030
Epoch 24/25
 - 4s - loss: 0.2298 - acc: 0.9423 - val_loss: 0.3321 - val_acc: 0.8884
Epoch 25/25
 - 4s - loss: 0.2247 - acc: 0.9416 - val_loss: 0.5164 - val_acc: 0.8582
Train accuracy 0.9231501632857504 Test accuracy: 0.8581608415337632
-------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_87 (Conv1D)           (None, 124, 42)           1932
_____
conv1d_88 (Conv1D)           (None, 122, 32)           4064
_____
dropout_44 (Dropout)         (None, 122, 32)           0
_____
max_pooling1d_44 (MaxPooling (None, 61, 32)            0
_____
flatten_44 (Flatten)         (None, 1952)              0
_____
dense_87 (Dense)             (None, 32)                62496
_____
dense_88 (Dense)             (None, 6)                 198
=================================================================
Total params: 68,690
Trainable params: 68,690
```

```
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 15.4742 - acc: 0.7338 - val_loss: 0.7912 - val_acc: 0.8100
Epoch 2/30
 - 3s - loss: 0.5992 - acc: 0.8464 - val_loss: 0.5625 - val_acc: 0.8537
Epoch 3/30
 - 3s - loss: 0.4923 - acc: 0.8807 - val_loss: 0.5012 - val_acc: 0.8802
Epoch 4/30
 - 3s - loss: 0.4579 - acc: 0.8847 - val_loss: 0.5514 - val_acc: 0.8561
Epoch 5/30
 - 3s - loss: 0.4439 - acc: 0.8901 - val_loss: 0.5712 - val_acc: 0.8181
Epoch 6/30
 - 3s - loss: 0.4265 - acc: 0.8946 - val_loss: 0.4373 - val_acc: 0.8948
Epoch 7/30
 - 3s - loss: 0.4266 - acc: 0.8964 - val_loss: 0.4360 - val_acc: 0.8850
Epoch 8/30
 - 3s - loss: 0.4167 - acc: 0.8925 - val_loss: 0.6559 - val_acc: 0.7499
Epoch 9/30
 - 3s - loss: 0.4134 - acc: 0.8953 - val_loss: 0.4291 - val_acc: 0.8877
Epoch 10/30
 - 3s - loss: 0.3963 - acc: 0.8970 - val_loss: 0.5227 - val_acc: 0.8202
Epoch 11/30
 - 3s - loss: 0.3913 - acc: 0.9022 - val_loss: 0.4991 - val_acc: 0.8551
Epoch 12/30
 - 3s - loss: 0.4025 - acc: 0.8985 - val_loss: 0.5791 - val_acc: 0.8147
Epoch 13/30
 - 3s - loss: 0.3869 - acc: 0.9057 - val_loss: 0.5648 - val_acc: 0.8025
Epoch 14/30
 - 3s - loss: 0.4073 - acc: 0.8953 - val_loss: 0.4612 - val_acc: 0.8734
Epoch 15/30
 - 3s - loss: 0.3964 - acc: 0.9041 - val_loss: 0.4749 - val_acc: 0.8531
Epoch 16/30
 - 3s - loss: 0.3814 - acc: 0.9049 - val_loss: 0.4152 - val_acc: 0.8717
Epoch 17/30
 - 3s - loss: 0.3879 - acc: 0.9063 - val_loss: 0.4685 - val_acc: 0.8829
Epoch 18/30
 - 3s - loss: 0.3878 - acc: 0.9025 - val_loss: 0.4877 - val_acc: 0.8578
Epoch 19/30
 - 3s - loss: 0.3885 - acc: 0.8981 - val_loss: 0.5265 - val_acc: 0.8490
Epoch 20/30
```

```
  - 3s - loss: 0.3793 - acc: 0.9037 - val_loss: 0.4773 - val_acc: 0.8537
Epoch 21/30
  - 3s - loss: 0.3839 - acc: 0.9060 - val_loss: 0.4736 - val_acc: 0.8850
Epoch 22/30
  - 3s - loss: 0.3708 - acc: 0.9051 - val_loss: 0.5082 - val_acc: 0.8246
Epoch 23/30
  - 3s - loss: 0.3729 - acc: 0.9048 - val_loss: 0.5330 - val_acc: 0.8565
Epoch 24/30
  - 3s - loss: 0.3717 - acc: 0.9063 - val_loss: 0.6459 - val_acc: 0.8371
Epoch 25/30
  - 3s - loss: 0.3813 - acc: 0.8998 - val_loss: 0.5365 - val_acc: 0.7988
Epoch 26/30
  - 3s - loss: 0.3742 - acc: 0.9048 - val_loss: 0.5463 - val_acc: 0.8548
Epoch 27/30
  - 3s - loss: 0.3766 - acc: 0.9066 - val_loss: 0.4888 - val_acc: 0.8633
Epoch 28/30
  - 3s - loss: 0.3722 - acc: 0.9071 - val_loss: 0.4506 - val_acc: 0.8785
Epoch 29/30
  - 3s - loss: 0.3634 - acc: 0.9110 - val_loss: 0.4248 - val_acc: 0.8717
Epoch 30/30
  - 3s - loss: 0.3792 - acc: 0.9041 - val_loss: 0.4477 - val_acc: 0.8826
Train accuracy 0.9065560391730142 Test accuracy: 0.8825924669155073
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_89 (Conv1D)	(None, 124, 32)	1472
conv1d_90 (Conv1D)	(None, 118, 16)	3600
dropout_45 (Dropout)	(None, 118, 16)	0
max_pooling1d_45 (MaxPooling	(None, 59, 16)	0
flatten_45 (Flatten)	(None, 944)	0
dense_89 (Dense)	(None, 32)	30240
dense_90 (Dense)	(None, 6)	198

```
Total params: 35,510
Trainable params: 35,510
Non-trainable params: 0
```

```
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 5s - loss: 11.5468 - acc: 0.7382 - val_loss: 0.7696 - val_acc: 0.8045
Epoch 2/35
 - 3s - loss: 0.5729 - acc: 0.8530 - val_loss: 0.6834 - val_acc: 0.8249
Epoch 3/35
 - 3s - loss: 0.5067 - acc: 0.8692 - val_loss: 0.5984 - val_acc: 0.8592
Epoch 4/35
 - 3s - loss: 0.4702 - acc: 0.8840 - val_loss: 0.5183 - val_acc: 0.8931
Epoch 5/35
 - 3s - loss: 0.4204 - acc: 0.8980 - val_loss: 0.5299 - val_acc: 0.8517
Epoch 6/35
 - 3s - loss: 0.4289 - acc: 0.8934 - val_loss: 0.5291 - val_acc: 0.8700
Epoch 7/35
 - 3s - loss: 0.4082 - acc: 0.8966 - val_loss: 0.4704 - val_acc: 0.8938
Epoch 8/35
 - 3s - loss: 0.3915 - acc: 0.9030 - val_loss: 0.4849 - val_acc: 0.8690
Epoch 9/35
 - 3s - loss: 0.4005 - acc: 0.9002 - val_loss: 0.5663 - val_acc: 0.8724
Epoch 10/35
 - 3s - loss: 0.3988 - acc: 0.9038 - val_loss: 0.5646 - val_acc: 0.8154
Epoch 11/35
 - 3s - loss: 0.3717 - acc: 0.9060 - val_loss: 0.4617 - val_acc: 0.8785
Epoch 12/35
 - 3s - loss: 0.3922 - acc: 0.9044 - val_loss: 0.4656 - val_acc: 0.8819
Epoch 13/35
 - 3s - loss: 0.3537 - acc: 0.9093 - val_loss: 0.4923 - val_acc: 0.8371
Epoch 14/35
 - 3s - loss: 0.3690 - acc: 0.9049 - val_loss: 0.4180 - val_acc: 0.8755
Epoch 15/35
 - 3s - loss: 0.3711 - acc: 0.9072 - val_loss: 0.4063 - val_acc: 0.8772
Epoch 16/35
 - 3s - loss: 0.3532 - acc: 0.9083 - val_loss: 0.4669 - val_acc: 0.8768
Epoch 17/35
 - 3s - loss: 0.3594 - acc: 0.9089 - val_loss: 0.5369 - val_acc: 0.8412
Epoch 18/35
 - 3s - loss: 0.3800 - acc: 0.9052 - val_loss: 0.4391 - val_acc: 0.8839
Epoch 19/35
 - 3s - loss: 0.3646 - acc: 0.9095 - val_loss: 0.4745 - val_acc: 0.8670
Epoch 20/35
 - 3s - loss: 0.3599 - acc: 0.9089 - val_loss: 0.4247 - val_acc: 0.8772
```

```
Epoch 21/35
 - 3s - loss: 0.3310 - acc: 0.9140 - val_loss: 0.4418 - val_acc: 0.8765
Epoch 22/35
 - 3s - loss: 0.3285 - acc: 0.9161 - val_loss: 0.4521 - val_acc: 0.8582
Epoch 23/35
 - 3s - loss: 0.3630 - acc: 0.9072 - val_loss: 0.4044 - val_acc: 0.8761
Epoch 24/35
 - 3s - loss: 0.3331 - acc: 0.9117 - val_loss: 0.5197 - val_acc: 0.8422
Epoch 25/35
 - 3s - loss: 0.3525 - acc: 0.9095 - val_loss: 0.6099 - val_acc: 0.7978
Epoch 26/35
 - 3s - loss: 0.3891 - acc: 0.9026 - val_loss: 0.6096 - val_acc: 0.8239
Epoch 27/35
 - 3s - loss: 0.3508 - acc: 0.9116 - val_loss: 0.4641 - val_acc: 0.8429
Epoch 28/35
 - 3s - loss: 0.3181 - acc: 0.9143 - val_loss: 0.4692 - val_acc: 0.8507
Epoch 29/35
 - 3s - loss: 0.3120 - acc: 0.9176 - val_loss: 0.4287 - val_acc: 0.8656
Epoch 30/35
 - 3s - loss: 0.3266 - acc: 0.9108 - val_loss: 0.4353 - val_acc: 0.8463
Epoch 31/35
 - 3s - loss: 0.3295 - acc: 0.9095 - val_loss: 0.4434 - val_acc: 0.8670
Epoch 32/35
 - 3s - loss: 0.3670 - acc: 0.9048 - val_loss: 0.4375 - val_acc: 0.8558
Epoch 33/35
 - 3s - loss: 0.3205 - acc: 0.9195 - val_loss: 0.4123 - val_acc: 0.8639
Epoch 34/35
 - 3s - loss: 0.3349 - acc: 0.9127 - val_loss: 0.5441 - val_acc: 0.8191
Epoch 35/35
 - 3s - loss: 0.3298 - acc: 0.9135 - val_loss: 0.4155 - val_acc: 0.8670
Train accuracy 0.9151251360174102 Test accuracy: 0.8669833729216152
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_91 (Conv1D)	(None, 122, 28)	1792
conv1d_92 (Conv1D)	(None, 116, 16)	3152
dropout_46 (Dropout)	(None, 116, 16)	0
max_pooling1d_46 (MaxPooling	(None, 58, 16)	0

```
flatten_46 (Flatten)            (None, 928)              0
_____
dense_91 (Dense)                (None, 64)               59456
_____
dense_92 (Dense)                (None, 6)                390
=================================================================
Total params: 64,790
Trainable params: 64,790
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 14.1224 - acc: 0.7764 - val_loss: 0.8613 - val_acc: 0.8324
Epoch 2/25
 - 2s - loss: 0.5556 - acc: 0.8751 - val_loss: 0.7224 - val_acc: 0.7940
Epoch 3/25
 - 2s - loss: 0.4908 - acc: 0.8901 - val_loss: 0.7228 - val_acc: 0.8124
Epoch 4/25
 - 2s - loss: 0.4757 - acc: 0.8913 - val_loss: 0.5623 - val_acc: 0.8894
Epoch 5/25
 - 2s - loss: 0.4047 - acc: 0.9091 - val_loss: 0.6285 - val_acc: 0.8690
Epoch 6/25
 - 2s - loss: 0.4235 - acc: 0.9029 - val_loss: 0.5732 - val_acc: 0.8636
Epoch 7/25
 - 2s - loss: 0.3981 - acc: 0.9108 - val_loss: 0.5661 - val_acc: 0.8894
Epoch 8/25
 - 2s - loss: 0.3818 - acc: 0.9121 - val_loss: 0.4896 - val_acc: 0.8887
Epoch 9/25
 - 2s - loss: 0.3650 - acc: 0.9127 - val_loss: 0.5023 - val_acc: 0.8666
Epoch 10/25
 - 2s - loss: 0.3698 - acc: 0.9158 - val_loss: 0.5703 - val_acc: 0.8307
Epoch 11/25
 - 2s - loss: 0.3430 - acc: 0.9180 - val_loss: 0.5050 - val_acc: 0.8911
Epoch 12/25
 - 2s - loss: 0.3577 - acc: 0.9177 - val_loss: 0.5017 - val_acc: 0.8965
Epoch 13/25
 - 2s - loss: 0.3643 - acc: 0.9163 - val_loss: 0.4940 - val_acc: 0.9030
Epoch 14/25
 - 2s - loss: 0.3304 - acc: 0.9240 - val_loss: 0.4770 - val_acc: 0.8799
Epoch 15/25
 - 2s - loss: 0.3455 - acc: 0.9146 - val_loss: 0.6261 - val_acc: 0.8239
Epoch 16/25
```

```
 - 2s - loss: 0.3338 - acc: 0.9241 - val_loss: 0.4990 - val_acc: 0.8877
Epoch 17/25
 - 2s - loss: 0.3156 - acc: 0.9255 - val_loss: 0.4398 - val_acc: 0.8965
Epoch 18/25
 - 2s - loss: 0.3075 - acc: 0.9260 - val_loss: 0.5896 - val_acc: 0.8212
Epoch 19/25
 - 2s - loss: 0.3441 - acc: 0.9221 - val_loss: 0.6169 - val_acc: 0.8164
Epoch 20/25
 - 2s - loss: 0.3255 - acc: 0.9249 - val_loss: 0.5002 - val_acc: 0.8704
Epoch 21/25
 - 2s - loss: 0.2894 - acc: 0.9324 - val_loss: 0.4547 - val_acc: 0.8911
Epoch 22/25
 - 2s - loss: 0.3026 - acc: 0.9268 - val_loss: 0.5328 - val_acc: 0.8544
Epoch 23/25
 - 2s - loss: 0.2981 - acc: 0.9291 - val_loss: 0.4558 - val_acc: 0.8599
Epoch 24/25
 - 2s - loss: 0.3203 - acc: 0.9222 - val_loss: 0.5094 - val_acc: 0.8765
Epoch 25/25
 - 2s - loss: 0.3036 - acc: 0.9261 - val_loss: 0.4021 - val_acc: 0.9019
Train accuracy 0.9472252448313384 Test accuracy: 0.9019341703427214
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_93 (Conv1D)	(None, 124, 42)	1932
conv1d_94 (Conv1D)	(None, 120, 32)	6752
dropout_47 (Dropout)	(None, 120, 32)	0
max_pooling1d_47 (MaxPooling	(None, 60, 32)	0
flatten_47 (Flatten)	(None, 1920)	0
dense_93 (Dense)	(None, 32)	61472
dense_94 (Dense)	(None, 6)	198

```
Total params: 70,354
Trainable params: 70,354
Non-trainable params: 0
```

```
None
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 20.6513 - acc: 0.7474 - val_loss: 0.8795 - val_acc: 0.7231
Epoch 2/30
 - 4s - loss: 0.5524 - acc: 0.8553 - val_loss: 0.6381 - val_acc: 0.8568
Epoch 3/30
 - 4s - loss: 0.4818 - acc: 0.8690 - val_loss: 0.5706 - val_acc: 0.8283
Epoch 4/30
 - 4s - loss: 0.4561 - acc: 0.8781 - val_loss: 0.6439 - val_acc: 0.7967
Epoch 5/30
 - 4s - loss: 0.4442 - acc: 0.8791 - val_loss: 0.5864 - val_acc: 0.8103
Epoch 6/30
 - 4s - loss: 0.4307 - acc: 0.8852 - val_loss: 0.5405 - val_acc: 0.8375
Epoch 7/30
 - 4s - loss: 0.4205 - acc: 0.8825 - val_loss: 0.5517 - val_acc: 0.8368
Epoch 8/30
 - 4s - loss: 0.4073 - acc: 0.8890 - val_loss: 0.6337 - val_acc: 0.7794
Epoch 9/30
 - 4s - loss: 0.3932 - acc: 0.8896 - val_loss: 0.5910 - val_acc: 0.7961
Epoch 10/30
 - 4s - loss: 0.3904 - acc: 0.8951 - val_loss: 0.4510 - val_acc: 0.8510
Epoch 11/30
 - 4s - loss: 0.3888 - acc: 0.8927 - val_loss: 0.4871 - val_acc: 0.8711
Epoch 12/30
 - 4s - loss: 0.3840 - acc: 0.8934 - val_loss: 0.3956 - val_acc: 0.8877
Epoch 13/30
 - 4s - loss: 0.3740 - acc: 0.9019 - val_loss: 0.3951 - val_acc: 0.8860
Epoch 14/30
 - 4s - loss: 0.3817 - acc: 0.8957 - val_loss: 0.6313 - val_acc: 0.8314
Epoch 15/30
 - 4s - loss: 0.3750 - acc: 0.9010 - val_loss: 0.5276 - val_acc: 0.8069
Epoch 16/30
 - 4s - loss: 0.3744 - acc: 0.8988 - val_loss: 0.4497 - val_acc: 0.8490
Epoch 17/30
 - 4s - loss: 0.3640 - acc: 0.9011 - val_loss: 0.3706 - val_acc: 0.8873
Epoch 18/30
 - 4s - loss: 0.3587 - acc: 0.9032 - val_loss: 0.4298 - val_acc: 0.8816
Epoch 19/30
 - 4s - loss: 0.3614 - acc: 0.9021 - val_loss: 0.4474 - val_acc: 0.8680
Epoch 20/30
 - 4s - loss: 0.3690 - acc: 0.8996 - val_loss: 0.4803 - val_acc: 0.8327
Epoch 21/30
 - 4s - loss: 0.3646 - acc: 0.9059 - val_loss: 0.4852 - val_acc: 0.8191
```

```
Epoch 22/30
 - 4s - loss: 0.3619 - acc: 0.9066 - val_loss: 0.8657 - val_acc: 0.7061
Epoch 23/30
 - 4s - loss: 0.3597 - acc: 0.9060 - val_loss: 0.4068 - val_acc: 0.8863
Epoch 24/30
 - 4s - loss: 0.3690 - acc: 0.9003 - val_loss: 0.6379 - val_acc: 0.8188
Epoch 25/30
 - 4s - loss: 0.3586 - acc: 0.9021 - val_loss: 0.4374 - val_acc: 0.8670
Epoch 26/30
 - 4s - loss: 0.3593 - acc: 0.9045 - val_loss: 0.4816 - val_acc: 0.8375
Epoch 27/30
 - 4s - loss: 0.3702 - acc: 0.9060 - val_loss: 0.7920 - val_acc: 0.7594
Epoch 28/30
 - 4s - loss: 0.3581 - acc: 0.9048 - val_loss: 0.4391 - val_acc: 0.8565
Epoch 29/30
 - 4s - loss: 0.3517 - acc: 0.9076 - val_loss: 0.7177 - val_acc: 0.7917
Epoch 30/30
 - 4s - loss: 0.3618 - acc: 0.9041 - val_loss: 0.3884 - val_acc: 0.8904
Train accuracy 0.925734494015234 Test accuracy: 0.8903970139124533
----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_95 (Conv1D)	(None, 126, 32)	896
conv1d_96 (Conv1D)	(None, 124, 16)	1552
dropout_48 (Dropout)	(None, 124, 16)	0
max_pooling1d_48 (MaxPooling	(None, 41, 16)	0
flatten_48 (Flatten)	(None, 656)	0
dense_95 (Dense)	(None, 32)	21024
dense_96 (Dense)	(None, 6)	198

```
Total params: 23,670
Trainable params: 23,670
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
```

```
Epoch 1/25
 - 7s - loss: 3.9199 - acc: 0.7568 - val_loss: 1.3115 - val_acc: 0.8504
Epoch 2/25
 - 4s - loss: 0.5764 - acc: 0.9207 - val_loss: 0.6236 - val_acc: 0.8259
Epoch 3/25
 - 5s - loss: 0.3302 - acc: 0.9264 - val_loss: 0.4838 - val_acc: 0.8850
Epoch 4/25
 - 4s - loss: 0.2730 - acc: 0.9343 - val_loss: 0.4120 - val_acc: 0.8989
Epoch 5/25
 - 4s - loss: 0.2438 - acc: 0.9408 - val_loss: 0.4230 - val_acc: 0.8867
Epoch 6/25
 - 4s - loss: 0.2204 - acc: 0.9456 - val_loss: 0.3906 - val_acc: 0.9070
Epoch 7/25
 - 4s - loss: 0.2359 - acc: 0.9388 - val_loss: 0.3531 - val_acc: 0.8985
Epoch 8/25
 - 4s - loss: 0.2122 - acc: 0.9476 - val_loss: 0.3350 - val_acc: 0.9074
Epoch 9/25
 - 5s - loss: 0.2003 - acc: 0.9425 - val_loss: 0.3846 - val_acc: 0.8846
Epoch 10/25
 - 4s - loss: 0.1874 - acc: 0.9498 - val_loss: 0.3056 - val_acc: 0.9233
Epoch 11/25
 - 5s - loss: 0.1895 - acc: 0.9494 - val_loss: 0.3580 - val_acc: 0.9118
Epoch 12/25
 - 4s - loss: 0.1969 - acc: 0.9444 - val_loss: 0.3796 - val_acc: 0.8982
Epoch 13/25
 - 4s - loss: 0.1860 - acc: 0.9509 - val_loss: 0.3324 - val_acc: 0.9013
Epoch 14/25
 - 5s - loss: 0.1712 - acc: 0.9543 - val_loss: 0.3050 - val_acc: 0.9135
Epoch 15/25
 - 4s - loss: 0.1810 - acc: 0.9475 - val_loss: 0.3063 - val_acc: 0.9094
Epoch 16/25
 - 4s - loss: 0.1636 - acc: 0.9516 - val_loss: 0.3497 - val_acc: 0.9104
Epoch 17/25
 - 5s - loss: 0.1579 - acc: 0.9535 - val_loss: 0.3284 - val_acc: 0.9077
Epoch 18/25
 - 4s - loss: 0.1715 - acc: 0.9495 - val_loss: 0.2929 - val_acc: 0.9209
Epoch 19/25
 - 4s - loss: 0.1720 - acc: 0.9510 - val_loss: 0.2761 - val_acc: 0.9002
Epoch 20/25
 - 4s - loss: 0.1516 - acc: 0.9565 - val_loss: 0.3332 - val_acc: 0.9050
Epoch 21/25
 - 4s - loss: 0.1854 - acc: 0.9433 - val_loss: 0.3419 - val_acc: 0.8972
Epoch 22/25
```

```
 - 4s - loss: 0.1568 - acc: 0.9539 - val_loss: 0.3314 - val_acc: 0.8989
Epoch 23/25
 - 4s - loss: 0.1568 - acc: 0.9539 - val_loss: 0.3017 - val_acc: 0.9087
Epoch 24/25
 - 4s - loss: 0.1506 - acc: 0.9538 - val_loss: 0.3026 - val_acc: 0.9070
Epoch 25/25
 - 4s - loss: 0.1608 - acc: 0.9533 - val_loss: 0.2811 - val_acc: 0.9145
Train accuracy 0.9613710554951034 Test accuracy: 0.9144893111638955
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_97 (Conv1D)	(None, 126, 32)	896
conv1d_98 (Conv1D)	(None, 124, 16)	1552
dropout_49 (Dropout)	(None, 124, 16)	0
max_pooling1d_49 (MaxPooling	(None, 62, 16)	0
flatten_49 (Flatten)	(None, 992)	0
dense_97 (Dense)	(None, 64)	63552
dense_98 (Dense)	(None, 6)	390

```
Total params: 66,390
Trainable params: 66,390
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 16.4565 - acc: 0.5947 - val_loss: 3.7476 - val_acc: 0.8012
Epoch 2/25
 - 2s - loss: 1.5969 - acc: 0.8796 - val_loss: 0.9833 - val_acc: 0.8616
Epoch 3/25
 - 2s - loss: 0.6378 - acc: 0.9120 - val_loss: 0.7204 - val_acc: 0.8887
Epoch 4/25
 - 3s - loss: 0.4893 - acc: 0.9211 - val_loss: 0.6302 - val_acc: 0.8806
Epoch 5/25
 - 2s - loss: 0.4115 - acc: 0.9211 - val_loss: 0.5471 - val_acc: 0.8931
Epoch 6/25
```

```
     - 2s - loss: 0.3678 - acc: 0.9256 - val_loss: 0.4995 - val_acc: 0.8935
Epoch 7/25
     - 2s - loss: 0.3099 - acc: 0.9350 - val_loss: 0.4832 - val_acc: 0.8860
Epoch 8/25
     - 2s - loss: 0.3044 - acc: 0.9308 - val_loss: 0.4442 - val_acc: 0.9016
Epoch 9/25
     - 3s - loss: 0.2944 - acc: 0.9319 - val_loss: 0.4784 - val_acc: 0.8677
Epoch 10/25
     - 2s - loss: 0.2729 - acc: 0.9339 - val_loss: 0.4225 - val_acc: 0.9111
Epoch 11/25
     - 2s - loss: 0.2450 - acc: 0.9416 - val_loss: 0.4151 - val_acc: 0.8904
Epoch 12/25
     - 2s - loss: 0.2444 - acc: 0.9384 - val_loss: 0.3890 - val_acc: 0.8863
Epoch 13/25
     - 2s - loss: 0.2417 - acc: 0.9378 - val_loss: 0.4039 - val_acc: 0.8785
Epoch 14/25
     - 3s - loss: 0.2609 - acc: 0.9332 - val_loss: 0.4009 - val_acc: 0.9043
Epoch 15/25
     - 2s - loss: 0.2288 - acc: 0.9391 - val_loss: 0.3991 - val_acc: 0.8846
Epoch 16/25
     - 2s - loss: 0.2235 - acc: 0.9412 - val_loss: 0.3854 - val_acc: 0.8914
Epoch 17/25
     - 3s - loss: 0.2077 - acc: 0.9470 - val_loss: 0.3681 - val_acc: 0.9013
Epoch 18/25
     - 3s - loss: 0.2275 - acc: 0.9376 - val_loss: 0.3870 - val_acc: 0.9080
Epoch 19/25
     - 3s - loss: 0.2135 - acc: 0.9442 - val_loss: 0.3656 - val_acc: 0.8955
Epoch 20/25
     - 2s - loss: 0.2119 - acc: 0.9416 - val_loss: 0.3578 - val_acc: 0.9057
Epoch 21/25
     - 3s - loss: 0.2102 - acc: 0.9437 - val_loss: 0.3854 - val_acc: 0.8907
Epoch 22/25
     - 2s - loss: 0.2099 - acc: 0.9407 - val_loss: 0.3475 - val_acc: 0.8989
Epoch 23/25
     - 2s - loss: 0.1956 - acc: 0.9440 - val_loss: 0.3455 - val_acc: 0.9145
Epoch 24/25
     - 3s - loss: 0.2010 - acc: 0.9442 - val_loss: 0.3476 - val_acc: 0.9030
Epoch 25/25
     - 2s - loss: 0.2221 - acc: 0.9412 - val_loss: 0.3550 - val_acc: 0.9046
Train accuracy 0.9381120783460283 Test accuracy: 0.9046487953851374
---------------------------------------------------------------------------------

_____
Layer (type)                    Output Shape               Param #
```

```
=================================================================
conv1d_99 (Conv1D)            (None, 126, 32)           896
_____
conv1d_100 (Conv1D)           (None, 124, 16)           1552
_____
dropout_50 (Dropout)          (None, 124, 16)           0
_____
max_pooling1d_50 (MaxPooling (None, 41, 16)             0
_____
flatten_50 (Flatten)          (None, 656)               0
_____
dense_99 (Dense)              (None, 32)                21024
_____
dense_100 (Dense)             (None, 6)                 198
=================================================================
Total params: 23,670
Trainable params: 23,670
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 48.8144 - acc: 0.6893 - val_loss: 4.1941 - val_acc: 0.6790
Epoch 2/30
 - 4s - loss: 1.1903 - acc: 0.7703 - val_loss: 0.9750 - val_acc: 0.6943
Epoch 3/30
 - 4s - loss: 0.6784 - acc: 0.8028 - val_loss: 0.8482 - val_acc: 0.7638
Epoch 4/30
 - 4s - loss: 0.6153 - acc: 0.8211 - val_loss: 0.7753 - val_acc: 0.8222
Epoch 5/30
 - 4s - loss: 0.5791 - acc: 0.8405 - val_loss: 0.7997 - val_acc: 0.7754
Epoch 6/30
 - 4s - loss: 0.5462 - acc: 0.8490 - val_loss: 0.7971 - val_acc: 0.7689
Epoch 7/30
 - 4s - loss: 0.5238 - acc: 0.8576 - val_loss: 0.6791 - val_acc: 0.8205
Epoch 8/30
 - 4s - loss: 0.5081 - acc: 0.8613 - val_loss: 0.6642 - val_acc: 0.8059
Epoch 9/30
 - 4s - loss: 0.4941 - acc: 0.8630 - val_loss: 0.7097 - val_acc: 0.7859
Epoch 10/30
 - 4s - loss: 0.4803 - acc: 0.8724 - val_loss: 0.6713 - val_acc: 0.8354
Epoch 11/30
 - 4s - loss: 0.4761 - acc: 0.8692 - val_loss: 0.6530 - val_acc: 0.8371
```

```
Epoch 12/30
 - 4s - loss: 0.4656 - acc: 0.8735 - val_loss: 0.6509 - val_acc: 0.7913
Epoch 13/30
 - 4s - loss: 0.4600 - acc: 0.8727 - val_loss: 0.6125 - val_acc: 0.8344
Epoch 14/30
 - 4s - loss: 0.4551 - acc: 0.8798 - val_loss: 0.6285 - val_acc: 0.8449
Epoch 15/30
 - 4s - loss: 0.4441 - acc: 0.8811 - val_loss: 0.6167 - val_acc: 0.8456
Epoch 16/30
 - 4s - loss: 0.4413 - acc: 0.8853 - val_loss: 0.6444 - val_acc: 0.8198
Epoch 17/30
 - 4s - loss: 0.4287 - acc: 0.8849 - val_loss: 0.6124 - val_acc: 0.8188
Epoch 18/30
 - 4s - loss: 0.4213 - acc: 0.8920 - val_loss: 0.5524 - val_acc: 0.8629
Epoch 19/30
 - 4s - loss: 0.4203 - acc: 0.8866 - val_loss: 0.6787 - val_acc: 0.7604
Epoch 20/30
 - 4s - loss: 0.4217 - acc: 0.8882 - val_loss: 0.6011 - val_acc: 0.8466
Epoch 21/30
 - 4s - loss: 0.4128 - acc: 0.8916 - val_loss: 0.5849 - val_acc: 0.8181
Epoch 22/30
 - 4s - loss: 0.4131 - acc: 0.8901 - val_loss: 0.5697 - val_acc: 0.8388
Epoch 23/30
 - 4s - loss: 0.4116 - acc: 0.8904 - val_loss: 0.5820 - val_acc: 0.8436
Epoch 24/30
 - 4s - loss: 0.3989 - acc: 0.8957 - val_loss: 0.5713 - val_acc: 0.8466
Epoch 25/30
 - 4s - loss: 0.3948 - acc: 0.8949 - val_loss: 0.5398 - val_acc: 0.8595
Epoch 26/30
 - 4s - loss: 0.3994 - acc: 0.8950 - val_loss: 0.8517 - val_acc: 0.7119
Epoch 27/30
 - 4s - loss: 0.3878 - acc: 0.8977 - val_loss: 0.7485 - val_acc: 0.7628
Epoch 28/30
 - 4s - loss: 0.3910 - acc: 0.8984 - val_loss: 0.5619 - val_acc: 0.8331
Epoch 29/30
 - 4s - loss: 0.3803 - acc: 0.8984 - val_loss: 0.5217 - val_acc: 0.8324
Epoch 30/30
 - 4s - loss: 0.3792 - acc: 0.8999 - val_loss: 0.5470 - val_acc: 0.8409
Train accuracy 0.9148531011969532 Test accuracy: 0.8408551068883611
-------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

```
conv1d_101 (Conv1D)          (None, 126, 32)          896
_____
conv1d_102 (Conv1D)          (None, 124, 32)          3104
_____
dropout_51 (Dropout)         (None, 124, 32)          0
_____
max_pooling1d_51 (MaxPooling (None, 41, 32)           0
_____
flatten_51 (Flatten)         (None, 1312)             0
_____
dense_101 (Dense)            (None, 32)               42016
_____
dense_102 (Dense)            (None, 6)                198
=================================================================
Total params: 46,214
Trainable params: 46,214
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 7s - loss: 7.2376 - acc: 0.7301 - val_loss: 1.9546 - val_acc: 0.8327
Epoch 2/35
 - 3s - loss: 0.8647 - acc: 0.9000 - val_loss: 0.7990 - val_acc: 0.8269
Epoch 3/35
 - 4s - loss: 0.4210 - acc: 0.9149 - val_loss: 0.6137 - val_acc: 0.8507
Epoch 4/35
 - 3s - loss: 0.3414 - acc: 0.9246 - val_loss: 0.5740 - val_acc: 0.8605
Epoch 5/35
 - 3s - loss: 0.3235 - acc: 0.9207 - val_loss: 0.5459 - val_acc: 0.8734
Epoch 6/35
 - 4s - loss: 0.3136 - acc: 0.9221 - val_loss: 0.5366 - val_acc: 0.8697
Epoch 7/35
 - 3s - loss: 0.2866 - acc: 0.9261 - val_loss: 0.4931 - val_acc: 0.8724
Epoch 8/35
 - 3s - loss: 0.2726 - acc: 0.9317 - val_loss: 0.4879 - val_acc: 0.8884
Epoch 9/35
 - 3s - loss: 0.2686 - acc: 0.9329 - val_loss: 0.4603 - val_acc: 0.8914
Epoch 10/35
 - 4s - loss: 0.2562 - acc: 0.9325 - val_loss: 0.4843 - val_acc: 0.8843
Epoch 11/35
 - 3s - loss: 0.2531 - acc: 0.9338 - val_loss: 0.4647 - val_acc: 0.8924
Epoch 12/35
```

```
        - 3s - loss: 0.2462 - acc: 0.9344 - val_loss: 0.4693 - val_acc: 0.8826
Epoch 13/35
        - 3s - loss: 0.2455 - acc: 0.9347 - val_loss: 0.4400 - val_acc: 0.8907
Epoch 14/35
        - 4s - loss: 0.2431 - acc: 0.9357 - val_loss: 0.4232 - val_acc: 0.8935
Epoch 15/35
        - 3s - loss: 0.2235 - acc: 0.9399 - val_loss: 0.4123 - val_acc: 0.8951
Epoch 16/35
        - 3s - loss: 0.2200 - acc: 0.9406 - val_loss: 0.4153 - val_acc: 0.8962
Epoch 17/35
        - 4s - loss: 0.2162 - acc: 0.9445 - val_loss: 0.4383 - val_acc: 0.8816
Epoch 18/35
        - 3s - loss: 0.2277 - acc: 0.9410 - val_loss: 0.4660 - val_acc: 0.8711
Epoch 19/35
        - 3s - loss: 0.2346 - acc: 0.9395 - val_loss: 0.3980 - val_acc: 0.8965
Epoch 20/35
        - 3s - loss: 0.2203 - acc: 0.9403 - val_loss: 0.4091 - val_acc: 0.8836
Epoch 21/35
        - 4s - loss: 0.2067 - acc: 0.9445 - val_loss: 0.4286 - val_acc: 0.8758
Epoch 22/35
        - 3s - loss: 0.2040 - acc: 0.9437 - val_loss: 0.4247 - val_acc: 0.8863
Epoch 23/35
        - 3s - loss: 0.2072 - acc: 0.9419 - val_loss: 0.4068 - val_acc: 0.8873
Epoch 24/35
        - 3s - loss: 0.2095 - acc: 0.9406 - val_loss: 0.4240 - val_acc: 0.8948
Epoch 25/35
        - 4s - loss: 0.2030 - acc: 0.9437 - val_loss: 0.4013 - val_acc: 0.8887
Epoch 26/35
        - 3s - loss: 0.2031 - acc: 0.9434 - val_loss: 0.3460 - val_acc: 0.9013
Epoch 27/35
        - 3s - loss: 0.1993 - acc: 0.9433 - val_loss: 0.4110 - val_acc: 0.8894
Epoch 28/35
        - 3s - loss: 0.2109 - acc: 0.9423 - val_loss: 0.3851 - val_acc: 0.8941
Epoch 29/35
        - 4s - loss: 0.1909 - acc: 0.9470 - val_loss: 0.3839 - val_acc: 0.8700
Epoch 30/35
        - 3s - loss: 0.1944 - acc: 0.9436 - val_loss: 0.4124 - val_acc: 0.8819
Epoch 31/35
        - 3s - loss: 0.1880 - acc: 0.9446 - val_loss: 0.3479 - val_acc: 0.9057
Epoch 32/35
        - 3s - loss: 0.1930 - acc: 0.9440 - val_loss: 0.3635 - val_acc: 0.9033
Epoch 33/35
        - 4s - loss: 0.2100 - acc: 0.9406 - val_loss: 0.4027 - val_acc: 0.8823
```

```
Epoch 34/35
 - 3s - loss: 0.1966 - acc: 0.9422 - val_loss: 0.3719 - val_acc: 0.8958
Epoch 35/35
 - 3s - loss: 0.1822 - acc: 0.9467 - val_loss: 0.3555 - val_acc: 0.8958
Train accuracy 0.9435527747551686 Test accuracy: 0.8958262639972854
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_103 (Conv1D)	(None, 126, 32)	896
conv1d_104 (Conv1D)	(None, 124, 16)	1552
dropout_52 (Dropout)	(None, 124, 16)	0
max_pooling1d_52 (MaxPooling	(None, 62, 16)	0
flatten_52 (Flatten)	(None, 992)	0
dense_103 (Dense)	(None, 64)	63552
dense_104 (Dense)	(None, 6)	390

```
Total params: 66,390
Trainable params: 66,390
Non-trainable params: 0


None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 61.2418 - acc: 0.7807 - val_loss: 17.9154 - val_acc: 0.8307
Epoch 2/25
 - 3s - loss: 7.0004 - acc: 0.9026 - val_loss: 2.0242 - val_acc: 0.8775
Epoch 3/25
 - 3s - loss: 0.9250 - acc: 0.9052 - val_loss: 0.7673 - val_acc: 0.8320
Epoch 4/25
 - 3s - loss: 0.5172 - acc: 0.8939 - val_loss: 0.6225 - val_acc: 0.8734
Epoch 5/25
 - 3s - loss: 0.3989 - acc: 0.9127 - val_loss: 0.5753 - val_acc: 0.8785
Epoch 6/25
 - 2s - loss: 0.3933 - acc: 0.9134 - val_loss: 0.4969 - val_acc: 0.8785
Epoch 7/25
 - 3s - loss: 0.3592 - acc: 0.9139 - val_loss: 0.5046 - val_acc: 0.8609
```

```
Epoch 8/25
 - 2s - loss: 0.3358 - acc: 0.9191 - val_loss: 0.4716 - val_acc: 0.8894
Epoch 9/25
 - 2s - loss: 0.3132 - acc: 0.9290 - val_loss: 0.4663 - val_acc: 0.8853
Epoch 10/25
 - 3s - loss: 0.2976 - acc: 0.9286 - val_loss: 0.4955 - val_acc: 0.8860
Epoch 11/25
 - 2s - loss: 0.2789 - acc: 0.9327 - val_loss: 0.4329 - val_acc: 0.8795
Epoch 12/25
 - 3s - loss: 0.3145 - acc: 0.9233 - val_loss: 0.4440 - val_acc: 0.8968
Epoch 13/25
 - 2s - loss: 0.2949 - acc: 0.9301 - val_loss: 0.4286 - val_acc: 0.8911
Epoch 14/25
 - 2s - loss: 0.2932 - acc: 0.9286 - val_loss: 0.4314 - val_acc: 0.8894
Epoch 15/25
 - 3s - loss: 0.2767 - acc: 0.9310 - val_loss: 0.4166 - val_acc: 0.8901
Epoch 16/25
 - 2s - loss: 0.2638 - acc: 0.9361 - val_loss: 0.3961 - val_acc: 0.9080
Epoch 17/25
 - 3s - loss: 0.2878 - acc: 0.9240 - val_loss: 0.4237 - val_acc: 0.8914
Epoch 18/25
 - 2s - loss: 0.2730 - acc: 0.9310 - val_loss: 0.3735 - val_acc: 0.9036
Epoch 19/25
 - 3s - loss: 0.2677 - acc: 0.9316 - val_loss: 0.3703 - val_acc: 0.8975
Epoch 20/25
 - 3s - loss: 0.2409 - acc: 0.9358 - val_loss: 0.3753 - val_acc: 0.8914
Epoch 21/25
 - 2s - loss: 0.2577 - acc: 0.9331 - val_loss: 0.3721 - val_acc: 0.9053
Epoch 22/25
 - 2s - loss: 0.2369 - acc: 0.9380 - val_loss: 0.3560 - val_acc: 0.9033
Epoch 23/25
 - 2s - loss: 0.2323 - acc: 0.9395 - val_loss: 0.4107 - val_acc: 0.8697
Epoch 24/25
 - 2s - loss: 0.2446 - acc: 0.9355 - val_loss: 0.3456 - val_acc: 0.9077
Epoch 25/25
 - 3s - loss: 0.2238 - acc: 0.9389 - val_loss: 0.3664 - val_acc: 0.8918
Train accuracy 0.9435527747551686 Test accuracy: 0.8917543264336614
-------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_105 (Conv1D)          (None, 126, 32)           896
_____
```

```
conv1d_106 (Conv1D)           (None, 124, 16)          1552
_____
dropout_53 (Dropout)          (None, 124, 16)          0
_____
max_pooling1d_53 (MaxPooling  (None, 41, 16)           0
_____
flatten_53 (Flatten)          (None, 656)              0
_____
dense_105 (Dense)             (None, 32)               21024
_____
dense_106 (Dense)             (None, 6)                198
=================================================================
Total params: 23,670
Trainable params: 23,670
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 16.4963 - acc: 0.7205 - val_loss: 0.9762 - val_acc: 0.7618
Epoch 2/25
 - 5s - loss: 0.7177 - acc: 0.7885 - val_loss: 0.8843 - val_acc: 0.7262
Epoch 3/25
 - 5s - loss: 0.6427 - acc: 0.8033 - val_loss: 0.8549 - val_acc: 0.7533
Epoch 4/25
 - 5s - loss: 0.5748 - acc: 0.8334 - val_loss: 0.7417 - val_acc: 0.7693
Epoch 5/25
 - 5s - loss: 0.5670 - acc: 0.8413 - val_loss: 0.7641 - val_acc: 0.8005
Epoch 6/25
 - 4s - loss: 0.5483 - acc: 0.8477 - val_loss: 0.8034 - val_acc: 0.7577
Epoch 7/25
 - 5s - loss: 0.5015 - acc: 0.8679 - val_loss: 0.7603 - val_acc: 0.7838
Epoch 8/25
 - 5s - loss: 0.4859 - acc: 0.8700 - val_loss: 0.6257 - val_acc: 0.8483
Epoch 9/25
 - 5s - loss: 0.4862 - acc: 0.8690 - val_loss: 0.6675 - val_acc: 0.8120
Epoch 10/25
 - 5s - loss: 0.4650 - acc: 0.8716 - val_loss: 0.6007 - val_acc: 0.8551
Epoch 11/25
 - 5s - loss: 0.4490 - acc: 0.8837 - val_loss: 0.8165 - val_acc: 0.6970
Epoch 12/25
 - 5s - loss: 0.4440 - acc: 0.8815 - val_loss: 0.6560 - val_acc: 0.8358
Epoch 13/25
```

```
  - 4s - loss: 0.4510 - acc: 0.8821 - val_loss: 0.6922 - val_acc: 0.7920
Epoch 14/25
  - 5s - loss: 0.4448 - acc: 0.8808 - val_loss: 0.5452 - val_acc: 0.8551
Epoch 15/25
  - 5s - loss: 0.4215 - acc: 0.8905 - val_loss: 0.6148 - val_acc: 0.8364
Epoch 16/25
  - 5s - loss: 0.4211 - acc: 0.8908 - val_loss: 0.6086 - val_acc: 0.8364
Epoch 17/25
  - 5s - loss: 0.4142 - acc: 0.8913 - val_loss: 0.5331 - val_acc: 0.8537
Epoch 18/25
  - 4s - loss: 0.4037 - acc: 0.8946 - val_loss: 0.6793 - val_acc: 0.7917
Epoch 19/25
  - 4s - loss: 0.4182 - acc: 0.8916 - val_loss: 0.6947 - val_acc: 0.7876
Epoch 20/25
  - 5s - loss: 0.4134 - acc: 0.8947 - val_loss: 0.4953 - val_acc: 0.8521
Epoch 21/25
  - 4s - loss: 0.4253 - acc: 0.8894 - val_loss: 0.6991 - val_acc: 0.7998
Epoch 22/25
  - 5s - loss: 0.4191 - acc: 0.8909 - val_loss: 0.5239 - val_acc: 0.8554
Epoch 23/25
  - 5s - loss: 0.3939 - acc: 0.8965 - val_loss: 0.5239 - val_acc: 0.8290
Epoch 24/25
  - 4s - loss: 0.3978 - acc: 0.9004 - val_loss: 0.5010 - val_acc: 0.8571
Epoch 25/25
  - 5s - loss: 0.3926 - acc: 0.8983 - val_loss: 0.5566 - val_acc: 0.8521
Train accuracy 0.8876496191512514 Test accuracy: 0.8520529351883271
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_107 (Conv1D)	(None, 126, 32)	896
conv1d_108 (Conv1D)	(None, 124, 16)	1552
dropout_54 (Dropout)	(None, 124, 16)	0
max_pooling1d_54 (MaxPooling	(None, 41, 16)	0
flatten_54 (Flatten)	(None, 656)	0
dense_107 (Dense)	(None, 32)	21024
dense_108 (Dense)	(None, 6)	198

```
=================================================================
Total params: 23,670
Trainable params: 23,670
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 7.2943 - acc: 0.7276 - val_loss: 0.8502 - val_acc: 0.7431
Epoch 2/30
 - 3s - loss: 0.5941 - acc: 0.8410 - val_loss: 0.7489 - val_acc: 0.7570
Epoch 3/30
 - 3s - loss: 0.5049 - acc: 0.8648 - val_loss: 0.6635 - val_acc: 0.8062
Epoch 4/30
 - 3s - loss: 0.4655 - acc: 0.8711 - val_loss: 0.5653 - val_acc: 0.8531
Epoch 5/30
 - 3s - loss: 0.4304 - acc: 0.8838 - val_loss: 0.5208 - val_acc: 0.8616
Epoch 6/30
 - 4s - loss: 0.3982 - acc: 0.8901 - val_loss: 0.5428 - val_acc: 0.8578
Epoch 7/30
 - 3s - loss: 0.3815 - acc: 0.8980 - val_loss: 0.7239 - val_acc: 0.7750
Epoch 8/30
 - 3s - loss: 0.3717 - acc: 0.8989 - val_loss: 0.5074 - val_acc: 0.8649
Epoch 9/30
 - 3s - loss: 0.3615 - acc: 0.9022 - val_loss: 0.4470 - val_acc: 0.8962
Epoch 10/30
 - 4s - loss: 0.3477 - acc: 0.9066 - val_loss: 0.4825 - val_acc: 0.8636
Epoch 11/30
 - 3s - loss: 0.3445 - acc: 0.9048 - val_loss: 0.4878 - val_acc: 0.8490
Epoch 12/30
 - 3s - loss: 0.3378 - acc: 0.9097 - val_loss: 0.5034 - val_acc: 0.8602
Epoch 13/30
 - 4s - loss: 0.3318 - acc: 0.9085 - val_loss: 0.4340 - val_acc: 0.8924
Epoch 14/30
 - 3s - loss: 0.3295 - acc: 0.9104 - val_loss: 0.4473 - val_acc: 0.8809
Epoch 15/30
 - 3s - loss: 0.3224 - acc: 0.9187 - val_loss: 0.4072 - val_acc: 0.8938
Epoch 16/30
 - 3s - loss: 0.3168 - acc: 0.9129 - val_loss: 0.4318 - val_acc: 0.8761
Epoch 17/30
 - 4s - loss: 0.3249 - acc: 0.9119 - val_loss: 0.4234 - val_acc: 0.8833
Epoch 18/30
 - 3s - loss: 0.3150 - acc: 0.9159 - val_loss: 0.4262 - val_acc: 0.8778
```

```
Epoch 19/30
 - 3s - loss: 0.3131 - acc: 0.9158 - val_loss: 0.4219 - val_acc: 0.8680
Epoch 20/30
 - 4s - loss: 0.3087 - acc: 0.9153 - val_loss: 0.4145 - val_acc: 0.8755
Epoch 21/30
 - 3s - loss: 0.3102 - acc: 0.9183 - val_loss: 0.5523 - val_acc: 0.8415
Epoch 22/30
 - 3s - loss: 0.3104 - acc: 0.9172 - val_loss: 0.7635 - val_acc: 0.7448
Epoch 23/30
 - 3s - loss: 0.3073 - acc: 0.9150 - val_loss: 0.7141 - val_acc: 0.7628
Epoch 24/30
 - 4s - loss: 0.3022 - acc: 0.9212 - val_loss: 0.4858 - val_acc: 0.8259
Epoch 25/30
 - 3s - loss: 0.3095 - acc: 0.9219 - val_loss: 0.5848 - val_acc: 0.7947
Epoch 26/30
 - 3s - loss: 0.2968 - acc: 0.9222 - val_loss: 0.5530 - val_acc: 0.8107
Epoch 27/30
 - 4s - loss: 0.2942 - acc: 0.9215 - val_loss: 0.4663 - val_acc: 0.8537
Epoch 28/30
 - 3s - loss: 0.3014 - acc: 0.9189 - val_loss: 0.4815 - val_acc: 0.8263
Epoch 29/30
 - 3s - loss: 0.2998 - acc: 0.9187 - val_loss: 0.6146 - val_acc: 0.7825
Epoch 30/30
 - 4s - loss: 0.3029 - acc: 0.9177 - val_loss: 0.5795 - val_acc: 0.8025
Train accuracy 0.8590859630032645 Test accuracy: 0.8025110281642348
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_109 (Conv1D)	(None, 126, 32)	896
conv1d_110 (Conv1D)	(None, 124, 32)	3104
dropout_55 (Dropout)	(None, 124, 32)	0
max_pooling1d_55 (MaxPooling	(None, 62, 32)	0
flatten_55 (Flatten)	(None, 1984)	0
dense_109 (Dense)	(None, 32)	63520
dense_110 (Dense)	(None, 6)	198

```
Total params: 67,718
Trainable params: 67,718
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 8.6993 - acc: 0.7422 - val_loss: 0.9144 - val_acc: 0.7784
Epoch 2/25
 - 5s - loss: 0.5869 - acc: 0.8547 - val_loss: 0.7051 - val_acc: 0.8303
Epoch 3/25
 - 5s - loss: 0.4864 - acc: 0.8800 - val_loss: 0.6360 - val_acc: 0.8276
Epoch 4/25
 - 5s - loss: 0.4354 - acc: 0.8913 - val_loss: 0.6226 - val_acc: 0.8449
Epoch 5/25
 - 5s - loss: 0.4105 - acc: 0.8932 - val_loss: 0.5604 - val_acc: 0.8558
Epoch 6/25
 - 5s - loss: 0.3962 - acc: 0.8989 - val_loss: 0.6237 - val_acc: 0.8049
Epoch 7/25
 - 5s - loss: 0.3891 - acc: 0.9027 - val_loss: 0.5631 - val_acc: 0.8487
Epoch 8/25
 - 5s - loss: 0.3631 - acc: 0.9071 - val_loss: 0.5022 - val_acc: 0.8568
Epoch 9/25
 - 5s - loss: 0.3509 - acc: 0.9106 - val_loss: 0.5078 - val_acc: 0.8738
Epoch 10/25
 - 5s - loss: 0.3263 - acc: 0.9173 - val_loss: 0.4969 - val_acc: 0.8483
Epoch 11/25
 - 5s - loss: 0.3202 - acc: 0.9200 - val_loss: 0.4656 - val_acc: 0.8616
Epoch 12/25
 - 5s - loss: 0.3206 - acc: 0.9196 - val_loss: 0.4649 - val_acc: 0.8785
Epoch 13/25
 - 5s - loss: 0.3091 - acc: 0.9232 - val_loss: 0.4803 - val_acc: 0.8812
Epoch 14/25
 - 5s - loss: 0.3051 - acc: 0.9263 - val_loss: 0.4823 - val_acc: 0.8619
Epoch 15/25
 - 5s - loss: 0.2792 - acc: 0.9289 - val_loss: 0.5387 - val_acc: 0.8429
Epoch 16/25
 - 5s - loss: 0.3156 - acc: 0.9218 - val_loss: 0.4439 - val_acc: 0.8626
Epoch 17/25
 - 5s - loss: 0.2922 - acc: 0.9238 - val_loss: 0.4209 - val_acc: 0.8924
Epoch 18/25
 - 5s - loss: 0.2949 - acc: 0.9249 - val_loss: 0.3998 - val_acc: 0.8921
Epoch 19/25
```

```
 - 5s - loss: 0.3135 - acc: 0.9197 - val_loss: 0.4041 - val_acc: 0.8856
Epoch 20/25
 - 5s - loss: 0.3087 - acc: 0.9219 - val_loss: 0.4810 - val_acc: 0.8551
Epoch 21/25
 - 5s - loss: 0.3053 - acc: 0.9222 - val_loss: 0.3927 - val_acc: 0.8812
Epoch 22/25
 - 5s - loss: 0.2906 - acc: 0.9253 - val_loss: 0.4503 - val_acc: 0.8761
Epoch 23/25
 - 5s - loss: 0.2750 - acc: 0.9282 - val_loss: 0.4167 - val_acc: 0.8687
Epoch 24/25
 - 5s - loss: 0.2985 - acc: 0.9210 - val_loss: 0.4217 - val_acc: 0.8768
Epoch 25/25
 - 5s - loss: 0.2726 - acc: 0.9304 - val_loss: 0.4347 - val_acc: 0.8551
Train accuracy 0.9181175190424374 Test accuracy: 0.8551068883610451
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_111 (Conv1D)	(None, 126, 32)	896
conv1d_112 (Conv1D)	(None, 124, 16)	1552
dropout_56 (Dropout)	(None, 124, 16)	0
max_pooling1d_56 (MaxPooling	(None, 41, 16)	0
flatten_56 (Flatten)	(None, 656)	0
dense_111 (Dense)	(None, 64)	42048
dense_112 (Dense)	(None, 6)	390

```
Total params: 44,886
Trainable params: 44,886
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 5s - loss: 27.9803 - acc: 0.7326 - val_loss: 4.8843 - val_acc: 0.8341
Epoch 2/35
 - 2s - loss: 1.7250 - acc: 0.8796 - val_loss: 0.9626 - val_acc: 0.8531
Epoch 3/35
```

```
         - 2s - loss: 0.5489 - acc: 0.8970 - val_loss: 0.7314 - val_acc: 0.8690
        Epoch 4/35
         - 2s - loss: 0.4823 - acc: 0.8976 - val_loss: 0.7276 - val_acc: 0.8517
        Epoch 5/35
         - 2s - loss: 0.4579 - acc: 0.8988 - val_loss: 0.6242 - val_acc: 0.8812
        Epoch 6/35
         - 2s - loss: 0.4022 - acc: 0.9132 - val_loss: 0.6094 - val_acc: 0.8711
        Epoch 7/35
         - 2s - loss: 0.4023 - acc: 0.9068 - val_loss: 0.5805 - val_acc: 0.8717
        Epoch 8/35
         - 2s - loss: 0.3912 - acc: 0.9120 - val_loss: 0.5675 - val_acc: 0.8687
        Epoch 9/35
         - 2s - loss: 0.3744 - acc: 0.9151 - val_loss: 0.5704 - val_acc: 0.8646
        Epoch 10/35
         - 2s - loss: 0.3729 - acc: 0.9116 - val_loss: 0.5922 - val_acc: 0.8558
        Epoch 11/35
         - 2s - loss: 0.3599 - acc: 0.9142 - val_loss: 0.5119 - val_acc: 0.8789
        Epoch 12/35
         - 2s - loss: 0.3326 - acc: 0.9197 - val_loss: 0.4924 - val_acc: 0.9002
        Epoch 13/35
         - 2s - loss: 0.3300 - acc: 0.9226 - val_loss: 0.5215 - val_acc: 0.8690
        Epoch 14/35
         - 2s - loss: 0.3783 - acc: 0.9075 - val_loss: 0.5516 - val_acc: 0.8683
        Epoch 15/35
         - 2s - loss: 0.3454 - acc: 0.9181 - val_loss: 0.5556 - val_acc: 0.8521
        Epoch 16/35
         - 2s - loss: 0.3029 - acc: 0.9256 - val_loss: 0.5167 - val_acc: 0.8490
        Epoch 17/35
         - 2s - loss: 0.3295 - acc: 0.9169 - val_loss: 0.5313 - val_acc: 0.8429
        Epoch 18/35
         - 2s - loss: 0.3239 - acc: 0.9177 - val_loss: 0.4892 - val_acc: 0.8880
        Epoch 19/35
         - 2s - loss: 0.3016 - acc: 0.9241 - val_loss: 0.4432 - val_acc: 0.8968
        Epoch 20/35
         - 2s - loss: 0.3012 - acc: 0.9274 - val_loss: 0.4653 - val_acc: 0.8738
        Epoch 21/35
         - 2s - loss: 0.3161 - acc: 0.9225 - val_loss: 0.5062 - val_acc: 0.8497
        Epoch 22/35
         - 2s - loss: 0.3164 - acc: 0.9255 - val_loss: 0.4527 - val_acc: 0.8728
        Epoch 23/35
         - 2s - loss: 0.3161 - acc: 0.9203 - val_loss: 0.4972 - val_acc: 0.8347
        Epoch 24/35
         - 2s - loss: 0.2993 - acc: 0.9259 - val_loss: 0.5269 - val_acc: 0.8290
```

```
Epoch 25/35
 - 2s - loss: 0.2912 - acc: 0.9300 - val_loss: 0.4920 - val_acc: 0.8585
Epoch 26/35
 - 2s - loss: 0.3039 - acc: 0.9289 - val_loss: 0.5328 - val_acc: 0.8076
Epoch 27/35
 - 2s - loss: 0.2863 - acc: 0.9274 - val_loss: 0.6839 - val_acc: 0.7805
Epoch 28/35
 - 2s - loss: 0.3049 - acc: 0.9226 - val_loss: 0.5165 - val_acc: 0.8307
Epoch 29/35
 - 2s - loss: 0.2806 - acc: 0.9295 - val_loss: 0.4749 - val_acc: 0.8493
Epoch 30/35
 - 2s - loss: 0.2847 - acc: 0.9260 - val_loss: 0.5675 - val_acc: 0.8361
Epoch 31/35
 - 2s - loss: 0.3033 - acc: 0.9251 - val_loss: 0.5231 - val_acc: 0.8137
Epoch 32/35
 - 2s - loss: 0.2704 - acc: 0.9350 - val_loss: 0.4261 - val_acc: 0.8694
Epoch 33/35
 - 2s - loss: 0.2841 - acc: 0.9278 - val_loss: 0.4470 - val_acc: 0.8565
Epoch 34/35
 - 2s - loss: 0.3377 - acc: 0.9181 - val_loss: 0.5030 - val_acc: 0.8497
Epoch 35/35
 - 2s - loss: 0.2961 - acc: 0.9260 - val_loss: 0.4879 - val_acc: 0.8402
Train accuracy 0.8993471164309031 Test accuracy: 0.840176450627757
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_113 (Conv1D)	(None, 122, 32)	2048
conv1d_114 (Conv1D)	(None, 120, 24)	2328
dropout_57 (Dropout)	(None, 120, 24)	0
max_pooling1d_57 (MaxPooling	(None, 40, 24)	0
flatten_57 (Flatten)	(None, 960)	0
dense_113 (Dense)	(None, 32)	30752
dense_114 (Dense)	(None, 6)	198

```
Total params: 35,326
Trainable params: 35,326
```

```
      Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 11.9047 - acc: 0.7330 - val_loss: 1.0429 - val_acc: 0.8388
Epoch 2/25
 - 4s - loss: 0.5299 - acc: 0.9006 - val_loss: 0.7633 - val_acc: 0.7896
Epoch 3/25
 - 4s - loss: 0.4528 - acc: 0.9064 - val_loss: 0.6281 - val_acc: 0.8914
Epoch 4/25
 - 4s - loss: 0.3801 - acc: 0.9203 - val_loss: 0.5500 - val_acc: 0.8972
Epoch 5/25
 - 4s - loss: 0.3590 - acc: 0.9234 - val_loss: 0.5300 - val_acc: 0.9067
Epoch 6/25
 - 4s - loss: 0.3219 - acc: 0.9336 - val_loss: 0.4778 - val_acc: 0.9114
Epoch 7/25
 - 4s - loss: 0.3146 - acc: 0.9314 - val_loss: 0.4738 - val_acc: 0.9209
Epoch 8/25
 - 4s - loss: 0.2984 - acc: 0.9348 - val_loss: 0.4679 - val_acc: 0.8965
Epoch 9/25
 - 4s - loss: 0.2966 - acc: 0.9324 - val_loss: 0.4545 - val_acc: 0.8996
Epoch 10/25
 - 4s - loss: 0.2879 - acc: 0.9372 - val_loss: 0.4596 - val_acc: 0.8951
Epoch 11/25
 - 4s - loss: 0.2605 - acc: 0.9369 - val_loss: 0.4331 - val_acc: 0.9087
Epoch 12/25
 - 4s - loss: 0.2811 - acc: 0.9325 - val_loss: 0.4510 - val_acc: 0.8880
Epoch 13/25
 - 4s - loss: 0.2786 - acc: 0.9289 - val_loss: 0.4101 - val_acc: 0.9101
Epoch 14/25
 - 4s - loss: 0.2687 - acc: 0.9357 - val_loss: 0.4053 - val_acc: 0.9094
Epoch 15/25
 - 4s - loss: 0.2467 - acc: 0.9358 - val_loss: 0.4430 - val_acc: 0.8744
Epoch 16/25
 - 4s - loss: 0.2594 - acc: 0.9343 - val_loss: 0.3756 - val_acc: 0.9118
Epoch 17/25
 - 4s - loss: 0.2373 - acc: 0.9392 - val_loss: 0.4044 - val_acc: 0.9013
Epoch 18/25
 - 4s - loss: 0.2518 - acc: 0.9340 - val_loss: 0.4091 - val_acc: 0.8999
Epoch 19/25
 - 4s - loss: 0.2256 - acc: 0.9395 - val_loss: 0.4113 - val_acc: 0.9030
Epoch 20/25
```

```
   - 4s - loss: 0.2416 - acc: 0.9382 - val_loss: 0.3761 - val_acc: 0.9063
Epoch 21/25
   - 4s - loss: 0.2725 - acc: 0.9342 - val_loss: 0.4235 - val_acc: 0.8700
Epoch 22/25
   - 4s - loss: 0.2309 - acc: 0.9408 - val_loss: 0.3487 - val_acc: 0.9094
Epoch 23/25
   - 4s - loss: 0.2238 - acc: 0.9393 - val_loss: 0.3771 - val_acc: 0.8921
Epoch 24/25
   - 4s - loss: 0.2318 - acc: 0.9395 - val_loss: 0.3915 - val_acc: 0.8948
Epoch 25/25
   - 4s - loss: 0.2398 - acc: 0.9385 - val_loss: 0.3975 - val_acc: 0.8992
Train accuracy 0.9426006528835691 Test accuracy: 0.8992195453003053
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_115 (Conv1D)	(None, 126, 42)	1176
conv1d_116 (Conv1D)	(None, 124, 16)	2032
dropout_58 (Dropout)	(None, 124, 16)	0
max_pooling1d_58 (MaxPooling	(None, 62, 16)	0
flatten_58 (Flatten)	(None, 992)	0
dense_115 (Dense)	(None, 32)	31776
dense_116 (Dense)	(None, 6)	198

```
Total params: 35,182
Trainable params: 35,182
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
   - 6s - loss: 14.7012 - acc: 0.6877 - val_loss: 0.8706 - val_acc: 0.7360
Epoch 2/30
   - 3s - loss: 0.6944 - acc: 0.7756 - val_loss: 0.8193 - val_acc: 0.7041
Epoch 3/30
   - 3s - loss: 0.6406 - acc: 0.7889 - val_loss: 0.8631 - val_acc: 0.6956
Epoch 4/30
```

```
           - 3s - loss: 0.5999 - acc: 0.8164 - val_loss: 0.6735 - val_acc: 0.8215
Epoch 5/30
           - 3s - loss: 0.5779 - acc: 0.8229 - val_loss: 0.6811 - val_acc: 0.7900
Epoch 6/30
           - 4s - loss: 0.5616 - acc: 0.8368 - val_loss: 0.7271 - val_acc: 0.7516
Epoch 7/30
           - 3s - loss: 0.5464 - acc: 0.8478 - val_loss: 0.6052 - val_acc: 0.8320
Epoch 8/30
           - 4s - loss: 0.5315 - acc: 0.8543 - val_loss: 0.5811 - val_acc: 0.8527
Epoch 9/30
           - 3s - loss: 0.5092 - acc: 0.8615 - val_loss: 0.7547 - val_acc: 0.7231
Epoch 10/30
           - 3s - loss: 0.5060 - acc: 0.8584 - val_loss: 0.6030 - val_acc: 0.8249
Epoch 11/30
           - 4s - loss: 0.4834 - acc: 0.8675 - val_loss: 0.5663 - val_acc: 0.8500
Epoch 12/30
           - 4s - loss: 0.4845 - acc: 0.8712 - val_loss: 0.7085 - val_acc: 0.7655
Epoch 13/30
           - 4s - loss: 0.4791 - acc: 0.8742 - val_loss: 0.8315 - val_acc: 0.6878
Epoch 14/30
           - 3s - loss: 0.4715 - acc: 0.8764 - val_loss: 0.5696 - val_acc: 0.8534
Epoch 15/30
           - 4s - loss: 0.4533 - acc: 0.8830 - val_loss: 0.5168 - val_acc: 0.8687
Epoch 16/30
           - 4s - loss: 0.4437 - acc: 0.8872 - val_loss: 0.6593 - val_acc: 0.8100
Epoch 17/30
           - 4s - loss: 0.4491 - acc: 0.8818 - val_loss: 0.5698 - val_acc: 0.8300
Epoch 18/30
           - 4s - loss: 0.4456 - acc: 0.8821 - val_loss: 0.6786 - val_acc: 0.8168
Epoch 19/30
           - 3s - loss: 0.4313 - acc: 0.8872 - val_loss: 0.5501 - val_acc: 0.8354
Epoch 20/30
           - 4s - loss: 0.4336 - acc: 0.8834 - val_loss: 0.5132 - val_acc: 0.8544
Epoch 21/30
           - 3s - loss: 0.4324 - acc: 0.8874 - val_loss: 0.5285 - val_acc: 0.8558
Epoch 22/30
           - 3s - loss: 0.4168 - acc: 0.8891 - val_loss: 0.5715 - val_acc: 0.8327
Epoch 23/30
           - 3s - loss: 0.4104 - acc: 0.8916 - val_loss: 0.5952 - val_acc: 0.7900
Epoch 24/30
           - 4s - loss: 0.4203 - acc: 0.8908 - val_loss: 0.5545 - val_acc: 0.8660
Epoch 25/30
           - 4s - loss: 0.4052 - acc: 0.8955 - val_loss: 0.5544 - val_acc: 0.8524
```

```
Epoch 26/30
 - 4s - loss: 0.4167 - acc: 0.8909 - val_loss: 0.5528 - val_acc: 0.8320
Epoch 27/30
 - 3s - loss: 0.4202 - acc: 0.8921 - val_loss: 0.8486 - val_acc: 0.7513
Epoch 28/30
 - 3s - loss: 0.4147 - acc: 0.8939 - val_loss: 0.7550 - val_acc: 0.7662
Epoch 29/30
 - 4s - loss: 0.4339 - acc: 0.8874 - val_loss: 0.5216 - val_acc: 0.8548
Epoch 30/30
 - 3s - loss: 0.4258 - acc: 0.8906 - val_loss: 0.5663 - val_acc: 0.8303
Train accuracy 0.8703754080522307 Test accuracy: 0.830335934848999
-------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_117 (Conv1D)          (None, 126, 32)           896
_____
conv1d_118 (Conv1D)          (None, 122, 16)           2576
_____
dropout_59 (Dropout)         (None, 122, 16)           0
_____
max_pooling1d_59 (MaxPooling (None, 40, 16)            0
_____
flatten_59 (Flatten)         (None, 640)               0
_____
dense_117 (Dense)            (None, 32)                20512
_____
dense_118 (Dense)            (None, 6)                 198
=================================================================
Total params: 24,182
Trainable params: 24,182
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 30.8358 - acc: 0.7058 - val_loss: 4.4262 - val_acc: 0.7044
Epoch 2/25
 - 3s - loss: 1.6429 - acc: 0.8126 - val_loss: 0.9871 - val_acc: 0.7808
Epoch 3/25
 - 3s - loss: 0.6854 - acc: 0.8286 - val_loss: 0.8757 - val_acc: 0.7448
Epoch 4/25
 - 3s - loss: 0.6262 - acc: 0.8341 - val_loss: 0.8295 - val_acc: 0.7696
```

```
Epoch 5/25
 - 3s - loss: 0.5936 - acc: 0.8429 - val_loss: 0.7578 - val_acc: 0.8246
Epoch 6/25
 - 3s - loss: 0.5399 - acc: 0.8606 - val_loss: 0.7201 - val_acc: 0.8283
Epoch 7/25
 - 3s - loss: 0.5115 - acc: 0.8711 - val_loss: 0.7028 - val_acc: 0.8398
Epoch 8/25
 - 3s - loss: 0.4914 - acc: 0.8735 - val_loss: 0.6664 - val_acc: 0.8307
Epoch 9/25
 - 3s - loss: 0.4766 - acc: 0.8785 - val_loss: 0.6513 - val_acc: 0.8012
Epoch 10/25
 - 3s - loss: 0.4898 - acc: 0.8681 - val_loss: 0.6588 - val_acc: 0.8310
Epoch 11/25
 - 3s - loss: 0.4643 - acc: 0.8757 - val_loss: 0.5893 - val_acc: 0.8470
Epoch 12/25
 - 3s - loss: 0.4451 - acc: 0.8817 - val_loss: 0.6121 - val_acc: 0.8358
Epoch 13/25
 - 3s - loss: 0.4549 - acc: 0.8784 - val_loss: 0.6512 - val_acc: 0.8504
Epoch 14/25
 - 3s - loss: 0.4309 - acc: 0.8864 - val_loss: 0.5802 - val_acc: 0.8419
Epoch 15/25
 - 3s - loss: 0.4286 - acc: 0.8844 - val_loss: 0.5748 - val_acc: 0.8442
Epoch 16/25
 - 3s - loss: 0.4097 - acc: 0.8936 - val_loss: 0.6548 - val_acc: 0.8344
Epoch 17/25
 - 3s - loss: 0.4001 - acc: 0.8968 - val_loss: 0.6155 - val_acc: 0.8320
Epoch 18/25
 - 3s - loss: 0.3991 - acc: 0.8940 - val_loss: 0.6884 - val_acc: 0.7801
Epoch 19/25
 - 3s - loss: 0.3960 - acc: 0.8954 - val_loss: 0.5954 - val_acc: 0.8470
Epoch 20/25
 - 3s - loss: 0.3976 - acc: 0.8945 - val_loss: 0.5961 - val_acc: 0.8541
Epoch 21/25
 - 3s - loss: 0.3984 - acc: 0.8927 - val_loss: 0.5921 - val_acc: 0.8609
Epoch 22/25
 - 3s - loss: 0.3844 - acc: 0.9037 - val_loss: 0.5499 - val_acc: 0.8731
Epoch 23/25
 - 3s - loss: 0.3692 - acc: 0.9052 - val_loss: 0.6297 - val_acc: 0.8683
Epoch 24/25
 - 3s - loss: 0.3578 - acc: 0.9076 - val_loss: 0.5555 - val_acc: 0.8571
Epoch 25/25
 - 3s - loss: 0.3592 - acc: 0.9101 - val_loss: 0.5500 - val_acc: 0.8653
Train accuracy 0.9319912948857454 Test accuracy: 0.8652867322701052
```

```
                 -------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_119 (Conv1D)	(None, 122, 32)	2048
conv1d_120 (Conv1D)	(None, 120, 24)	2328
dropout_60 (Dropout)	(None, 120, 24)	0
max_pooling1d_60 (MaxPooling	(None, 40, 24)	0
flatten_60 (Flatten)	(None, 960)	0
dense_119 (Dense)	(None, 64)	61504
dense_120 (Dense)	(None, 6)	390

```
=================================================================
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 4.3495 - acc: 0.7495 - val_loss: 2.7413 - val_acc: 0.8459
Epoch 2/25
 - 2s - loss: 1.6296 - acc: 0.9180 - val_loss: 1.1715 - val_acc: 0.9030
Epoch 3/25
 - 2s - loss: 0.6645 - acc: 0.9475 - val_loss: 0.6454 - val_acc: 0.9036
Epoch 4/25
 - 2s - loss: 0.3430 - acc: 0.9521 - val_loss: 0.4889 - val_acc: 0.9077
Epoch 5/25
 - 2s - loss: 0.2451 - acc: 0.9516 - val_loss: 0.3857 - val_acc: 0.9318
Epoch 6/25
 - 2s - loss: 0.2238 - acc: 0.9494 - val_loss: 0.3657 - val_acc: 0.9165
Epoch 7/25
 - 2s - loss: 0.1939 - acc: 0.9551 - val_loss: 0.3421 - val_acc: 0.9274
Epoch 8/25
 - 2s - loss: 0.2014 - acc: 0.9508 - val_loss: 0.3561 - val_acc: 0.9040
Epoch 9/25
 - 2s - loss: 0.2014 - acc: 0.9498 - val_loss: 0.3117 - val_acc: 0.9192
Epoch 10/25
```

```
 - 2s - loss: 0.1794 - acc: 0.9544 - val_loss: 0.3435 - val_acc: 0.9138
Epoch 11/25
 - 2s - loss: 0.1780 - acc: 0.9514 - val_loss: 0.3316 - val_acc: 0.9138
Epoch 12/25
 - 2s - loss: 0.1713 - acc: 0.9553 - val_loss: 0.3260 - val_acc: 0.9186
Epoch 13/25
 - 2s - loss: 0.1568 - acc: 0.9577 - val_loss: 0.3113 - val_acc: 0.9220
Epoch 14/25
 - 2s - loss: 0.1623 - acc: 0.9536 - val_loss: 0.3801 - val_acc: 0.8907
Epoch 15/25
 - 2s - loss: 0.1637 - acc: 0.9558 - val_loss: 0.3516 - val_acc: 0.9257
Epoch 16/25
 - 2s - loss: 0.1611 - acc: 0.9531 - val_loss: 0.3047 - val_acc: 0.9155
Epoch 17/25
 - 2s - loss: 0.1498 - acc: 0.9578 - val_loss: 0.2892 - val_acc: 0.9301
Epoch 18/25
 - 2s - loss: 0.1437 - acc: 0.9573 - val_loss: 0.3393 - val_acc: 0.9243
Epoch 19/25
 - 2s - loss: 0.1408 - acc: 0.9591 - val_loss: 0.4105 - val_acc: 0.8721
Epoch 20/25
 - 2s - loss: 0.1563 - acc: 0.9555 - val_loss: 0.3408 - val_acc: 0.9233
Epoch 21/25
 - 2s - loss: 0.1300 - acc: 0.9606 - val_loss: 0.3021 - val_acc: 0.9287
Epoch 22/25
 - 2s - loss: 0.1408 - acc: 0.9565 - val_loss: 0.3086 - val_acc: 0.9240
Epoch 23/25
 - 2s - loss: 0.1346 - acc: 0.9587 - val_loss: 0.3492 - val_acc: 0.9114
Epoch 24/25
 - 2s - loss: 0.1383 - acc: 0.9588 - val_loss: 0.3698 - val_acc: 0.9077
Epoch 25/25
 - 2s - loss: 0.1302 - acc: 0.9607 - val_loss: 0.2972 - val_acc: 0.9230
Train accuracy 0.963139281828074 Test accuracy: 0.9229725144214456
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_121 (Conv1D)	(None, 122, 32)	2048
conv1d_122 (Conv1D)	(None, 120, 24)	2328
dropout_61 (Dropout)	(None, 120, 24)	0
max_pooling1d_61 (MaxPooling	(None, 60, 24)	0

```
_____
flatten_61 (Flatten)            (None, 1440)              0
_____
dense_121 (Dense)               (None, 64)                92224
_____
dense_122 (Dense)               (None, 6)                 390
================================================================
Total params: 96,990
Trainable params: 96,990
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 27.4172 - acc: 0.7273 - val_loss: 12.6662 - val_acc: 0.8453
Epoch 2/25
 - 3s - loss: 6.5987 - acc: 0.9127 - val_loss: 3.0875 - val_acc: 0.8782
Epoch 3/25
 - 2s - loss: 1.5861 - acc: 0.9219 - val_loss: 1.0655 - val_acc: 0.8765
Epoch 4/25
 - 2s - loss: 0.5844 - acc: 0.9236 - val_loss: 0.6587 - val_acc: 0.9026
Epoch 5/25
 - 2s - loss: 0.3850 - acc: 0.9339 - val_loss: 0.5537 - val_acc: 0.8982
Epoch 6/25
 - 3s - loss: 0.3433 - acc: 0.9335 - val_loss: 0.5426 - val_acc: 0.9023
Epoch 7/25
 - 3s - loss: 0.3233 - acc: 0.9340 - val_loss: 0.5043 - val_acc: 0.8962
Epoch 8/25
 - 2s - loss: 0.2895 - acc: 0.9387 - val_loss: 0.4914 - val_acc: 0.9084
Epoch 9/25
 - 2s - loss: 0.2862 - acc: 0.9366 - val_loss: 0.4630 - val_acc: 0.9057
Epoch 10/25
 - 2s - loss: 0.2778 - acc: 0.9384 - val_loss: 0.4865 - val_acc: 0.8799
Epoch 11/25
 - 3s - loss: 0.2695 - acc: 0.9363 - val_loss: 0.4534 - val_acc: 0.8812
Epoch 12/25
 - 3s - loss: 0.2514 - acc: 0.9406 - val_loss: 0.4256 - val_acc: 0.8955
Epoch 13/25
 - 2s - loss: 0.2533 - acc: 0.9406 - val_loss: 0.4506 - val_acc: 0.8965
Epoch 14/25
 - 2s - loss: 0.2557 - acc: 0.9353 - val_loss: 0.5058 - val_acc: 0.8714
Epoch 15/25
 - 2s - loss: 0.2636 - acc: 0.9373 - val_loss: 0.4219 - val_acc: 0.9060
```

```
Epoch 16/25
 - 2s - loss: 0.2238 - acc: 0.9445 - val_loss: 0.3794 - val_acc: 0.9023
Epoch 17/25
 - 3s - loss: 0.2370 - acc: 0.9412 - val_loss: 0.4036 - val_acc: 0.8965
Epoch 18/25
 - 2s - loss: 0.2350 - acc: 0.9400 - val_loss: 0.3961 - val_acc: 0.9002
Epoch 19/25
 - 2s - loss: 0.2232 - acc: 0.9426 - val_loss: 0.3953 - val_acc: 0.9053
Epoch 20/25
 - 2s - loss: 0.2194 - acc: 0.9418 - val_loss: 0.3681 - val_acc: 0.8951
Epoch 21/25
 - 2s - loss: 0.2250 - acc: 0.9406 - val_loss: 0.4315 - val_acc: 0.8806
Epoch 22/25
 - 3s - loss: 0.2268 - acc: 0.9392 - val_loss: 0.3884 - val_acc: 0.8955
Epoch 23/25
 - 3s - loss: 0.2149 - acc: 0.9429 - val_loss: 0.3738 - val_acc: 0.8999
Epoch 24/25
 - 2s - loss: 0.2221 - acc: 0.9411 - val_loss: 0.3491 - val_acc: 0.8999
Epoch 25/25
 - 2s - loss: 0.2237 - acc: 0.9422 - val_loss: 0.3724 - val_acc: 0.9101
Train accuracy 0.9445048966267682 Test accuracy: 0.9100780454699695
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_123 (Conv1D)	(None, 122, 42)	2688
conv1d_124 (Conv1D)	(None, 118, 24)	5064
dropout_62 (Dropout)	(None, 118, 24)	0
max_pooling1d_62 (MaxPooling	(None, 39, 24)	0
flatten_62 (Flatten)	(None, 936)	0
dense_123 (Dense)	(None, 64)	59968
dense_124 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 48.8714 - acc: 0.6624 - val_loss: 27.6073 - val_acc: 0.8364
Epoch 2/30
 - 2s - loss: 16.7984 - acc: 0.8972 - val_loss: 9.5414 - val_acc: 0.8853
Epoch 3/30
 - 2s - loss: 5.6073 - acc: 0.9221 - val_loss: 3.3938 - val_acc: 0.8768
Epoch 4/30
 - 2s - loss: 1.9049 - acc: 0.9268 - val_loss: 1.4708 - val_acc: 0.8694
Epoch 5/30
 - 2s - loss: 0.7797 - acc: 0.9310 - val_loss: 0.8697 - val_acc: 0.8711
Epoch 6/30
 - 2s - loss: 0.4685 - acc: 0.9275 - val_loss: 0.6930 - val_acc: 0.8782
Epoch 7/30
 - 2s - loss: 0.3873 - acc: 0.9305 - val_loss: 0.6478 - val_acc: 0.9046
Epoch 8/30
 - 2s - loss: 0.3268 - acc: 0.9368 - val_loss: 0.5983 - val_acc: 0.9053
Epoch 9/30
 - 2s - loss: 0.3140 - acc: 0.9348 - val_loss: 0.5803 - val_acc: 0.8894
Epoch 10/30
 - 2s - loss: 0.3050 - acc: 0.9323 - val_loss: 0.5903 - val_acc: 0.8901
Epoch 11/30
 - 2s - loss: 0.2910 - acc: 0.9385 - val_loss: 0.5271 - val_acc: 0.8918
Epoch 12/30
 - 2s - loss: 0.2688 - acc: 0.9441 - val_loss: 0.5027 - val_acc: 0.8968
Epoch 13/30
 - 2s - loss: 0.2691 - acc: 0.9393 - val_loss: 0.5169 - val_acc: 0.8941
Epoch 14/30
 - 2s - loss: 0.2542 - acc: 0.9415 - val_loss: 0.4986 - val_acc: 0.9016
Epoch 15/30
 - 2s - loss: 0.2475 - acc: 0.9434 - val_loss: 0.4838 - val_acc: 0.8955
Epoch 16/30
 - 2s - loss: 0.2497 - acc: 0.9419 - val_loss: 0.4614 - val_acc: 0.8985
Epoch 17/30
 - 2s - loss: 0.2488 - acc: 0.9392 - val_loss: 0.4339 - val_acc: 0.9128
Epoch 18/30
 - 2s - loss: 0.2300 - acc: 0.9441 - val_loss: 0.4668 - val_acc: 0.8951
Epoch 19/30
 - 2s - loss: 0.2301 - acc: 0.9457 - val_loss: 0.4250 - val_acc: 0.9087
Epoch 20/30
 - 2s - loss: 0.2273 - acc: 0.9453 - val_loss: 0.4139 - val_acc: 0.9125
Epoch 21/30
```

```
 - 2s - loss: 0.2198 - acc: 0.9444 - val_loss: 0.4311 - val_acc: 0.8996
Epoch 22/30
 - 2s - loss: 0.2353 - acc: 0.9410 - val_loss: 0.4143 - val_acc: 0.9104
Epoch 23/30
 - 2s - loss: 0.2480 - acc: 0.9355 - val_loss: 0.4795 - val_acc: 0.8833
Epoch 24/30
 - 2s - loss: 0.2190 - acc: 0.9478 - val_loss: 0.4147 - val_acc: 0.9060
Epoch 25/30
 - 2s - loss: 0.2066 - acc: 0.9486 - val_loss: 0.4049 - val_acc: 0.9084
Epoch 26/30
 - 2s - loss: 0.2046 - acc: 0.9470 - val_loss: 0.3908 - val_acc: 0.9101
Epoch 27/30
 - 2s - loss: 0.2176 - acc: 0.9411 - val_loss: 0.4208 - val_acc: 0.9043
Epoch 28/30
 - 2s - loss: 0.2134 - acc: 0.9456 - val_loss: 0.3780 - val_acc: 0.9128
Epoch 29/30
 - 2s - loss: 0.2012 - acc: 0.9459 - val_loss: 0.3973 - val_acc: 0.9019
Epoch 30/30
 - 2s - loss: 0.2140 - acc: 0.9436 - val_loss: 0.3785 - val_acc: 0.9179
Train accuracy 0.9499455930359086 Test accuracy: 0.9178825924669155
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_125 (Conv1D)	(None, 122, 42)	2688
conv1d_126 (Conv1D)	(None, 118, 24)	5064
dropout_63 (Dropout)	(None, 118, 24)	0
max_pooling1d_63 (MaxPooling	(None, 39, 24)	0
flatten_63 (Flatten)	(None, 936)	0
dense_125 (Dense)	(None, 64)	59968
dense_126 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

None

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 17.3823 - acc: 0.7144 - val_loss: 1.3445 - val_acc: 0.6675
Epoch 2/30
 - 2s - loss: 0.6146 - acc: 0.8607 - val_loss: 0.6483 - val_acc: 0.8622
Epoch 3/30
 - 2s - loss: 0.4675 - acc: 0.8891 - val_loss: 0.7659 - val_acc: 0.7689
Epoch 4/30
 - 2s - loss: 0.4013 - acc: 0.8998 - val_loss: 0.5965 - val_acc: 0.8354
Epoch 5/30
 - 2s - loss: 0.3879 - acc: 0.9037 - val_loss: 0.7299 - val_acc: 0.7486
Epoch 6/30
 - 2s - loss: 0.3623 - acc: 0.9095 - val_loss: 0.5280 - val_acc: 0.8670
Epoch 7/30
 - 2s - loss: 0.3590 - acc: 0.9106 - val_loss: 0.6155 - val_acc: 0.7988
Epoch 8/30
 - 2s - loss: 0.3565 - acc: 0.9087 - val_loss: 0.5859 - val_acc: 0.7967
Epoch 9/30
 - 2s - loss: 0.3546 - acc: 0.9140 - val_loss: 0.4361 - val_acc: 0.8802
Epoch 10/30
 - 2s - loss: 0.3319 - acc: 0.9225 - val_loss: 0.4676 - val_acc: 0.8544
Epoch 11/30
 - 2s - loss: 0.3379 - acc: 0.9143 - val_loss: 0.4439 - val_acc: 0.8996
Epoch 12/30
 - 2s - loss: 0.3215 - acc: 0.9206 - val_loss: 0.4290 - val_acc: 0.8694
Epoch 13/30
 - 2s - loss: 0.3270 - acc: 0.9159 - val_loss: 0.4299 - val_acc: 0.8887
Epoch 14/30
 - 2s - loss: 0.3173 - acc: 0.9166 - val_loss: 0.5044 - val_acc: 0.8656
Epoch 15/30
 - 2s - loss: 0.3308 - acc: 0.9163 - val_loss: 0.4358 - val_acc: 0.8890
Epoch 16/30
 - 2s - loss: 0.3168 - acc: 0.9184 - val_loss: 0.4497 - val_acc: 0.8819
Epoch 17/30
 - 2s - loss: 0.3055 - acc: 0.9226 - val_loss: 0.4123 - val_acc: 0.8836
Epoch 18/30
 - 2s - loss: 0.3059 - acc: 0.9210 - val_loss: 0.4720 - val_acc: 0.8487
Epoch 19/30
 - 2s - loss: 0.3089 - acc: 0.9183 - val_loss: 0.4604 - val_acc: 0.8707
Epoch 20/30
 - 2s - loss: 0.2968 - acc: 0.9176 - val_loss: 0.6224 - val_acc: 0.7991
Epoch 21/30
 - 2s - loss: 0.3209 - acc: 0.9176 - val_loss: 0.4251 - val_acc: 0.8931
```

```
Epoch 22/30
 - 2s - loss: 0.2925 - acc: 0.9252 - val_loss: 0.7995 - val_acc: 0.7713
Epoch 23/30
 - 2s - loss: 0.2963 - acc: 0.9192 - val_loss: 0.5472 - val_acc: 0.8446
Epoch 24/30
 - 2s - loss: 0.3154 - acc: 0.9144 - val_loss: 0.4371 - val_acc: 0.8951
Epoch 25/30
 - 2s - loss: 0.3020 - acc: 0.9236 - val_loss: 0.4852 - val_acc: 0.8677
Epoch 26/30
 - 2s - loss: 0.3015 - acc: 0.9197 - val_loss: 0.4004 - val_acc: 0.8897
Epoch 27/30
 - 2s - loss: 0.3085 - acc: 0.9200 - val_loss: 0.5358 - val_acc: 0.8541
Epoch 28/30
 - 2s - loss: 0.2895 - acc: 0.9229 - val_loss: 0.4264 - val_acc: 0.8761
Epoch 29/30
 - 2s - loss: 0.2990 - acc: 0.9237 - val_loss: 0.4062 - val_acc: 0.9023
Epoch 30/30
 - 2s - loss: 0.2972 - acc: 0.9238 - val_loss: 0.3753 - val_acc: 0.8935
Train accuracy 0.9510337323177367 Test accuracy: 0.8934509670851714
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_127 (Conv1D)	(None, 122, 42)	2688
conv1d_128 (Conv1D)	(None, 118, 24)	5064
dropout_64 (Dropout)	(None, 118, 24)	0
max_pooling1d_64 (MaxPooling	(None, 39, 24)	0
flatten_64 (Flatten)	(None, 936)	0
dense_127 (Dense)	(None, 64)	59968
dense_128 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
```

```
Epoch 1/30
 - 5s - loss: 50.6101 - acc: 0.7337 - val_loss: 28.4510 - val_acc: 0.8269
Epoch 2/30
 - 2s - loss: 17.0244 - acc: 0.9115 - val_loss: 9.3103 - val_acc: 0.8690
Epoch 3/30
 - 2s - loss: 5.2981 - acc: 0.9325 - val_loss: 3.0019 - val_acc: 0.8897
Epoch 4/30
 - 2s - loss: 1.6300 - acc: 0.9327 - val_loss: 1.2139 - val_acc: 0.8884
Epoch 5/30
 - 2s - loss: 0.6281 - acc: 0.9365 - val_loss: 0.6987 - val_acc: 0.8829
Epoch 6/30
 - 2s - loss: 0.3841 - acc: 0.9359 - val_loss: 0.5702 - val_acc: 0.8962
Epoch 7/30
 - 2s - loss: 0.3192 - acc: 0.9389 - val_loss: 0.5314 - val_acc: 0.9070
Epoch 8/30
 - 2s - loss: 0.2997 - acc: 0.9373 - val_loss: 0.5211 - val_acc: 0.8850
Epoch 9/30
 - 2s - loss: 0.2662 - acc: 0.9430 - val_loss: 0.4786 - val_acc: 0.8962
Epoch 10/30
 - 2s - loss: 0.2582 - acc: 0.9422 - val_loss: 0.4569 - val_acc: 0.8972
Epoch 11/30
 - 2s - loss: 0.2389 - acc: 0.9479 - val_loss: 0.4533 - val_acc: 0.9009
Epoch 12/30
 - 2s - loss: 0.2679 - acc: 0.9353 - val_loss: 0.4625 - val_acc: 0.9016
Epoch 13/30
 - 2s - loss: 0.2395 - acc: 0.9459 - val_loss: 0.4290 - val_acc: 0.8968
Epoch 14/30
 - 2s - loss: 0.2274 - acc: 0.9471 - val_loss: 0.4270 - val_acc: 0.8921
Epoch 15/30
 - 2s - loss: 0.2262 - acc: 0.9453 - val_loss: 0.4322 - val_acc: 0.9050
Epoch 16/30
 - 2s - loss: 0.2233 - acc: 0.9412 - val_loss: 0.4134 - val_acc: 0.9006
Epoch 17/30
 - 2s - loss: 0.2170 - acc: 0.9463 - val_loss: 0.4244 - val_acc: 0.9118
Epoch 18/30
 - 2s - loss: 0.2194 - acc: 0.9433 - val_loss: 0.3974 - val_acc: 0.9240
Epoch 19/30
 - 2s - loss: 0.2115 - acc: 0.9480 - val_loss: 0.4025 - val_acc: 0.9016
Epoch 20/30
 - 2s - loss: 0.2032 - acc: 0.9480 - val_loss: 0.3664 - val_acc: 0.9053
Epoch 21/30
 - 2s - loss: 0.2113 - acc: 0.9434 - val_loss: 0.3845 - val_acc: 0.9237
Epoch 22/30
```

```
                - 2s - loss: 0.2006 - acc: 0.9476 - val_loss: 0.4382 - val_acc: 0.8853
Epoch 23/30
                - 2s - loss: 0.1963 - acc: 0.9482 - val_loss: 0.3699 - val_acc: 0.9108
Epoch 24/30
                - 2s - loss: 0.1915 - acc: 0.9465 - val_loss: 0.3475 - val_acc: 0.9216
Epoch 25/30
                - 2s - loss: 0.1862 - acc: 0.9476 - val_loss: 0.3768 - val_acc: 0.8999
Epoch 26/30
                - 2s - loss: 0.2347 - acc: 0.9365 - val_loss: 0.3651 - val_acc: 0.9141
Epoch 27/30
                - 2s - loss: 0.1887 - acc: 0.9486 - val_loss: 0.3818 - val_acc: 0.9118
Epoch 28/30
                - 2s - loss: 0.2066 - acc: 0.9434 - val_loss: 0.3828 - val_acc: 0.9111
Epoch 29/30
                - 2s - loss: 0.1933 - acc: 0.9475 - val_loss: 0.3741 - val_acc: 0.8975
Epoch 30/30
                - 2s - loss: 0.1845 - acc: 0.9459 - val_loss: 0.3850 - val_acc: 0.9030
Train accuracy 0.9457290533188248 Test accuracy: 0.9029521547336274
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_129 (Conv1D)	(None, 122, 42)	2688
conv1d_130 (Conv1D)	(None, 118, 24)	5064
dropout_65 (Dropout)	(None, 118, 24)	0
max_pooling1d_65 (MaxPooling	(None, 39, 24)	0
flatten_65 (Flatten)	(None, 936)	0
dense_129 (Dense)	(None, 64)	59968
dense_130 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
```

```
            - 5s - loss: 75.6152 - acc: 0.6952 - val_loss: 45.9681 - val_acc: 0.7750
        Epoch 2/30
            - 2s - loss: 29.3537 - acc: 0.8867 - val_loss: 17.2696 - val_acc: 0.8300
        Epoch 3/30
            - 2s - loss: 10.5343 - acc: 0.9244 - val_loss: 6.1212 - val_acc: 0.8816
        Epoch 4/30
            - 2s - loss: 3.5535 - acc: 0.9350 - val_loss: 2.2469 - val_acc: 0.8819
        Epoch 5/30
            - 2s - loss: 1.2534 - acc: 0.9373 - val_loss: 1.0839 - val_acc: 0.9033
        Epoch 6/30
            - 2s - loss: 0.5805 - acc: 0.9384 - val_loss: 0.7243 - val_acc: 0.8972
        Epoch 7/30
            - 2s - loss: 0.3978 - acc: 0.9378 - val_loss: 0.6027 - val_acc: 0.9002
        Epoch 8/30
            - 2s - loss: 0.3298 - acc: 0.9400 - val_loss: 0.5543 - val_acc: 0.8979
        Epoch 9/30
            - 2s - loss: 0.3049 - acc: 0.9362 - val_loss: 0.5385 - val_acc: 0.9046
        Epoch 10/30
            - 2s - loss: 0.2950 - acc: 0.9406 - val_loss: 0.5479 - val_acc: 0.8941
        Epoch 11/30
            - 2s - loss: 0.2760 - acc: 0.9403 - val_loss: 0.4846 - val_acc: 0.8989
        Epoch 12/30
            - 2s - loss: 0.2573 - acc: 0.9425 - val_loss: 0.4912 - val_acc: 0.9053
        Epoch 13/30
            - 2s - loss: 0.2598 - acc: 0.9414 - val_loss: 0.4741 - val_acc: 0.8955
        Epoch 14/30
            - 2s - loss: 0.2438 - acc: 0.9461 - val_loss: 0.4556 - val_acc: 0.8979
        Epoch 15/30
            - 2s - loss: 0.2429 - acc: 0.9414 - val_loss: 0.4385 - val_acc: 0.9063
        Epoch 16/30
            - 2s - loss: 0.2349 - acc: 0.9442 - val_loss: 0.4254 - val_acc: 0.9030
        Epoch 17/30
            - 2s - loss: 0.2380 - acc: 0.9427 - val_loss: 0.4410 - val_acc: 0.8985
        Epoch 18/30
            - 2s - loss: 0.2252 - acc: 0.9476 - val_loss: 0.4381 - val_acc: 0.8877
        Epoch 19/30
            - 2s - loss: 0.2465 - acc: 0.9404 - val_loss: 0.4440 - val_acc: 0.9002
        Epoch 20/30
            - 2s - loss: 0.2148 - acc: 0.9448 - val_loss: 0.4240 - val_acc: 0.8884
        Epoch 21/30
            - 2s - loss: 0.2321 - acc: 0.9418 - val_loss: 0.4024 - val_acc: 0.8914
        Epoch 22/30
            - 2s - loss: 0.2122 - acc: 0.9474 - val_loss: 0.4108 - val_acc: 0.8958
```

```
Epoch 23/30
 - 2s - loss: 0.2165 - acc: 0.9434 - val_loss: 0.4417 - val_acc: 0.9053
Epoch 24/30
 - 2s - loss: 0.2108 - acc: 0.9489 - val_loss: 0.4565 - val_acc: 0.8785
Epoch 25/30
 - 2s - loss: 0.2070 - acc: 0.9470 - val_loss: 0.3806 - val_acc: 0.9002
Epoch 26/30
 - 2s - loss: 0.2096 - acc: 0.9470 - val_loss: 0.3741 - val_acc: 0.9046
Epoch 27/30
 - 2s - loss: 0.1974 - acc: 0.9463 - val_loss: 0.3624 - val_acc: 0.9101
Epoch 28/30
 - 2s - loss: 0.2164 - acc: 0.9437 - val_loss: 0.3966 - val_acc: 0.8985
Epoch 29/30
 - 2s - loss: 0.2001 - acc: 0.9467 - val_loss: 0.3922 - val_acc: 0.8850
Epoch 30/30
 - 2s - loss: 0.2130 - acc: 0.9452 - val_loss: 0.3927 - val_acc: 0.9006
Train accuracy 0.9483133841131665 Test accuracy: 0.9005768578215134
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_131 (Conv1D)	(None, 122, 42)	2688
conv1d_132 (Conv1D)	(None, 118, 24)	5064
dropout_66 (Dropout)	(None, 118, 24)	0
max_pooling1d_66 (MaxPooling	(None, 39, 24)	0
flatten_66 (Flatten)	(None, 936)	0
dense_131 (Dense)	(None, 64)	59968
dense_132 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 9.8358 - acc: 0.7752 - val_loss: 3.4873 - val_acc: 0.8829
```

```
Epoch 2/30
 - 2s - loss: 1.6666 - acc: 0.9310 - val_loss: 1.1205 - val_acc: 0.8887
Epoch 3/30
 - 2s - loss: 0.5701 - acc: 0.9382 - val_loss: 0.6510 - val_acc: 0.9053
Epoch 4/30
 - 2s - loss: 0.3402 - acc: 0.9406 - val_loss: 0.5602 - val_acc: 0.9019
Epoch 5/30
 - 2s - loss: 0.2900 - acc: 0.9418 - val_loss: 0.4787 - val_acc: 0.8992
Epoch 6/30
 - 2s - loss: 0.2497 - acc: 0.9445 - val_loss: 0.4167 - val_acc: 0.9179
Epoch 7/30
 - 2s - loss: 0.2246 - acc: 0.9478 - val_loss: 0.4231 - val_acc: 0.9172
Epoch 8/30
 - 2s - loss: 0.2168 - acc: 0.9465 - val_loss: 0.4257 - val_acc: 0.9019
Epoch 9/30
 - 2s - loss: 0.2132 - acc: 0.9468 - val_loss: 0.3907 - val_acc: 0.9148
Epoch 10/30
 - 2s - loss: 0.2211 - acc: 0.9456 - val_loss: 0.3603 - val_acc: 0.9230
Epoch 11/30
 - 2s - loss: 0.2013 - acc: 0.9494 - val_loss: 0.4070 - val_acc: 0.9023
Epoch 12/30
 - 2s - loss: 0.1908 - acc: 0.9482 - val_loss: 0.3575 - val_acc: 0.9158
Epoch 13/30
 - 2s - loss: 0.1890 - acc: 0.9486 - val_loss: 0.3430 - val_acc: 0.9138
Epoch 14/30
 - 2s - loss: 0.1872 - acc: 0.9480 - val_loss: 0.3360 - val_acc: 0.9114
Epoch 15/30
 - 2s - loss: 0.2020 - acc: 0.9459 - val_loss: 0.3607 - val_acc: 0.9125
Epoch 16/30
 - 2s - loss: 0.1848 - acc: 0.9487 - val_loss: 0.3718 - val_acc: 0.9131
Epoch 17/30
 - 2s - loss: 0.1780 - acc: 0.9480 - val_loss: 0.3492 - val_acc: 0.9077
Epoch 18/30
 - 2s - loss: 0.1795 - acc: 0.9476 - val_loss: 0.3367 - val_acc: 0.9175
Epoch 19/30
 - 2s - loss: 0.1733 - acc: 0.9482 - val_loss: 0.3379 - val_acc: 0.9131
Epoch 20/30
 - 2s - loss: 0.1718 - acc: 0.9482 - val_loss: 0.3264 - val_acc: 0.9084
Epoch 21/30
 - 2s - loss: 0.1770 - acc: 0.9472 - val_loss: 0.3123 - val_acc: 0.9226
Epoch 22/30
 - 2s - loss: 0.1857 - acc: 0.9478 - val_loss: 0.3252 - val_acc: 0.8996
Epoch 23/30
```

```
 - 2s - loss: 0.1692 - acc: 0.9475 - val_loss: 0.3208 - val_acc: 0.9131
Epoch 24/30
 - 2s - loss: 0.1672 - acc: 0.9528 - val_loss: 0.3090 - val_acc: 0.9148
Epoch 25/30
 - 2s - loss: 0.1827 - acc: 0.9465 - val_loss: 0.3289 - val_acc: 0.9158
Epoch 26/30
 - 2s - loss: 0.1814 - acc: 0.9475 - val_loss: 0.3128 - val_acc: 0.8999
Epoch 27/30
 - 2s - loss: 0.1691 - acc: 0.9483 - val_loss: 0.3428 - val_acc: 0.9013
Epoch 28/30
 - 2s - loss: 0.1641 - acc: 0.9490 - val_loss: 0.3360 - val_acc: 0.9097
Epoch 29/30
 - 2s - loss: 0.1837 - acc: 0.9448 - val_loss: 0.3218 - val_acc: 0.9172
Epoch 30/30
 - 2s - loss: 0.1594 - acc: 0.9514 - val_loss: 0.3166 - val_acc: 0.9063
Train accuracy 0.9511697497279652 Test accuracy: 0.9063454360366474
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_133 (Conv1D)	(None, 122, 42)	2688
conv1d_134 (Conv1D)	(None, 118, 24)	5064
dropout_67 (Dropout)	(None, 118, 24)	0
max_pooling1d_67 (MaxPooling	(None, 39, 24)	0
flatten_67 (Flatten)	(None, 936)	0
dense_133 (Dense)	(None, 64)	59968
dense_134 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 29.5171 - acc: 0.7307 - val_loss: 9.1926 - val_acc: 0.8324
Epoch 2/30
```

```
         - 2s - loss: 3.8775 - acc: 0.9041 - val_loss: 1.6253 - val_acc: 0.8778
        Epoch 3/30
         - 2s - loss: 0.7419 - acc: 0.9215 - val_loss: 0.7882 - val_acc: 0.8904
        Epoch 4/30
         - 2s - loss: 0.4066 - acc: 0.9280 - val_loss: 0.6613 - val_acc: 0.8683
        Epoch 5/30
         - 2s - loss: 0.3569 - acc: 0.9283 - val_loss: 0.5926 - val_acc: 0.8975
        Epoch 6/30
         - 2s - loss: 0.3445 - acc: 0.9264 - val_loss: 0.5981 - val_acc: 0.8907
        Epoch 7/30
         - 2s - loss: 0.3012 - acc: 0.9373 - val_loss: 0.5547 - val_acc: 0.8775
        Epoch 8/30
         - 2s - loss: 0.2942 - acc: 0.9308 - val_loss: 0.5063 - val_acc: 0.8894
        Epoch 9/30
         - 2s - loss: 0.2903 - acc: 0.9314 - val_loss: 0.4836 - val_acc: 0.8924
        Epoch 10/30
         - 2s - loss: 0.2852 - acc: 0.9350 - val_loss: 0.4911 - val_acc: 0.8982
        Epoch 11/30
         - 2s - loss: 0.2793 - acc: 0.9327 - val_loss: 0.5159 - val_acc: 0.8772
        Epoch 12/30
         - 2s - loss: 0.2785 - acc: 0.9336 - val_loss: 0.4482 - val_acc: 0.8890
        Epoch 13/30
         - 2s - loss: 0.2623 - acc: 0.9369 - val_loss: 0.4668 - val_acc: 0.8911
        Epoch 14/30
         - 2s - loss: 0.2623 - acc: 0.9361 - val_loss: 0.4482 - val_acc: 0.8901
        Epoch 15/30
         - 2s - loss: 0.2557 - acc: 0.9377 - val_loss: 0.4461 - val_acc: 0.8938
        Epoch 16/30
         - 2s - loss: 0.2694 - acc: 0.9329 - val_loss: 0.4687 - val_acc: 0.8823
        Epoch 17/30
         - 2s - loss: 0.2367 - acc: 0.9433 - val_loss: 0.4488 - val_acc: 0.8918
        Epoch 18/30
         - 2s - loss: 0.2474 - acc: 0.9378 - val_loss: 0.4090 - val_acc: 0.8989
        Epoch 19/30
         - 2s - loss: 0.2393 - acc: 0.9403 - val_loss: 0.4958 - val_acc: 0.8687
        Epoch 20/30
         - 2s - loss: 0.2498 - acc: 0.9369 - val_loss: 0.4526 - val_acc: 0.8928
        Epoch 21/30
         - 2s - loss: 0.2361 - acc: 0.9388 - val_loss: 0.4225 - val_acc: 0.8870
        Epoch 22/30
         - 2s - loss: 0.2403 - acc: 0.9366 - val_loss: 0.5166 - val_acc: 0.8666
        Epoch 23/30
         - 2s - loss: 0.2404 - acc: 0.9403 - val_loss: 0.4329 - val_acc: 0.8850
```

```
Epoch 24/30
 - 2s - loss: 0.2283 - acc: 0.9403 - val_loss: 0.4088 - val_acc: 0.8955
Epoch 25/30
 - 2s - loss: 0.2335 - acc: 0.9395 - val_loss: 0.4425 - val_acc: 0.8639
Epoch 26/30
 - 2s - loss: 0.2246 - acc: 0.9374 - val_loss: 0.4459 - val_acc: 0.8870
Epoch 27/30
 - 2s - loss: 0.2145 - acc: 0.9430 - val_loss: 0.4187 - val_acc: 0.8860
Epoch 28/30
 - 2s - loss: 0.2271 - acc: 0.9402 - val_loss: 0.4269 - val_acc: 0.8656
Epoch 29/30
 - 2s - loss: 0.2235 - acc: 0.9403 - val_loss: 0.4065 - val_acc: 0.8968
Epoch 30/30
 - 2s - loss: 0.2315 - acc: 0.9414 - val_loss: 0.3931 - val_acc: 0.8924
Train accuracy 0.9420565832426551 Test accuracy: 0.8924329826942654
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_135 (Conv1D)	(None, 122, 42)	2688
conv1d_136 (Conv1D)	(None, 118, 24)	5064
dropout_68 (Dropout)	(None, 118, 24)	0
max_pooling1d_68 (MaxPooling	(None, 39, 24)	0
flatten_68 (Flatten)	(None, 936)	0
dense_135 (Dense)	(None, 64)	59968
dense_136 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 92.7670 - acc: 0.7641 - val_loss: 39.0706 - val_acc: 0.7974
Epoch 2/30
 - 2s - loss: 19.4374 - acc: 0.9094 - val_loss: 7.9359 - val_acc: 0.8660
```

```
Epoch 3/30
 - 2s - loss: 3.7507 - acc: 0.9168 - val_loss: 1.9581 - val_acc: 0.8035
Epoch 4/30
 - 2s - loss: 0.9449 - acc: 0.9123 - val_loss: 0.9198 - val_acc: 0.8446
Epoch 5/30
 - 2s - loss: 0.5073 - acc: 0.9208 - val_loss: 0.7195 - val_acc: 0.8901
Epoch 6/30
 - 2s - loss: 0.4332 - acc: 0.9184 - val_loss: 0.6707 - val_acc: 0.8911
Epoch 7/30
 - 2s - loss: 0.3975 - acc: 0.9253 - val_loss: 0.6230 - val_acc: 0.8843
Epoch 8/30
 - 2s - loss: 0.3860 - acc: 0.9207 - val_loss: 0.6279 - val_acc: 0.8907
Epoch 9/30
 - 2s - loss: 0.3573 - acc: 0.9313 - val_loss: 0.5995 - val_acc: 0.8924
Epoch 10/30
 - 2s - loss: 0.3411 - acc: 0.9320 - val_loss: 0.5888 - val_acc: 0.8904
Epoch 11/30
 - 2s - loss: 0.3395 - acc: 0.9282 - val_loss: 0.5476 - val_acc: 0.9077
Epoch 12/30
 - 2s - loss: 0.3151 - acc: 0.9300 - val_loss: 0.5552 - val_acc: 0.8853
Epoch 13/30
 - 2s - loss: 0.3013 - acc: 0.9339 - val_loss: 0.5454 - val_acc: 0.9023
Epoch 14/30
 - 2s - loss: 0.3146 - acc: 0.9289 - val_loss: 0.5326 - val_acc: 0.9019
Epoch 15/30
 - 2s - loss: 0.2978 - acc: 0.9331 - val_loss: 0.5256 - val_acc: 0.8948
Epoch 16/30
 - 2s - loss: 0.3063 - acc: 0.9323 - val_loss: 0.5137 - val_acc: 0.8829
Epoch 17/30
 - 2s - loss: 0.3023 - acc: 0.9343 - val_loss: 0.5029 - val_acc: 0.8975
Epoch 18/30
 - 2s - loss: 0.2842 - acc: 0.9332 - val_loss: 0.4836 - val_acc: 0.9006
Epoch 19/30
 - 2s - loss: 0.2704 - acc: 0.9387 - val_loss: 0.4692 - val_acc: 0.8968
Epoch 20/30
 - 2s - loss: 0.2799 - acc: 0.9344 - val_loss: 0.4859 - val_acc: 0.8972
Epoch 21/30
 - 2s - loss: 0.2814 - acc: 0.9344 - val_loss: 0.4948 - val_acc: 0.8755
Epoch 22/30
 - 2s - loss: 0.2672 - acc: 0.9381 - val_loss: 0.4504 - val_acc: 0.8968
Epoch 23/30
 - 2s - loss: 0.2564 - acc: 0.9395 - val_loss: 0.4577 - val_acc: 0.8935
Epoch 24/30
```

```
 - 2s - loss: 0.2830 - acc: 0.9316 - val_loss: 0.4942 - val_acc: 0.8785
Epoch 25/30
 - 2s - loss: 0.2639 - acc: 0.9354 - val_loss: 0.4717 - val_acc: 0.8795
Epoch 26/30
 - 2s - loss: 0.2492 - acc: 0.9369 - val_loss: 0.4660 - val_acc: 0.8880
Epoch 27/30
 - 2s - loss: 0.2395 - acc: 0.9408 - val_loss: 0.4492 - val_acc: 0.8928
Epoch 28/30
 - 2s - loss: 0.2478 - acc: 0.9353 - val_loss: 0.4508 - val_acc: 0.8928
Epoch 29/30
 - 2s - loss: 0.2549 - acc: 0.9351 - val_loss: 0.4313 - val_acc: 0.9050
Epoch 30/30
 - 2s - loss: 0.2472 - acc: 0.9388 - val_loss: 0.4157 - val_acc: 0.8924
Train accuracy 0.9423286180631121 Test accuracy: 0.8924329826942654
------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_137 (Conv1D)	(None, 122, 42)	2688
conv1d_138 (Conv1D)	(None, 118, 24)	5064
dropout_69 (Dropout)	(None, 118, 24)	0
max_pooling1d_69 (MaxPooling	(None, 39, 24)	0
flatten_69 (Flatten)	(None, 936)	0
dense_137 (Dense)	(None, 64)	59968
dense_138 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 29.0453 - acc: 0.7511 - val_loss: 13.1608 - val_acc: 0.8514
Epoch 2/30
 - 2s - loss: 6.9638 - acc: 0.9128 - val_loss: 3.5920 - val_acc: 0.8897
Epoch 3/30
```

```
          - 2s - loss: 1.8805 - acc: 0.9301 - val_loss: 1.3210 - val_acc: 0.8975
         Epoch 4/30
          - 2s - loss: 0.6821 - acc: 0.9355 - val_loss: 0.7726 - val_acc: 0.8955
         Epoch 5/30
          - 2s - loss: 0.4126 - acc: 0.9361 - val_loss: 0.6183 - val_acc: 0.8982
         Epoch 6/30
          - 2s - loss: 0.3370 - acc: 0.9397 - val_loss: 0.5280 - val_acc: 0.9182
         Epoch 7/30
          - 2s - loss: 0.3102 - acc: 0.9348 - val_loss: 0.5408 - val_acc: 0.9043
         Epoch 8/30
          - 2s - loss: 0.2801 - acc: 0.9396 - val_loss: 0.5202 - val_acc: 0.8958
         Epoch 9/30
          - 2s - loss: 0.2709 - acc: 0.9391 - val_loss: 0.4887 - val_acc: 0.9111
         Epoch 10/30
          - 2s - loss: 0.2675 - acc: 0.9378 - val_loss: 0.4514 - val_acc: 0.9114
         Epoch 11/30
          - 2s - loss: 0.2620 - acc: 0.9372 - val_loss: 0.4769 - val_acc: 0.8873
         Epoch 12/30
          - 2s - loss: 0.2606 - acc: 0.9376 - val_loss: 0.4476 - val_acc: 0.9053
         Epoch 13/30
          - 2s - loss: 0.2486 - acc: 0.9410 - val_loss: 0.4487 - val_acc: 0.9040
         Epoch 14/30
          - 2s - loss: 0.2293 - acc: 0.9455 - val_loss: 0.4811 - val_acc: 0.8856
         Epoch 15/30
          - 2s - loss: 0.2293 - acc: 0.9437 - val_loss: 0.4151 - val_acc: 0.9019
         Epoch 16/30
          - 2s - loss: 0.2244 - acc: 0.9446 - val_loss: 0.4569 - val_acc: 0.8877
         Epoch 17/30
          - 2s - loss: 0.2293 - acc: 0.9404 - val_loss: 0.3932 - val_acc: 0.9125
         Epoch 18/30
          - 2s - loss: 0.2202 - acc: 0.9431 - val_loss: 0.4416 - val_acc: 0.8778
         Epoch 19/30
          - 2s - loss: 0.2229 - acc: 0.9423 - val_loss: 0.4611 - val_acc: 0.8870
         Epoch 20/30
          - 2s - loss: 0.2167 - acc: 0.9434 - val_loss: 0.3924 - val_acc: 0.8941
         Epoch 21/30
          - 2s - loss: 0.2459 - acc: 0.9355 - val_loss: 0.4056 - val_acc: 0.9019
         Epoch 22/30
          - 2s - loss: 0.2239 - acc: 0.9415 - val_loss: 0.4165 - val_acc: 0.8918
         Epoch 23/30
          - 2s - loss: 0.1976 - acc: 0.9459 - val_loss: 0.3863 - val_acc: 0.9006
         Epoch 24/30
          - 2s - loss: 0.1961 - acc: 0.9474 - val_loss: 0.3605 - val_acc: 0.9053
```

```
Epoch 25/30
 - 2s - loss: 0.2142 - acc: 0.9388 - val_loss: 0.4033 - val_acc: 0.8850
Epoch 26/30
 - 2s - loss: 0.1952 - acc: 0.9483 - val_loss: 0.3589 - val_acc: 0.9023
Epoch 27/30
 - 2s - loss: 0.2327 - acc: 0.9368 - val_loss: 0.3625 - val_acc: 0.9104
Epoch 28/30
 - 2s - loss: 0.1893 - acc: 0.9504 - val_loss: 0.3898 - val_acc: 0.8887
Epoch 29/30
 - 2s - loss: 0.1947 - acc: 0.9429 - val_loss: 0.3832 - val_acc: 0.9067
Epoch 30/30
 - 2s - loss: 0.1856 - acc: 0.9506 - val_loss: 0.3595 - val_acc: 0.9114
Train accuracy 0.9544341675734495 Test accuracy: 0.9114353579911775
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_139 (Conv1D)	(None, 122, 42)	2688
conv1d_140 (Conv1D)	(None, 118, 24)	5064
dropout_70 (Dropout)	(None, 118, 24)	0
max_pooling1d_70 (MaxPooling	(None, 39, 24)	0
flatten_70 (Flatten)	(None, 936)	0
dense_139 (Dense)	(None, 64)	59968
dense_140 (Dense)	(None, 6)	390

```
Total params: 68,110
Trainable params: 68,110
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 67.8996 - acc: 0.7432 - val_loss: 24.4306 - val_acc: 0.8188
Epoch 2/30
 - 2s - loss: 10.9655 - acc: 0.8953 - val_loss: 3.9665 - val_acc: 0.8649
Epoch 3/30
 - 2s - loss: 1.7413 - acc: 0.9237 - val_loss: 1.0921 - val_acc: 0.8870
```

```
Epoch 4/30
 - 2s - loss: 0.5724 - acc: 0.9257 - val_loss: 0.7842 - val_acc: 0.8880
Epoch 5/30
 - 2s - loss: 0.4326 - acc: 0.9298 - val_loss: 0.6701 - val_acc: 0.8782
Epoch 6/30
 - 2s - loss: 0.4042 - acc: 0.9278 - val_loss: 0.6308 - val_acc: 0.8785
Epoch 7/30
 - 2s - loss: 0.3742 - acc: 0.9295 - val_loss: 0.5984 - val_acc: 0.8972
Epoch 8/30
 - 2s - loss: 0.3513 - acc: 0.9321 - val_loss: 0.5696 - val_acc: 0.8843
Epoch 9/30
 - 2s - loss: 0.3320 - acc: 0.9313 - val_loss: 0.5557 - val_acc: 0.9057
Epoch 10/30
 - 2s - loss: 0.3324 - acc: 0.9310 - val_loss: 0.5364 - val_acc: 0.9009
Epoch 11/30
 - 2s - loss: 0.3244 - acc: 0.9301 - val_loss: 0.5411 - val_acc: 0.9023
Epoch 12/30
 - 2s - loss: 0.3305 - acc: 0.9294 - val_loss: 0.5092 - val_acc: 0.9152
Epoch 13/30
 - 2s - loss: 0.2984 - acc: 0.9385 - val_loss: 0.4965 - val_acc: 0.8965
Epoch 14/30
 - 2s - loss: 0.2830 - acc: 0.9382 - val_loss: 0.4861 - val_acc: 0.8856
Epoch 15/30
 - 2s - loss: 0.2737 - acc: 0.9404 - val_loss: 0.4907 - val_acc: 0.8853
Epoch 16/30
 - 2s - loss: 0.3046 - acc: 0.9324 - val_loss: 0.4850 - val_acc: 0.8829
Epoch 17/30
 - 2s - loss: 0.2844 - acc: 0.9323 - val_loss: 0.4600 - val_acc: 0.8992
Epoch 18/30
 - 2s - loss: 0.2738 - acc: 0.9362 - val_loss: 0.4696 - val_acc: 0.8816
Epoch 19/30
 - 2s - loss: 0.2674 - acc: 0.9389 - val_loss: 0.4743 - val_acc: 0.8968
Epoch 20/30
 - 2s - loss: 0.2862 - acc: 0.9324 - val_loss: 0.4601 - val_acc: 0.9023
Epoch 21/30
 - 2s - loss: 0.2418 - acc: 0.9448 - val_loss: 0.4581 - val_acc: 0.8870
Epoch 22/30
 - 2s - loss: 0.2558 - acc: 0.9373 - val_loss: 0.5145 - val_acc: 0.8578
Epoch 23/30
 - 2s - loss: 0.2639 - acc: 0.9374 - val_loss: 0.4366 - val_acc: 0.8945
Epoch 24/30
 - 2s - loss: 0.2462 - acc: 0.9400 - val_loss: 0.4139 - val_acc: 0.9013
Epoch 25/30
```

```
  - 2s - loss: 0.2413 - acc: 0.9419 - val_loss: 0.4236 - val_acc: 0.8965
Epoch 26/30
  - 2s - loss: 0.2530 - acc: 0.9373 - val_loss: 0.4354 - val_acc: 0.8982
Epoch 27/30
  - 2s - loss: 0.2452 - acc: 0.9377 - val_loss: 0.4397 - val_acc: 0.8856
Epoch 28/30
  - 2s - loss: 0.2346 - acc: 0.9407 - val_loss: 0.4121 - val_acc: 0.8999
Epoch 29/30
  - 2s - loss: 0.2428 - acc: 0.9396 - val_loss: 0.4186 - val_acc: 0.8894
Epoch 30/30
  - 2s - loss: 0.2467 - acc: 0.9366 - val_loss: 0.4019 - val_acc: 0.9040
Train accuracy 0.9462731229597389 Test accuracy: 0.9039701391245334
-------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_141 (Conv1D)          (None, 122, 32)           2048

conv1d_142 (Conv1D)          (None, 118, 24)           3864

dropout_71 (Dropout)         (None, 118, 24)           0

max_pooling1d_71 (MaxPooling (None, 39, 24)            0

flatten_71 (Flatten)         (None, 936)               0

dense_141 (Dense)            (None, 64)                59968

dense_142 (Dense)            (None, 6)                 390
=================================================================
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
  - 6s - loss: 15.5199 - acc: 0.7844 - val_loss: 2.4015 - val_acc: 0.8880
Epoch 2/25
  - 3s - loss: 0.9192 - acc: 0.9115 - val_loss: 0.7775 - val_acc: 0.8683
Epoch 3/25
  - 2s - loss: 0.4096 - acc: 0.9202 - val_loss: 0.6144 - val_acc: 0.8877
Epoch 4/25
```

```
          - 3s - loss: 0.3681 - acc: 0.9196 - val_loss: 0.5921 - val_acc: 0.9043
        Epoch 5/25
          - 3s - loss: 0.3259 - acc: 0.9316 - val_loss: 0.5209 - val_acc: 0.8836
        Epoch 6/25
          - 3s - loss: 0.3377 - acc: 0.9272 - val_loss: 0.5020 - val_acc: 0.8894
        Epoch 7/25
          - 3s - loss: 0.2968 - acc: 0.9329 - val_loss: 0.5164 - val_acc: 0.8772
        Epoch 8/25
          - 3s - loss: 0.2822 - acc: 0.9350 - val_loss: 0.4769 - val_acc: 0.8802
        Epoch 9/25
          - 3s - loss: 0.2743 - acc: 0.9351 - val_loss: 0.4823 - val_acc: 0.8758
        Epoch 10/25
          - 3s - loss: 0.2813 - acc: 0.9348 - val_loss: 0.4356 - val_acc: 0.8826
        Epoch 11/25
          - 3s - loss: 0.2667 - acc: 0.9351 - val_loss: 0.4359 - val_acc: 0.9087
        Epoch 12/25
          - 3s - loss: 0.3117 - acc: 0.9257 - val_loss: 0.4691 - val_acc: 0.8911
        Epoch 13/25
          - 3s - loss: 0.2724 - acc: 0.9314 - val_loss: 0.5162 - val_acc: 0.8697
        Epoch 14/25
          - 3s - loss: 0.2854 - acc: 0.9347 - val_loss: 0.4723 - val_acc: 0.8890
        Epoch 15/25
          - 3s - loss: 0.2510 - acc: 0.9381 - val_loss: 0.4187 - val_acc: 0.8945
        Epoch 16/25
          - 3s - loss: 0.2441 - acc: 0.9378 - val_loss: 0.4044 - val_acc: 0.8904
        Epoch 17/25
          - 2s - loss: 0.2425 - acc: 0.9362 - val_loss: 0.4547 - val_acc: 0.8884
        Epoch 18/25
          - 3s - loss: 0.2552 - acc: 0.9354 - val_loss: 0.4103 - val_acc: 0.8975
        Epoch 19/25
          - 3s - loss: 0.2460 - acc: 0.9327 - val_loss: 0.6146 - val_acc: 0.8385
        Epoch 20/25
          - 3s - loss: 0.2429 - acc: 0.9400 - val_loss: 0.4179 - val_acc: 0.8938
        Epoch 21/25
          - 3s - loss: 0.2237 - acc: 0.9391 - val_loss: 0.4486 - val_acc: 0.8707
        Epoch 22/25
          - 2s - loss: 0.2403 - acc: 0.9381 - val_loss: 0.3819 - val_acc: 0.8935
        Epoch 23/25
          - 3s - loss: 0.2235 - acc: 0.9423 - val_loss: 0.3933 - val_acc: 0.8924
        Epoch 24/25
          - 3s - loss: 0.2319 - acc: 0.9406 - val_loss: 0.4706 - val_acc: 0.8636
        Epoch 25/25
          - 2s - loss: 0.2130 - acc: 0.9475 - val_loss: 0.3838 - val_acc: 0.8955
```

```
Train accuracy 0.9533460282916213 Test accuracy: 0.8954869358669834
-----------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
======================================================================
conv1d_143 (Conv1D)          (None, 122, 42)           2688
_____
conv1d_144 (Conv1D)          (None, 116, 24)           7080
_____
dropout_72 (Dropout)         (None, 116, 24)           0
_____
max_pooling1d_72 (MaxPooling (None, 38, 24)            0
_____
flatten_72 (Flatten)         (None, 912)               0
_____
dense_143 (Dense)            (None, 64)                58432
_____
dense_144 (Dense)            (None, 6)                 390
======================================================================
Total params: 68,590
Trainable params: 68,590
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 5s - loss: 27.2431 - acc: 0.7874 - val_loss: 3.7998 - val_acc: 0.7923
Epoch 2/35
 - 2s - loss: 1.2754 - acc: 0.9078 - val_loss: 0.7984 - val_acc: 0.8870
Epoch 3/35
 - 2s - loss: 0.4591 - acc: 0.9127 - val_loss: 0.6392 - val_acc: 0.8856
Epoch 4/35
 - 2s - loss: 0.3798 - acc: 0.9219 - val_loss: 0.6127 - val_acc: 0.8544
Epoch 5/35
 - 2s - loss: 0.3484 - acc: 0.9282 - val_loss: 0.5440 - val_acc: 0.9033
Epoch 6/35
 - 2s - loss: 0.3507 - acc: 0.9275 - val_loss: 0.4836 - val_acc: 0.8935
Epoch 7/35
 - 2s - loss: 0.3274 - acc: 0.9294 - val_loss: 0.4867 - val_acc: 0.9030
Epoch 8/35
 - 2s - loss: 0.2922 - acc: 0.9346 - val_loss: 0.4747 - val_acc: 0.8924
Epoch 9/35
 - 2s - loss: 0.2849 - acc: 0.9363 - val_loss: 0.4774 - val_acc: 0.8850
```

```
Epoch 10/35
 - 2s - loss: 0.2943 - acc: 0.9283 - val_loss: 0.5930 - val_acc: 0.8504
Epoch 11/35
 - 2s - loss: 0.2843 - acc: 0.9362 - val_loss: 0.4536 - val_acc: 0.8938
Epoch 12/35
 - 2s - loss: 0.2734 - acc: 0.9361 - val_loss: 0.5401 - val_acc: 0.8385
Epoch 13/35
 - 2s - loss: 0.2774 - acc: 0.9334 - val_loss: 0.4452 - val_acc: 0.9006
Epoch 14/35
 - 2s - loss: 0.3009 - acc: 0.9302 - val_loss: 0.4144 - val_acc: 0.9016
Epoch 15/35
 - 2s - loss: 0.2690 - acc: 0.9346 - val_loss: 0.4409 - val_acc: 0.8941
Epoch 16/35
 - 2s - loss: 0.2630 - acc: 0.9384 - val_loss: 0.4487 - val_acc: 0.8996
Epoch 17/35
 - 2s - loss: 0.3041 - acc: 0.9259 - val_loss: 0.4295 - val_acc: 0.9060
Epoch 18/35
 - 2s - loss: 0.2521 - acc: 0.9389 - val_loss: 0.4089 - val_acc: 0.8948
Epoch 19/35
 - 2s - loss: 0.2532 - acc: 0.9340 - val_loss: 0.4498 - val_acc: 0.8897
Epoch 20/35
 - 2s - loss: 0.2550 - acc: 0.9377 - val_loss: 0.3967 - val_acc: 0.8962
Epoch 21/35
 - 2s - loss: 0.2706 - acc: 0.9334 - val_loss: 0.3973 - val_acc: 0.9030
Epoch 22/35
 - 2s - loss: 0.2388 - acc: 0.9395 - val_loss: 0.3989 - val_acc: 0.8890
Epoch 23/35
 - 2s - loss: 0.2490 - acc: 0.9359 - val_loss: 0.3506 - val_acc: 0.9080
Epoch 24/35
 - 2s - loss: 0.3043 - acc: 0.9272 - val_loss: 0.4080 - val_acc: 0.8948
Epoch 25/35
 - 2s - loss: 0.2515 - acc: 0.9366 - val_loss: 0.4404 - val_acc: 0.8823
Epoch 26/35
 - 2s - loss: 0.2451 - acc: 0.9372 - val_loss: 0.4079 - val_acc: 0.8924
Epoch 27/35
 - 2s - loss: 0.2366 - acc: 0.9353 - val_loss: 0.3978 - val_acc: 0.8931
Epoch 28/35
 - 2s - loss: 0.2492 - acc: 0.9366 - val_loss: 0.3909 - val_acc: 0.8921
Epoch 29/35
 - 2s - loss: 0.2677 - acc: 0.9305 - val_loss: 0.4165 - val_acc: 0.8992
Epoch 30/35
 - 2s - loss: 0.2637 - acc: 0.9305 - val_loss: 0.4102 - val_acc: 0.9019
Epoch 31/35
```

```
 - 2s - loss: 0.2502 - acc: 0.9377 - val_loss: 0.3708 - val_acc: 0.8948
Epoch 32/35
 - 2s - loss: 0.2598 - acc: 0.9325 - val_loss: 0.3991 - val_acc: 0.8948
Epoch 33/35
 - 2s - loss: 0.2349 - acc: 0.9399 - val_loss: 0.3973 - val_acc: 0.8829
Epoch 34/35
 - 2s - loss: 0.2256 - acc: 0.9418 - val_loss: 0.3926 - val_acc: 0.8846
Epoch 35/35
 - 2s - loss: 0.2524 - acc: 0.9368 - val_loss: 0.3700 - val_acc: 0.8958
Train accuracy 0.9503536452665942 Test accuracy: 0.8958262639972854
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_145 (Conv1D)	(None, 122, 32)	2048
conv1d_146 (Conv1D)	(None, 118, 24)	3864
dropout_73 (Dropout)	(None, 118, 24)	0
max_pooling1d_73 (MaxPooling	(None, 39, 24)	0
flatten_73 (Flatten)	(None, 936)	0
dense_145 (Dense)	(None, 64)	59968
dense_146 (Dense)	(None, 6)	390

```
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 34.0518 - acc: 0.7050 - val_loss: 17.5698 - val_acc: 0.8300
Epoch 2/30
 - 3s - loss: 10.0857 - acc: 0.9032 - val_loss: 5.4524 - val_acc: 0.8890
Epoch 3/30
 - 3s - loss: 3.1206 - acc: 0.9195 - val_loss: 1.9977 - val_acc: 0.8897
Epoch 4/30
 - 3s - loss: 1.1367 - acc: 0.9270 - val_loss: 0.9758 - val_acc: 0.8945
Epoch 5/30
```

```
            - 3s - loss: 0.5683 - acc: 0.9332 - val_loss: 0.6821 - val_acc: 0.8962
Epoch 6/30
            - 3s - loss: 0.4013 - acc: 0.9347 - val_loss: 0.6074 - val_acc: 0.8955
Epoch 7/30
            - 2s - loss: 0.3439 - acc: 0.9399 - val_loss: 0.5377 - val_acc: 0.8958
Epoch 8/30
            - 3s - loss: 0.3169 - acc: 0.9373 - val_loss: 0.4940 - val_acc: 0.9138
Epoch 9/30
            - 3s - loss: 0.3115 - acc: 0.9392 - val_loss: 0.4829 - val_acc: 0.9114
Epoch 10/30
            - 3s - loss: 0.3061 - acc: 0.9348 - val_loss: 0.4744 - val_acc: 0.8982
Epoch 11/30
            - 3s - loss: 0.2746 - acc: 0.9427 - val_loss: 0.4870 - val_acc: 0.8856
Epoch 12/30
            - 3s - loss: 0.2723 - acc: 0.9416 - val_loss: 0.4525 - val_acc: 0.9141
Epoch 13/30
            - 3s - loss: 0.2656 - acc: 0.9422 - val_loss: 0.4502 - val_acc: 0.9009
Epoch 14/30
            - 3s - loss: 0.2523 - acc: 0.9422 - val_loss: 0.4230 - val_acc: 0.9046
Epoch 15/30
            - 3s - loss: 0.2580 - acc: 0.9381 - val_loss: 0.4662 - val_acc: 0.9019
Epoch 16/30
            - 3s - loss: 0.2454 - acc: 0.9423 - val_loss: 0.4090 - val_acc: 0.9019
Epoch 17/30
            - 3s - loss: 0.2395 - acc: 0.9450 - val_loss: 0.4077 - val_acc: 0.9013
Epoch 18/30
            - 3s - loss: 0.2290 - acc: 0.9463 - val_loss: 0.4243 - val_acc: 0.8979
Epoch 19/30
            - 3s - loss: 0.2375 - acc: 0.9431 - val_loss: 0.4058 - val_acc: 0.9040
Epoch 20/30
            - 3s - loss: 0.2209 - acc: 0.9471 - val_loss: 0.4012 - val_acc: 0.9125
Epoch 21/30
            - 3s - loss: 0.2193 - acc: 0.9453 - val_loss: 0.4056 - val_acc: 0.9087
Epoch 22/30
            - 3s - loss: 0.2138 - acc: 0.9479 - val_loss: 0.3649 - val_acc: 0.9104
Epoch 23/30
            - 3s - loss: 0.2122 - acc: 0.9498 - val_loss: 0.3880 - val_acc: 0.9053
Epoch 24/30
            - 3s - loss: 0.2126 - acc: 0.9449 - val_loss: 0.3859 - val_acc: 0.9023
Epoch 25/30
            - 3s - loss: 0.2083 - acc: 0.9452 - val_loss: 0.3560 - val_acc: 0.9063
Epoch 26/30
            - 3s - loss: 0.2042 - acc: 0.9474 - val_loss: 0.3859 - val_acc: 0.9080
```

```
Epoch 27/30
 - 3s - loss: 0.2128 - acc: 0.9446 - val_loss: 0.4133 - val_acc: 0.8860
Epoch 28/30
 - 3s - loss: 0.1976 - acc: 0.9508 - val_loss: 0.3645 - val_acc: 0.8904
Epoch 29/30
 - 3s - loss: 0.2048 - acc: 0.9434 - val_loss: 0.3408 - val_acc: 0.9094
Epoch 30/30
 - 3s - loss: 0.1974 - acc: 0.9494 - val_loss: 0.3706 - val_acc: 0.8955
Train accuracy 0.941784548422198 Test accuracy: 0.8954869358669834
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_147 (Conv1D)	(None, 122, 32)	2048
conv1d_148 (Conv1D)	(None, 116, 24)	5400
dropout_74 (Dropout)	(None, 116, 24)	0
max_pooling1d_74 (MaxPooling	(None, 38, 24)	0
flatten_74 (Flatten)	(None, 912)	0
dense_147 (Dense)	(None, 64)	58432
dense_148 (Dense)	(None, 6)	390

```
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0


None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 61.7130 - acc: 0.7163 - val_loss: 39.9502 - val_acc: 0.8235
Epoch 2/25
 - 2s - loss: 26.9145 - acc: 0.9070 - val_loss: 17.1180 - val_acc: 0.8626
Epoch 3/25
 - 2s - loss: 11.1822 - acc: 0.9323 - val_loss: 7.0526 - val_acc: 0.8816
Epoch 4/25
 - 2s - loss: 4.4350 - acc: 0.9410 - val_loss: 2.8886 - val_acc: 0.8985
Epoch 5/25
 - 3s - loss: 1.7589 - acc: 0.9382 - val_loss: 1.3239 - val_acc: 0.9002
```

```
Epoch 6/25
 - 2s - loss: 0.7859 - acc: 0.9387 - val_loss: 0.7564 - val_acc: 0.9019
Epoch 7/25
 - 2s - loss: 0.4622 - acc: 0.9396 - val_loss: 0.5795 - val_acc: 0.9030
Epoch 8/25
 - 2s - loss: 0.3608 - acc: 0.9373 - val_loss: 0.5102 - val_acc: 0.9070
Epoch 9/25
 - 2s - loss: 0.3236 - acc: 0.9338 - val_loss: 0.4910 - val_acc: 0.8982
Epoch 10/25
 - 3s - loss: 0.2973 - acc: 0.9416 - val_loss: 0.4474 - val_acc: 0.9158
Epoch 11/25
 - 2s - loss: 0.2789 - acc: 0.9400 - val_loss: 0.5258 - val_acc: 0.8951
Epoch 12/25
 - 2s - loss: 0.2746 - acc: 0.9426 - val_loss: 0.4475 - val_acc: 0.9030
Epoch 13/25
 - 2s - loss: 0.2661 - acc: 0.9382 - val_loss: 0.4392 - val_acc: 0.8968
Epoch 14/25
 - 2s - loss: 0.2473 - acc: 0.9470 - val_loss: 0.4180 - val_acc: 0.9101
Epoch 15/25
 - 2s - loss: 0.2365 - acc: 0.9457 - val_loss: 0.4201 - val_acc: 0.9148
Epoch 16/25
 - 3s - loss: 0.2591 - acc: 0.9425 - val_loss: 0.4360 - val_acc: 0.9033
Epoch 17/25
 - 2s - loss: 0.2344 - acc: 0.9453 - val_loss: 0.4177 - val_acc: 0.9135
Epoch 18/25
 - 2s - loss: 0.2348 - acc: 0.9430 - val_loss: 0.3853 - val_acc: 0.9148
Epoch 19/25
 - 2s - loss: 0.2208 - acc: 0.9463 - val_loss: 0.3782 - val_acc: 0.9036
Epoch 20/25
 - 2s - loss: 0.2236 - acc: 0.9464 - val_loss: 0.3845 - val_acc: 0.9070
Epoch 21/25
 - 3s - loss: 0.2154 - acc: 0.9474 - val_loss: 0.3696 - val_acc: 0.9016
Epoch 22/25
 - 2s - loss: 0.2106 - acc: 0.9468 - val_loss: 0.3782 - val_acc: 0.9009
Epoch 23/25
 - 2s - loss: 0.2072 - acc: 0.9489 - val_loss: 0.3639 - val_acc: 0.9138
Epoch 24/25
 - 2s - loss: 0.2161 - acc: 0.9450 - val_loss: 0.3698 - val_acc: 0.9050
Epoch 25/25
 - 2s - loss: 0.2052 - acc: 0.9471 - val_loss: 0.3836 - val_acc: 0.8979
Train accuracy 0.9472252448313384 Test accuracy: 0.8978622327790974
--------------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape              Param #
=================================================================
conv1d_149 (Conv1D)             (None, 122, 42)           2688

conv1d_150 (Conv1D)             (None, 120, 24)           3048

dropout_75 (Dropout)            (None, 120, 24)           0

max_pooling1d_75 (MaxPooling    (None, 60, 24)            0

flatten_75 (Flatten)            (None, 1440)              0

dense_149 (Dense)               (None, 64)                92224

dense_150 (Dense)               (None, 6)                 390
=================================================================
Total params: 98,350
Trainable params: 98,350
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 7.9329 - acc: 0.8075 - val_loss: 2.5448 - val_acc: 0.8931
Epoch 2/25
 - 2s - loss: 1.1475 - acc: 0.9348 - val_loss: 0.7381 - val_acc: 0.8880
Epoch 3/25
 - 2s - loss: 0.3857 - acc: 0.9406 - val_loss: 0.4919 - val_acc: 0.8951
Epoch 4/25
 - 2s - loss: 0.2934 - acc: 0.9363 - val_loss: 0.4240 - val_acc: 0.8955
Epoch 5/25
 - 2s - loss: 0.2481 - acc: 0.9425 - val_loss: 0.3938 - val_acc: 0.9050
Epoch 6/25
 - 2s - loss: 0.2314 - acc: 0.9455 - val_loss: 0.4483 - val_acc: 0.8884
Epoch 7/25
 - 2s - loss: 0.2300 - acc: 0.9415 - val_loss: 0.3637 - val_acc: 0.9023
Epoch 8/25
 - 2s - loss: 0.2179 - acc: 0.9433 - val_loss: 0.3187 - val_acc: 0.9135
Epoch 9/25
 - 2s - loss: 0.1921 - acc: 0.9480 - val_loss: 0.3382 - val_acc: 0.9080
Epoch 10/25
 - 2s - loss: 0.1996 - acc: 0.9441 - val_loss: 0.3417 - val_acc: 0.9135
Epoch 11/25
```

```
 - 2s - loss: 0.2079 - acc: 0.9457 - val_loss: 0.3683 - val_acc: 0.8846
Epoch 12/25
 - 2s - loss: 0.1995 - acc: 0.9455 - val_loss: 0.3114 - val_acc: 0.9121
Epoch 13/25
 - 2s - loss: 0.1842 - acc: 0.9468 - val_loss: 0.3759 - val_acc: 0.8863
Epoch 14/25
 - 2s - loss: 0.2015 - acc: 0.9415 - val_loss: 0.3607 - val_acc: 0.8836
Epoch 15/25
 - 2s - loss: 0.1890 - acc: 0.9476 - val_loss: 0.3487 - val_acc: 0.8941
Epoch 16/25
 - 2s - loss: 0.1825 - acc: 0.9467 - val_loss: 0.3341 - val_acc: 0.8914
Epoch 17/25
 - 2s - loss: 0.1778 - acc: 0.9474 - val_loss: 0.3169 - val_acc: 0.9094
Epoch 18/25
 - 2s - loss: 0.1637 - acc: 0.9524 - val_loss: 0.3113 - val_acc: 0.8958
Epoch 19/25
 - 2s - loss: 0.1932 - acc: 0.9438 - val_loss: 0.3447 - val_acc: 0.9043
Epoch 20/25
 - 2s - loss: 0.1698 - acc: 0.9512 - val_loss: 0.3818 - val_acc: 0.8901
Epoch 21/25
 - 2s - loss: 0.1862 - acc: 0.9449 - val_loss: 0.3214 - val_acc: 0.9104
Epoch 22/25
 - 2s - loss: 0.1752 - acc: 0.9487 - val_loss: 0.2967 - val_acc: 0.9148
Epoch 23/25
 - 2s - loss: 0.1763 - acc: 0.9464 - val_loss: 0.3132 - val_acc: 0.9074
Epoch 24/25
 - 2s - loss: 0.1923 - acc: 0.9436 - val_loss: 0.2900 - val_acc: 0.9125
Epoch 25/25
 - 2s - loss: 0.1629 - acc: 0.9540 - val_loss: 0.2942 - val_acc: 0.9040
Train accuracy 0.9571545157780196 Test accuracy: 0.9039701391245334
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_151 (Conv1D)	(None, 122, 32)	2048
conv1d_152 (Conv1D)	(None, 116, 24)	5400
dropout_76 (Dropout)	(None, 116, 24)	0
max_pooling1d_76 (MaxPooling	(None, 38, 24)	0
flatten_76 (Flatten)	(None, 912)	0

```
_____
dense_151 (Dense)              (None, 64)                  58432
_____
dense_152 (Dense)              (None, 6)                   390
================================================================
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0

_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 53.3607 - acc: 0.7465 - val_loss: 26.5124 - val_acc: 0.8476
Epoch 2/30
 - 2s - loss: 14.5229 - acc: 0.9174 - val_loss: 6.8551 - val_acc: 0.8846
Epoch 3/30
 - 2s - loss: 3.5500 - acc: 0.9382 - val_loss: 1.8605 - val_acc: 0.8751
Epoch 4/30
 - 2s - loss: 0.9814 - acc: 0.9340 - val_loss: 0.8247 - val_acc: 0.8846
Epoch 5/30
 - 3s - loss: 0.4950 - acc: 0.9377 - val_loss: 0.6401 - val_acc: 0.8850
Epoch 6/30
 - 2s - loss: 0.3723 - acc: 0.9423 - val_loss: 0.5275 - val_acc: 0.8924
Epoch 7/30
 - 2s - loss: 0.3221 - acc: 0.9460 - val_loss: 0.5195 - val_acc: 0.8880
Epoch 8/30
 - 2s - loss: 0.3207 - acc: 0.9414 - val_loss: 0.4919 - val_acc: 0.8914
Epoch 9/30
 - 2s - loss: 0.2809 - acc: 0.9453 - val_loss: 0.5103 - val_acc: 0.8744
Epoch 10/30
 - 2s - loss: 0.2699 - acc: 0.9449 - val_loss: 0.4766 - val_acc: 0.8853
Epoch 11/30
 - 3s - loss: 0.2495 - acc: 0.9467 - val_loss: 0.4222 - val_acc: 0.8968
Epoch 12/30
 - 2s - loss: 0.2303 - acc: 0.9471 - val_loss: 0.4444 - val_acc: 0.8748
Epoch 13/30
 - 2s - loss: 0.2331 - acc: 0.9461 - val_loss: 0.4088 - val_acc: 0.8999
Epoch 14/30
 - 2s - loss: 0.2339 - acc: 0.9444 - val_loss: 0.4471 - val_acc: 0.8968
Epoch 15/30
 - 2s - loss: 0.2299 - acc: 0.9452 - val_loss: 0.3831 - val_acc: 0.8979
Epoch 16/30
 - 3s - loss: 0.2065 - acc: 0.9486 - val_loss: 0.3892 - val_acc: 0.8904
```

```
Epoch 17/30
 - 2s - loss: 0.2369 - acc: 0.9425 - val_loss: 0.3354 - val_acc: 0.9019
Epoch 18/30
 - 2s - loss: 0.1894 - acc: 0.9486 - val_loss: 0.3434 - val_acc: 0.9002
Epoch 19/30
 - 2s - loss: 0.1980 - acc: 0.9490 - val_loss: 0.3589 - val_acc: 0.8989
Epoch 20/30
 - 2s - loss: 0.1857 - acc: 0.9474 - val_loss: 0.3341 - val_acc: 0.9046
Epoch 21/30
 - 2s - loss: 0.2183 - acc: 0.9461 - val_loss: 0.3572 - val_acc: 0.9125
Epoch 22/30
 - 2s - loss: 0.1856 - acc: 0.9476 - val_loss: 0.3455 - val_acc: 0.9016
Epoch 23/30
 - 2s - loss: 0.1858 - acc: 0.9491 - val_loss: 0.3610 - val_acc: 0.8979
Epoch 24/30
 - 2s - loss: 0.1733 - acc: 0.9505 - val_loss: 0.3228 - val_acc: 0.9006
Epoch 25/30
 - 2s - loss: 0.1759 - acc: 0.9495 - val_loss: 0.3542 - val_acc: 0.8836
Epoch 26/30
 - 2s - loss: 0.1773 - acc: 0.9498 - val_loss: 0.3418 - val_acc: 0.9026
Epoch 27/30
 - 3s - loss: 0.1743 - acc: 0.9479 - val_loss: 0.3195 - val_acc: 0.8907
Epoch 28/30
 - 2s - loss: 0.1678 - acc: 0.9489 - val_loss: 0.3111 - val_acc: 0.8938
Epoch 29/30
 - 2s - loss: 0.1645 - acc: 0.9516 - val_loss: 0.3460 - val_acc: 0.8941
Epoch 30/30
 - 2s - loss: 0.1944 - acc: 0.9472 - val_loss: 0.3964 - val_acc: 0.8700
Train accuracy 0.9476332970620239 Test accuracy: 0.8700373260943333
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_153 (Conv1D)	(None, 122, 42)	2688
conv1d_154 (Conv1D)	(None, 118, 24)	5064
dropout_77 (Dropout)	(None, 118, 24)	0
max_pooling1d_77 (MaxPooling	(None, 59, 24)	0
flatten_77 (Flatten)	(None, 1416)	0

```
dense_153 (Dense)              (None, 64)                   90688
_____
dense_154 (Dense)              (None, 6)                    390
=================================================================
Total params: 98,830
Trainable params: 98,830
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 39.3390 - acc: 0.7852 - val_loss: 9.5518 - val_acc: 0.8683
Epoch 2/25
 - 2s - loss: 3.4300 - acc: 0.9215 - val_loss: 1.0761 - val_acc: 0.8870
Epoch 3/25
 - 2s - loss: 0.5285 - acc: 0.9211 - val_loss: 0.5803 - val_acc: 0.8938
Epoch 4/25
 - 2s - loss: 0.3491 - acc: 0.9294 - val_loss: 0.5586 - val_acc: 0.8521
Epoch 5/25
 - 2s - loss: 0.3307 - acc: 0.9270 - val_loss: 0.4401 - val_acc: 0.9043
Epoch 6/25
 - 2s - loss: 0.3070 - acc: 0.9285 - val_loss: 0.4785 - val_acc: 0.8823
Epoch 7/25
 - 2s - loss: 0.2950 - acc: 0.9368 - val_loss: 0.4164 - val_acc: 0.8989
Epoch 8/25
 - 2s - loss: 0.2775 - acc: 0.9339 - val_loss: 0.4677 - val_acc: 0.9036
Epoch 9/25
 - 2s - loss: 0.2881 - acc: 0.9350 - val_loss: 0.4089 - val_acc: 0.9013
Epoch 10/25
 - 2s - loss: 0.2454 - acc: 0.9427 - val_loss: 0.3907 - val_acc: 0.9006
Epoch 11/25
 - 2s - loss: 0.2743 - acc: 0.9357 - val_loss: 0.4031 - val_acc: 0.8975
Epoch 12/25
 - 2s - loss: 0.2679 - acc: 0.9313 - val_loss: 0.4272 - val_acc: 0.9043
Epoch 13/25
 - 2s - loss: 0.2445 - acc: 0.9426 - val_loss: 0.4798 - val_acc: 0.8565
Epoch 14/25
 - 2s - loss: 0.2356 - acc: 0.9433 - val_loss: 0.3808 - val_acc: 0.8880
Epoch 15/25
 - 2s - loss: 0.2688 - acc: 0.9338 - val_loss: 0.3623 - val_acc: 0.9043
Epoch 16/25
 - 2s - loss: 0.2403 - acc: 0.9369 - val_loss: 0.3779 - val_acc: 0.8955
Epoch 17/25
```

```
 - 2s - loss: 0.2883 - acc: 0.9314 - val_loss: 0.4009 - val_acc: 0.9043
Epoch 18/25
 - 2s - loss: 0.2402 - acc: 0.9403 - val_loss: 0.3530 - val_acc: 0.9118
Epoch 19/25
 - 2s - loss: 0.2194 - acc: 0.9440 - val_loss: 0.5464 - val_acc: 0.8358
Epoch 20/25
 - 2s - loss: 0.2556 - acc: 0.9365 - val_loss: 0.3419 - val_acc: 0.9040
Epoch 21/25
 - 2s - loss: 0.2263 - acc: 0.9381 - val_loss: 0.3149 - val_acc: 0.9067
Epoch 22/25
 - 2s - loss: 0.2205 - acc: 0.9423 - val_loss: 0.3553 - val_acc: 0.8982
Epoch 23/25
 - 2s - loss: 0.2432 - acc: 0.9391 - val_loss: 0.3634 - val_acc: 0.9033
Epoch 24/25
 - 2s - loss: 0.2298 - acc: 0.9389 - val_loss: 0.3635 - val_acc: 0.8938
Epoch 25/25
 - 2s - loss: 0.2275 - acc: 0.9415 - val_loss: 0.3519 - val_acc: 0.9094
Train accuracy 0.9416485310119695 Test accuracy: 0.9093993892093655
--------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_155 (Conv1D)          (None, 124, 32)           1472
_____
conv1d_156 (Conv1D)          (None, 122, 32)           3104
_____
dropout_78 (Dropout)         (None, 122, 32)           0
_____
max_pooling1d_78 (MaxPooling (None, 40, 32)            0
_____
flatten_78 (Flatten)         (None, 1280)              0
_____
dense_155 (Dense)            (None, 64)                81984
_____
dense_156 (Dense)            (None, 6)                 390
=================================================================
Total params: 86,950
Trainable params: 86,950
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
```

```
                    - 6s - loss: 23.8866 - acc: 0.8035 - val_loss: 3.8662 - val_acc: 0.8398
          Epoch 2/35
                    - 2s - loss: 1.3297 - acc: 0.9025 - val_loss: 0.8660 - val_acc: 0.7883
          Epoch 3/35
                    - 2s - loss: 0.4738 - acc: 0.9055 - val_loss: 0.6646 - val_acc: 0.8544
          Epoch 4/35
                    - 2s - loss: 0.4083 - acc: 0.9108 - val_loss: 0.5563 - val_acc: 0.8853
          Epoch 5/35
                    - 3s - loss: 0.3635 - acc: 0.9210 - val_loss: 0.5511 - val_acc: 0.8697
          Epoch 6/35
                    - 2s - loss: 0.3423 - acc: 0.9217 - val_loss: 0.5860 - val_acc: 0.8514
          Epoch 7/35
                    - 2s - loss: 0.3352 - acc: 0.9242 - val_loss: 0.5352 - val_acc: 0.8870
          Epoch 8/35
                    - 2s - loss: 0.3175 - acc: 0.9237 - val_loss: 0.4922 - val_acc: 0.8833
          Epoch 9/35
                    - 2s - loss: 0.3438 - acc: 0.9208 - val_loss: 0.5470 - val_acc: 0.8799
          Epoch 10/35
                    - 3s - loss: 0.2848 - acc: 0.9342 - val_loss: 0.4420 - val_acc: 0.8880
          Epoch 11/35
                    - 2s - loss: 0.3094 - acc: 0.9259 - val_loss: 0.4420 - val_acc: 0.8982
          Epoch 12/35
                    - 2s - loss: 0.2784 - acc: 0.9362 - val_loss: 0.4529 - val_acc: 0.8744
          Epoch 13/35
                    - 2s - loss: 0.2875 - acc: 0.9302 - val_loss: 0.4532 - val_acc: 0.8700
          Epoch 14/35
                    - 3s - loss: 0.2624 - acc: 0.9368 - val_loss: 0.4088 - val_acc: 0.8806
          Epoch 15/35
                    - 3s - loss: 0.2661 - acc: 0.9297 - val_loss: 0.4723 - val_acc: 0.8938
          Epoch 16/35
                    - 2s - loss: 0.2745 - acc: 0.9300 - val_loss: 0.3850 - val_acc: 0.8935
          Epoch 17/35
                    - 2s - loss: 0.2456 - acc: 0.9414 - val_loss: 0.4002 - val_acc: 0.8843
          Epoch 18/35
                    - 2s - loss: 0.2683 - acc: 0.9270 - val_loss: 0.4058 - val_acc: 0.9165
          Epoch 19/35
                    - 2s - loss: 0.2894 - acc: 0.9241 - val_loss: 0.5452 - val_acc: 0.8415
          Epoch 20/35
                    - 3s - loss: 0.2852 - acc: 0.9327 - val_loss: 0.3998 - val_acc: 0.8806
          Epoch 21/35
                    - 2s - loss: 0.2867 - acc: 0.9266 - val_loss: 0.4374 - val_acc: 0.8975
          Epoch 22/35
                    - 2s - loss: 0.2513 - acc: 0.9381 - val_loss: 0.4121 - val_acc: 0.8931
```

```
Epoch 23/35
 - 2s - loss: 0.2891 - acc: 0.9266 - val_loss: 0.5593 - val_acc: 0.8514
Epoch 24/35
 - 2s - loss: 0.2608 - acc: 0.9391 - val_loss: 0.4083 - val_acc: 0.8829
Epoch 25/35
 - 3s - loss: 0.2454 - acc: 0.9377 - val_loss: 0.3833 - val_acc: 0.9016
Epoch 26/35
 - 2s - loss: 0.2512 - acc: 0.9377 - val_loss: 0.3716 - val_acc: 0.9019
Epoch 27/35
 - 2s - loss: 0.2449 - acc: 0.9355 - val_loss: 0.4336 - val_acc: 0.8931
Epoch 28/35
 - 2s - loss: 0.3009 - acc: 0.9251 - val_loss: 0.4719 - val_acc: 0.8897
Epoch 29/35
 - 3s - loss: 0.2597 - acc: 0.9374 - val_loss: 0.3644 - val_acc: 0.9013
Epoch 30/35
 - 3s - loss: 0.2248 - acc: 0.9425 - val_loss: 0.4016 - val_acc: 0.8856
Epoch 31/35
 - 2s - loss: 0.2568 - acc: 0.9372 - val_loss: 0.3657 - val_acc: 0.8921
Epoch 32/35
 - 2s - loss: 0.2493 - acc: 0.9340 - val_loss: 0.3931 - val_acc: 0.8935
Epoch 33/35
 - 2s - loss: 0.2489 - acc: 0.9328 - val_loss: 0.4019 - val_acc: 0.8887
Epoch 34/35
 - 2s - loss: 0.2609 - acc: 0.9344 - val_loss: 0.3853 - val_acc: 0.9043
Epoch 35/35
 - 3s - loss: 0.2520 - acc: 0.9320 - val_loss: 0.3945 - val_acc: 0.8819
Train accuracy 0.9269586507072906 Test accuracy: 0.8819138106549033
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_157 (Conv1D)	(None, 122, 32)	2048
conv1d_158 (Conv1D)	(None, 116, 24)	5400
dropout_79 (Dropout)	(None, 116, 24)	0
max_pooling1d_79 (MaxPooling	(None, 58, 24)	0
flatten_79 (Flatten)	(None, 1392)	0
dense_157 (Dense)	(None, 64)	89152

```
dense_158 (Dense)              (None, 6)                    390
=================================================================
Total params: 96,990
Trainable params: 96,990
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 11s - loss: 3.1010 - acc: 0.8369 - val_loss: 0.6432 - val_acc: 0.8697
Epoch 2/25
 - 7s - loss: 0.4064 - acc: 0.9317 - val_loss: 0.4303 - val_acc: 0.8982
Epoch 3/25
 - 7s - loss: 0.3341 - acc: 0.9339 - val_loss: 0.4220 - val_acc: 0.9006
Epoch 4/25
 - 7s - loss: 0.2637 - acc: 0.9450 - val_loss: 0.4492 - val_acc: 0.8795
Epoch 5/25
 - 7s - loss: 0.2329 - acc: 0.9448 - val_loss: 0.4092 - val_acc: 0.8806
Epoch 6/25
 - 7s - loss: 0.2239 - acc: 0.9486 - val_loss: 0.3333 - val_acc: 0.9080
Epoch 7/25
 - 7s - loss: 0.2249 - acc: 0.9463 - val_loss: 0.3599 - val_acc: 0.9050
Epoch 8/25
 - 7s - loss: 0.1811 - acc: 0.9514 - val_loss: 0.3340 - val_acc: 0.9101
Epoch 9/25
 - 6s - loss: 0.2069 - acc: 0.9474 - val_loss: 0.3517 - val_acc: 0.9162
Epoch 10/25
 - 7s - loss: 0.1801 - acc: 0.9527 - val_loss: 0.2969 - val_acc: 0.9257
Epoch 11/25
 - 7s - loss: 0.1775 - acc: 0.9512 - val_loss: 0.2882 - val_acc: 0.9128
Epoch 12/25
 - 7s - loss: 0.1835 - acc: 0.9502 - val_loss: 0.3008 - val_acc: 0.9247
Epoch 13/25
 - 7s - loss: 0.2148 - acc: 0.9468 - val_loss: 0.4361 - val_acc: 0.8955
Epoch 14/25
 - 7s - loss: 0.2154 - acc: 0.9494 - val_loss: 0.2789 - val_acc: 0.9125
Epoch 15/25
 - 6s - loss: 0.1705 - acc: 0.9512 - val_loss: 0.3123 - val_acc: 0.9226
Epoch 16/25
 - 7s - loss: 0.1715 - acc: 0.9521 - val_loss: 0.2865 - val_acc: 0.9145
Epoch 17/25
 - 7s - loss: 0.1718 - acc: 0.9513 - val_loss: 0.3066 - val_acc: 0.9237
Epoch 18/25
```

```
 - 7s - loss: 0.1798 - acc: 0.9527 - val_loss: 0.2820 - val_acc: 0.9237
Epoch 19/25
 - 7s - loss: 0.1514 - acc: 0.9555 - val_loss: 0.2843 - val_acc: 0.9040
Epoch 20/25
 - 7s - loss: 0.1531 - acc: 0.9533 - val_loss: 0.2990 - val_acc: 0.9114
Epoch 21/25
 - 7s - loss: 0.1976 - acc: 0.9498 - val_loss: 0.2903 - val_acc: 0.9155
Epoch 22/25
 - 7s - loss: 0.1678 - acc: 0.9514 - val_loss: 0.2984 - val_acc: 0.9158
Epoch 23/25
 - 7s - loss: 0.1502 - acc: 0.9540 - val_loss: 0.2735 - val_acc: 0.9145
Epoch 24/25
 - 7s - loss: 0.1489 - acc: 0.9551 - val_loss: 0.3228 - val_acc: 0.9036
Epoch 25/25
 - 7s - loss: 0.1572 - acc: 0.9531 - val_loss: 0.3068 - val_acc: 0.8999
Train accuracy 0.9600108813928183 Test accuracy: 0.8998982015609094
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_159 (Conv1D)          (None, 124, 42)           1932
_____
conv1d_160 (Conv1D)          (None, 120, 24)           5064
_____
dropout_80 (Dropout)         (None, 120, 24)           0
_____
max_pooling1d_80 (MaxPooling (None, 40, 24)            0
_____
flatten_80 (Flatten)         (None, 960)               0
_____
dense_159 (Dense)            (None, 64)                61504
_____
dense_160 (Dense)            (None, 6)                 390
=================================================================
Total params: 68,890
Trainable params: 68,890
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 7.7646 - acc: 0.7401 - val_loss: 0.8961 - val_acc: 0.8314
Epoch 2/30
```

```
        - 2s - loss: 0.5973 - acc: 0.8629 - val_loss: 0.5856 - val_acc: 0.8636
Epoch 3/30
        - 2s - loss: 0.4353 - acc: 0.8972 - val_loss: 0.5480 - val_acc: 0.8931
Epoch 4/30
        - 2s - loss: 0.3756 - acc: 0.9066 - val_loss: 0.5384 - val_acc: 0.8575
Epoch 5/30
        - 2s - loss: 0.3465 - acc: 0.9121 - val_loss: 0.4354 - val_acc: 0.8789
Epoch 6/30
        - 2s - loss: 0.3132 - acc: 0.9249 - val_loss: 0.4131 - val_acc: 0.9019
Epoch 7/30
        - 2s - loss: 0.3039 - acc: 0.9248 - val_loss: 0.3844 - val_acc: 0.8951
Epoch 8/30
        - 2s - loss: 0.2837 - acc: 0.9306 - val_loss: 0.4228 - val_acc: 0.8836
Epoch 9/30
        - 2s - loss: 0.2798 - acc: 0.9291 - val_loss: 0.4317 - val_acc: 0.8704
Epoch 10/30
        - 2s - loss: 0.2724 - acc: 0.9300 - val_loss: 0.3784 - val_acc: 0.9026
Epoch 11/30
        - 2s - loss: 0.2678 - acc: 0.9306 - val_loss: 0.3656 - val_acc: 0.9070
Epoch 12/30
        - 2s - loss: 0.2641 - acc: 0.9313 - val_loss: 0.4314 - val_acc: 0.8605
Epoch 13/30
        - 2s - loss: 0.2490 - acc: 0.9348 - val_loss: 0.4047 - val_acc: 0.8802
Epoch 14/30
        - 2s - loss: 0.2505 - acc: 0.9324 - val_loss: 0.4241 - val_acc: 0.8473
Epoch 15/30
        - 2s - loss: 0.2669 - acc: 0.9309 - val_loss: 0.3784 - val_acc: 0.8853
Epoch 16/30
        - 2s - loss: 0.2618 - acc: 0.9327 - val_loss: 0.3582 - val_acc: 0.8951
Epoch 17/30
        - 2s - loss: 0.2440 - acc: 0.9359 - val_loss: 0.6121 - val_acc: 0.7682
Epoch 18/30
        - 2s - loss: 0.2506 - acc: 0.9323 - val_loss: 0.3583 - val_acc: 0.8999
Epoch 19/30
        - 2s - loss: 0.2377 - acc: 0.9354 - val_loss: 0.3620 - val_acc: 0.8918
Epoch 20/30
        - 2s - loss: 0.2462 - acc: 0.9321 - val_loss: 0.4097 - val_acc: 0.8724
Epoch 21/30
        - 2s - loss: 0.2380 - acc: 0.9361 - val_loss: 0.4164 - val_acc: 0.8738
Epoch 22/30
        - 2s - loss: 0.2316 - acc: 0.9365 - val_loss: 0.3966 - val_acc: 0.8744
Epoch 23/30
        - 2s - loss: 0.2278 - acc: 0.9381 - val_loss: 0.3601 - val_acc: 0.8972
```

```
Epoch 24/30
 - 2s - loss: 0.2386 - acc: 0.9332 - val_loss: 0.3854 - val_acc: 0.8880
Epoch 25/30
 - 2s - loss: 0.2288 - acc: 0.9377 - val_loss: 0.4876 - val_acc: 0.8738
Epoch 26/30
 - 2s - loss: 0.2292 - acc: 0.9370 - val_loss: 0.4004 - val_acc: 0.8704
Epoch 27/30
 - 2s - loss: 0.2274 - acc: 0.9399 - val_loss: 0.5994 - val_acc: 0.8290
Epoch 28/30
 - 2s - loss: 0.2203 - acc: 0.9366 - val_loss: 0.5852 - val_acc: 0.7913
Epoch 29/30
 - 2s - loss: 0.2245 - acc: 0.9351 - val_loss: 0.3735 - val_acc: 0.8785
Epoch 30/30
 - 2s - loss: 0.2303 - acc: 0.9355 - val_loss: 0.3740 - val_acc: 0.8734
Train accuracy 0.9394722524483133 Test accuracy: 0.8734306073973532
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_161 (Conv1D)	(None, 122, 32)	2048
conv1d_162 (Conv1D)	(None, 116, 24)	5400
dropout_81 (Dropout)	(None, 116, 24)	0
max_pooling1d_81 (MaxPooling	(None, 58, 24)	0
flatten_81 (Flatten)	(None, 1392)	0
dense_161 (Dense)	(None, 64)	89152
dense_162 (Dense)	(None, 6)	390

```
Total params: 96,990
Trainable params: 96,990
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 54.8862 - acc: 0.6699 - val_loss: 32.6824 - val_acc: 0.7981
Epoch 2/25
 - 3s - loss: 20.6442 - acc: 0.8885 - val_loss: 12.1397 - val_acc: 0.8426
```

```
Epoch 3/25
 - 3s - loss: 7.3965 - acc: 0.9223 - val_loss: 4.4355 - val_acc: 0.8721
Epoch 4/25
 - 3s - loss: 2.5925 - acc: 0.9280 - val_loss: 1.7582 - val_acc: 0.8870
Epoch 5/25
 - 3s - loss: 1.0096 - acc: 0.9335 - val_loss: 0.9414 - val_acc: 0.8918
Epoch 6/25
 - 3s - loss: 0.5349 - acc: 0.9329 - val_loss: 0.6835 - val_acc: 0.8856
Epoch 7/25
 - 3s - loss: 0.3866 - acc: 0.9365 - val_loss: 0.5878 - val_acc: 0.8887
Epoch 8/25
 - 3s - loss: 0.3497 - acc: 0.9295 - val_loss: 0.6214 - val_acc: 0.8402
Epoch 9/25
 - 3s - loss: 0.3301 - acc: 0.9362 - val_loss: 0.5042 - val_acc: 0.9040
Epoch 10/25
 - 2s - loss: 0.2959 - acc: 0.9363 - val_loss: 0.5160 - val_acc: 0.8965
Epoch 11/25
 - 3s - loss: 0.2742 - acc: 0.9450 - val_loss: 0.4609 - val_acc: 0.8951
Epoch 12/25
 - 3s - loss: 0.2778 - acc: 0.9378 - val_loss: 0.4558 - val_acc: 0.9080
Epoch 13/25
 - 3s - loss: 0.2655 - acc: 0.9406 - val_loss: 0.4475 - val_acc: 0.9138
Epoch 14/25
 - 3s - loss: 0.2585 - acc: 0.9396 - val_loss: 0.4531 - val_acc: 0.8938
Epoch 15/25
 - 3s - loss: 0.2537 - acc: 0.9408 - val_loss: 0.4117 - val_acc: 0.9057
Epoch 16/25
 - 3s - loss: 0.2452 - acc: 0.9426 - val_loss: 0.4380 - val_acc: 0.9091
Epoch 17/25
 - 3s - loss: 0.2468 - acc: 0.9403 - val_loss: 0.4145 - val_acc: 0.8985
Epoch 18/25
 - 3s - loss: 0.2364 - acc: 0.9442 - val_loss: 0.3822 - val_acc: 0.9121
Epoch 19/25
 - 3s - loss: 0.2501 - acc: 0.9381 - val_loss: 0.3974 - val_acc: 0.9111
Epoch 20/25
 - 3s - loss: 0.2307 - acc: 0.9441 - val_loss: 0.3797 - val_acc: 0.8975
Epoch 21/25
 - 3s - loss: 0.2393 - acc: 0.9400 - val_loss: 0.3906 - val_acc: 0.9084
Epoch 22/25
 - 3s - loss: 0.2132 - acc: 0.9460 - val_loss: 0.4179 - val_acc: 0.8758
Epoch 23/25
 - 3s - loss: 0.2261 - acc: 0.9430 - val_loss: 0.3617 - val_acc: 0.9114
Epoch 24/25
```

```
   - 3s - loss: 0.2299 - acc: 0.9400 - val_loss: 0.3604 - val_acc: 0.9006
Epoch 25/25
   - 3s - loss: 0.2330 - acc: 0.9404 - val_loss: 0.3658 - val_acc: 0.9080
Train accuracy 0.948721436343852 Test accuracy: 0.9080420766881574
-----------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_163 (Conv1D)          (None, 124, 32)           1472
_____
conv1d_164 (Conv1D)          (None, 122, 32)           3104
_____
dropout_82 (Dropout)         (None, 122, 32)           0
_____
max_pooling1d_82 (MaxPooling (None, 40, 32)            0
_____
flatten_82 (Flatten)         (None, 1280)              0
_____
dense_163 (Dense)            (None, 64)                81984
_____
dense_164 (Dense)            (None, 6)                 390
=================================================================
Total params: 86,950
Trainable params: 86,950
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
   - 12s - loss: 4.6894 - acc: 0.8033 - val_loss: 0.7175 - val_acc: 0.7815
Epoch 2/25
   - 8s - loss: 0.5004 - acc: 0.8723 - val_loss: 0.7488 - val_acc: 0.8005
Epoch 3/25
   - 8s - loss: 0.4297 - acc: 0.8897 - val_loss: 0.5473 - val_acc: 0.8765
Epoch 4/25
   - 8s - loss: 0.3929 - acc: 0.8985 - val_loss: 0.5836 - val_acc: 0.8622
Epoch 5/25
   - 8s - loss: 0.3985 - acc: 0.8992 - val_loss: 0.5505 - val_acc: 0.8385
Epoch 6/25
   - 8s - loss: 0.3735 - acc: 0.9094 - val_loss: 0.4442 - val_acc: 0.8962
Epoch 7/25
   - 8s - loss: 0.3496 - acc: 0.9144 - val_loss: 0.5137 - val_acc: 0.8711
Epoch 8/25
```

```
        - 8s - loss: 0.3579 - acc: 0.9100 - val_loss: 0.4600 - val_acc: 0.8856
      Epoch 9/25
        - 8s - loss: 0.3408 - acc: 0.9158 - val_loss: 0.4608 - val_acc: 0.8880
      Epoch 10/25
        - 8s - loss: 0.3392 - acc: 0.9149 - val_loss: 0.4807 - val_acc: 0.8487
      Epoch 11/25
        - 8s - loss: 0.3717 - acc: 0.9098 - val_loss: 0.4334 - val_acc: 0.8924
      Epoch 12/25
        - 8s - loss: 0.3276 - acc: 0.9159 - val_loss: 0.4134 - val_acc: 0.8884
      Epoch 13/25
        - 8s - loss: 0.2905 - acc: 0.9253 - val_loss: 0.4337 - val_acc: 0.8680
      Epoch 14/25
        - 8s - loss: 0.3297 - acc: 0.9172 - val_loss: 0.4380 - val_acc: 0.8772
      Epoch 15/25
        - 8s - loss: 0.3198 - acc: 0.9204 - val_loss: 0.5433 - val_acc: 0.8483
      Epoch 16/25
        - 8s - loss: 0.3140 - acc: 0.9240 - val_loss: 0.4682 - val_acc: 0.8884
      Epoch 17/25
        - 8s - loss: 0.3221 - acc: 0.9200 - val_loss: 0.4319 - val_acc: 0.8901
      Epoch 18/25
        - 8s - loss: 0.3039 - acc: 0.9218 - val_loss: 0.4138 - val_acc: 0.8873
      Epoch 19/25
        - 8s - loss: 0.3235 - acc: 0.9196 - val_loss: 0.4169 - val_acc: 0.8918
      Epoch 20/25
        - 8s - loss: 0.3038 - acc: 0.9229 - val_loss: 0.3826 - val_acc: 0.8992
      Epoch 21/25
        - 8s - loss: 0.3186 - acc: 0.9215 - val_loss: 0.4471 - val_acc: 0.8673
      Epoch 22/25
        - 8s - loss: 0.3037 - acc: 0.9257 - val_loss: 0.4678 - val_acc: 0.8694
      Epoch 23/25
        - 8s - loss: 0.3028 - acc: 0.9237 - val_loss: 0.4534 - val_acc: 0.8741
      Epoch 24/25
        - 8s - loss: 0.3120 - acc: 0.9222 - val_loss: 0.5698 - val_acc: 0.8269
      Epoch 25/25
        - 8s - loss: 0.2912 - acc: 0.9283 - val_loss: 0.5051 - val_acc: 0.8286
      Train accuracy 0.8926822633945644 Test accuracy: 0.8286392941974889
      ------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
=======================	====================	=========
conv1d_165 (Conv1D)	(None, 122, 28)	1792
conv1d_166 (Conv1D)	(None, 116, 24)	4728

```
_____
dropout_83 (Dropout)            (None, 116, 24)           0
_____
max_pooling1d_83 (MaxPooling (None, 58, 24)              0
_____
flatten_83 (Flatten)            (None, 1392)              0
_____
dense_165 (Dense)               (None, 64)                89152
_____
dense_166 (Dense)               (None, 6)                 390
=================================================================
Total params: 96,062
Trainable params: 96,062
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 6s - loss: 12.5170 - acc: 0.7654 - val_loss: 0.9312 - val_acc: 0.7292
Epoch 2/35
 - 2s - loss: 0.5538 - acc: 0.8720 - val_loss: 0.8257 - val_acc: 0.7170
Epoch 3/35
 - 2s - loss: 0.4872 - acc: 0.8890 - val_loss: 0.6864 - val_acc: 0.7991
Epoch 4/35
 - 2s - loss: 0.4289 - acc: 0.8984 - val_loss: 0.6905 - val_acc: 0.7801
Epoch 5/35
 - 2s - loss: 0.4279 - acc: 0.8969 - val_loss: 0.7220 - val_acc: 0.8147
Epoch 6/35
 - 2s - loss: 0.4583 - acc: 0.8961 - val_loss: 0.5878 - val_acc: 0.8602
Epoch 7/35
 - 2s - loss: 0.4092 - acc: 0.9014 - val_loss: 0.6632 - val_acc: 0.8802
Epoch 8/35
 - 2s - loss: 0.3901 - acc: 0.9056 - val_loss: 0.5972 - val_acc: 0.8602
Epoch 9/35
 - 2s - loss: 0.3616 - acc: 0.9165 - val_loss: 0.5125 - val_acc: 0.8863
Epoch 10/35
 - 2s - loss: 0.3666 - acc: 0.9076 - val_loss: 0.5473 - val_acc: 0.8812
Epoch 11/35
 - 2s - loss: 0.3384 - acc: 0.9197 - val_loss: 0.5089 - val_acc: 0.8911
Epoch 12/35
 - 2s - loss: 0.3157 - acc: 0.9234 - val_loss: 0.5284 - val_acc: 0.8683
Epoch 13/35
 - 2s - loss: 0.3310 - acc: 0.9225 - val_loss: 0.4528 - val_acc: 0.8551
```

```
Epoch 14/35
 - 2s - loss: 0.3199 - acc: 0.9159 - val_loss: 0.4809 - val_acc: 0.8799
Epoch 15/35
 - 2s - loss: 0.2836 - acc: 0.9295 - val_loss: 0.4308 - val_acc: 0.8853
Epoch 16/35
 - 2s - loss: 0.3236 - acc: 0.9195 - val_loss: 0.4061 - val_acc: 0.9006
Epoch 17/35
 - 2s - loss: 0.2850 - acc: 0.9293 - val_loss: 0.4001 - val_acc: 0.8972
Epoch 18/35
 - 2s - loss: 0.2738 - acc: 0.9310 - val_loss: 0.4429 - val_acc: 0.8999
Epoch 19/35
 - 2s - loss: 0.3175 - acc: 0.9233 - val_loss: 0.4394 - val_acc: 0.8887
Epoch 20/35
 - 2s - loss: 0.2712 - acc: 0.9310 - val_loss: 0.4083 - val_acc: 0.8748
Epoch 21/35
 - 2s - loss: 0.2806 - acc: 0.9293 - val_loss: 0.4338 - val_acc: 0.8823
Epoch 22/35
 - 2s - loss: 0.2759 - acc: 0.9285 - val_loss: 0.5863 - val_acc: 0.8242
Epoch 23/35
 - 2s - loss: 0.2662 - acc: 0.9348 - val_loss: 0.3891 - val_acc: 0.8972
Epoch 24/35
 - 2s - loss: 0.3477 - acc: 0.9207 - val_loss: 0.4052 - val_acc: 0.9009
Epoch 25/35
 - 2s - loss: 0.2614 - acc: 0.9336 - val_loss: 0.4465 - val_acc: 0.8707
Epoch 26/35
 - 2s - loss: 0.2644 - acc: 0.9319 - val_loss: 0.4639 - val_acc: 0.8649
Epoch 27/35
 - 2s - loss: 0.2664 - acc: 0.9325 - val_loss: 0.4462 - val_acc: 0.8592
Epoch 28/35
 - 2s - loss: 0.2705 - acc: 0.9297 - val_loss: 0.4355 - val_acc: 0.8717
Epoch 29/35
 - 2s - loss: 0.2654 - acc: 0.9317 - val_loss: 0.3970 - val_acc: 0.8979
Epoch 30/35
 - 2s - loss: 0.2656 - acc: 0.9317 - val_loss: 0.4432 - val_acc: 0.8867
Epoch 31/35
 - 2s - loss: 0.2974 - acc: 0.9278 - val_loss: 0.3796 - val_acc: 0.8894
Epoch 32/35
 - 2s - loss: 0.2556 - acc: 0.9324 - val_loss: 0.3961 - val_acc: 0.8975
Epoch 33/35
 - 2s - loss: 0.2822 - acc: 0.9291 - val_loss: 0.4347 - val_acc: 0.8853
Epoch 34/35
 - 2s - loss: 0.2478 - acc: 0.9381 - val_loss: 0.3841 - val_acc: 0.8951
Epoch 35/35
```

```
 - 2s - loss: 0.2735 - acc: 0.9283 - val_loss: 0.4508 - val_acc: 0.8510
Train accuracy 0.919885745375408 Test accuracy: 0.8510349507974211
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_167 (Conv1D)	(None, 124, 42)	1932
conv1d_168 (Conv1D)	(None, 122, 24)	3048
dropout_84 (Dropout)	(None, 122, 24)	0
max_pooling1d_84 (MaxPooling	(None, 40, 24)	0
flatten_84 (Flatten)	(None, 960)	0
dense_167 (Dense)	(None, 64)	61504
dense_168 (Dense)	(None, 6)	390

```
Total params: 66,874
Trainable params: 66,874
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 14.9023 - acc: 0.7428 - val_loss: 1.7944 - val_acc: 0.7350
Epoch 2/25
 - 2s - loss: 0.7719 - acc: 0.8549 - val_loss: 0.6923 - val_acc: 0.8375
Epoch 3/25
 - 2s - loss: 0.4564 - acc: 0.8913 - val_loss: 0.6011 - val_acc: 0.8789
Epoch 4/25
 - 2s - loss: 0.3951 - acc: 0.9021 - val_loss: 0.5297 - val_acc: 0.8819
Epoch 5/25
 - 2s - loss: 0.3669 - acc: 0.9090 - val_loss: 0.5020 - val_acc: 0.8802
Epoch 6/25
 - 2s - loss: 0.3349 - acc: 0.9173 - val_loss: 0.4600 - val_acc: 0.8799
Epoch 7/25
 - 2s - loss: 0.3227 - acc: 0.9183 - val_loss: 0.4454 - val_acc: 0.8829
Epoch 8/25
 - 2s - loss: 0.3061 - acc: 0.9192 - val_loss: 0.4239 - val_acc: 0.8744
Epoch 9/25
```

```
        - 2s - loss: 0.2907 - acc: 0.9208 - val_loss: 0.5619 - val_acc: 0.8168
      Epoch 10/25
        - 2s - loss: 0.2821 - acc: 0.9238 - val_loss: 0.4140 - val_acc: 0.8853
      Epoch 11/25
        - 2s - loss: 0.2773 - acc: 0.9282 - val_loss: 0.4211 - val_acc: 0.8795
      Epoch 12/25
        - 2s - loss: 0.2723 - acc: 0.9272 - val_loss: 0.4598 - val_acc: 0.8721
      Epoch 13/25
        - 2s - loss: 0.2641 - acc: 0.9302 - val_loss: 0.4977 - val_acc: 0.8320
      Epoch 14/25
        - 2s - loss: 0.2656 - acc: 0.9286 - val_loss: 0.4492 - val_acc: 0.8744
      Epoch 15/25
        - 2s - loss: 0.2545 - acc: 0.9340 - val_loss: 0.3560 - val_acc: 0.9057
      Epoch 16/25
        - 2s - loss: 0.2544 - acc: 0.9304 - val_loss: 0.4466 - val_acc: 0.8867
      Epoch 17/25
        - 2s - loss: 0.2561 - acc: 0.9295 - val_loss: 0.3536 - val_acc: 0.9070
      Epoch 18/25
        - 2s - loss: 0.2553 - acc: 0.9297 - val_loss: 0.3867 - val_acc: 0.9002
      Epoch 19/25
        - 2s - loss: 0.2501 - acc: 0.9366 - val_loss: 0.4176 - val_acc: 0.8724
      Epoch 20/25
        - 2s - loss: 0.2461 - acc: 0.9317 - val_loss: 0.3663 - val_acc: 0.8965
      Epoch 21/25
        - 2s - loss: 0.2415 - acc: 0.9344 - val_loss: 0.3721 - val_acc: 0.8877
      Epoch 22/25
        - 2s - loss: 0.2360 - acc: 0.9357 - val_loss: 0.5405 - val_acc: 0.7978
      Epoch 23/25
        - 2s - loss: 0.2358 - acc: 0.9350 - val_loss: 0.3713 - val_acc: 0.9060
      Epoch 24/25
        - 2s - loss: 0.2462 - acc: 0.9327 - val_loss: 0.3475 - val_acc: 0.9013
      Epoch 25/25
        - 2s - loss: 0.2335 - acc: 0.9339 - val_loss: 0.3673 - val_acc: 0.8931
      Train accuracy 0.9468171926006529 Test accuracy: 0.8931116389548693
      --------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_169 (Conv1D)	(None, 122, 32)	2048
conv1d_170 (Conv1D)	(None, 118, 32)	5152
dropout_85 (Dropout)	(None, 118, 32)	0

```
max_pooling1d_85 (MaxPooling (None, 39, 32)              0
_____
flatten_85 (Flatten)         (None, 1248)                0
_____
dense_169 (Dense)            (None, 64)                  79936
_____
dense_170 (Dense)            (None, 6)                   390
===============================================================
Total params: 87,526
Trainable params: 87,526
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 9s - loss: 6.8475 - acc: 0.8289 - val_loss: 0.7355 - val_acc: 0.8456
Epoch 2/30
 - 6s - loss: 0.4122 - acc: 0.9070 - val_loss: 0.5736 - val_acc: 0.8843
Epoch 3/30
 - 6s - loss: 0.3670 - acc: 0.9120 - val_loss: 0.4935 - val_acc: 0.8941
Epoch 4/30
 - 6s - loss: 0.3390 - acc: 0.9166 - val_loss: 0.4949 - val_acc: 0.8914
Epoch 5/30
 - 6s - loss: 0.3328 - acc: 0.9170 - val_loss: 0.5045 - val_acc: 0.8806
Epoch 6/30
 - 6s - loss: 0.3056 - acc: 0.9278 - val_loss: 0.4981 - val_acc: 0.8829
Epoch 7/30
 - 6s - loss: 0.3170 - acc: 0.9215 - val_loss: 0.4750 - val_acc: 0.8914
Epoch 8/30
 - 5s - loss: 0.2997 - acc: 0.9241 - val_loss: 0.4037 - val_acc: 0.9023
Epoch 9/30
 - 6s - loss: 0.2868 - acc: 0.9270 - val_loss: 0.4186 - val_acc: 0.8931
Epoch 10/30
 - 5s - loss: 0.2933 - acc: 0.9255 - val_loss: 0.3863 - val_acc: 0.8938
Epoch 11/30
 - 6s - loss: 0.2903 - acc: 0.9274 - val_loss: 0.4444 - val_acc: 0.8850
Epoch 12/30
 - 6s - loss: 0.2851 - acc: 0.9276 - val_loss: 0.4318 - val_acc: 0.8741
Epoch 13/30
 - 6s - loss: 0.2883 - acc: 0.9276 - val_loss: 0.4381 - val_acc: 0.9033
Epoch 14/30
 - 6s - loss: 0.2857 - acc: 0.9283 - val_loss: 0.4467 - val_acc: 0.8588
```

```
Epoch 15/30
 - 6s - loss: 0.2770 - acc: 0.9317 - val_loss: 0.3837 - val_acc: 0.8755
Epoch 16/30
 - 6s - loss: 0.2766 - acc: 0.9290 - val_loss: 0.4049 - val_acc: 0.8887
Epoch 17/30
 - 6s - loss: 0.2685 - acc: 0.9294 - val_loss: 0.4797 - val_acc: 0.8490
Epoch 18/30
 - 6s - loss: 0.2815 - acc: 0.9280 - val_loss: 0.4360 - val_acc: 0.8846
Epoch 19/30
 - 5s - loss: 0.2594 - acc: 0.9323 - val_loss: 0.4327 - val_acc: 0.8839
Epoch 20/30
 - 6s - loss: 0.2658 - acc: 0.9313 - val_loss: 0.4685 - val_acc: 0.8337
Epoch 21/30
 - 6s - loss: 0.2836 - acc: 0.9259 - val_loss: 0.4454 - val_acc: 0.8660
Epoch 22/30
 - 6s - loss: 0.2625 - acc: 0.9339 - val_loss: 0.4459 - val_acc: 0.8989
Epoch 23/30
 - 6s - loss: 0.3047 - acc: 0.9253 - val_loss: 0.4848 - val_acc: 0.8473
Epoch 24/30
 - 6s - loss: 0.2576 - acc: 0.9361 - val_loss: 0.3768 - val_acc: 0.8975
Epoch 25/30
 - 6s - loss: 0.2795 - acc: 0.9286 - val_loss: 0.3878 - val_acc: 0.8945
Epoch 26/30
 - 6s - loss: 0.2721 - acc: 0.9279 - val_loss: 0.3652 - val_acc: 0.8812
Epoch 27/30
 - 5s - loss: 0.2715 - acc: 0.9328 - val_loss: 0.3949 - val_acc: 0.8918
Epoch 28/30
 - 6s - loss: 0.2571 - acc: 0.9331 - val_loss: 0.4221 - val_acc: 0.8761
Epoch 29/30
 - 6s - loss: 0.2488 - acc: 0.9353 - val_loss: 0.3859 - val_acc: 0.8704
Epoch 30/30
 - 5s - loss: 0.2507 - acc: 0.9334 - val_loss: 0.4119 - val_acc: 0.8612
Train accuracy 0.905467899891186 Test accuracy: 0.8612147947064812
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_171 (Conv1D)	(None, 124, 32)	1472
conv1d_172 (Conv1D)	(None, 118, 24)	5400
dropout_86 (Dropout)	(None, 118, 24)	0

```
max_pooling1d_86 (MaxPooling (None, 59, 24)              0
_____
flatten_86 (Flatten)         (None, 1416)                0
_____
dense_171 (Dense)            (None, 64)                  90688
_____
dense_172 (Dense)            (None, 6)                   390
=================================================================
Total params: 97,950
Trainable params: 97,950
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 15.9475 - acc: 0.8440 - val_loss: 1.1642 - val_acc: 0.8975
Epoch 2/25
 - 3s - loss: 0.5140 - acc: 0.9172 - val_loss: 0.5033 - val_acc: 0.8941
Epoch 3/25
 - 3s - loss: 0.3759 - acc: 0.9236 - val_loss: 0.4970 - val_acc: 0.8629
Epoch 4/25
 - 3s - loss: 0.3284 - acc: 0.9274 - val_loss: 0.4429 - val_acc: 0.8924
Epoch 5/25
 - 3s - loss: 0.3142 - acc: 0.9290 - val_loss: 0.4180 - val_acc: 0.9080
Epoch 6/25
 - 3s - loss: 0.2808 - acc: 0.9332 - val_loss: 0.4399 - val_acc: 0.8951
Epoch 7/25
 - 3s - loss: 0.2997 - acc: 0.9268 - val_loss: 0.5484 - val_acc: 0.8521
Epoch 8/25
 - 3s - loss: 0.2535 - acc: 0.9403 - val_loss: 0.3941 - val_acc: 0.9023
Epoch 9/25
 - 3s - loss: 0.2595 - acc: 0.9334 - val_loss: 0.3872 - val_acc: 0.8921
Epoch 10/25
 - 3s - loss: 0.3227 - acc: 0.9226 - val_loss: 0.5766 - val_acc: 0.9043
Epoch 11/25
 - 3s - loss: 0.3140 - acc: 0.9331 - val_loss: 0.3889 - val_acc: 0.8985
Epoch 12/25
 - 3s - loss: 0.2310 - acc: 0.9422 - val_loss: 0.3395 - val_acc: 0.9097
Epoch 13/25
 - 3s - loss: 0.2589 - acc: 0.9340 - val_loss: 0.3660 - val_acc: 0.8928
Epoch 14/25
 - 3s - loss: 0.2451 - acc: 0.9389 - val_loss: 0.4025 - val_acc: 0.8850
Epoch 15/25
```

```
 - 3s - loss: 0.3124 - acc: 0.9294 - val_loss: 0.4006 - val_acc: 0.8846
Epoch 16/25
 - 3s - loss: 0.2450 - acc: 0.9374 - val_loss: 0.3918 - val_acc: 0.9013
Epoch 17/25
 - 3s - loss: 0.2356 - acc: 0.9410 - val_loss: 0.3284 - val_acc: 0.8975
Epoch 18/25
 - 3s - loss: 0.2434 - acc: 0.9376 - val_loss: 0.4164 - val_acc: 0.8965
Epoch 19/25
 - 3s - loss: 0.2499 - acc: 0.9389 - val_loss: 0.3804 - val_acc: 0.8894
Epoch 20/25
 - 3s - loss: 0.2785 - acc: 0.9362 - val_loss: 0.3768 - val_acc: 0.8772
Epoch 21/25
 - 3s - loss: 0.2298 - acc: 0.9425 - val_loss: 0.3490 - val_acc: 0.9084
Epoch 22/25
 - 3s - loss: 0.2165 - acc: 0.9414 - val_loss: 0.3712 - val_acc: 0.8962
Epoch 23/25
 - 3s - loss: 0.2380 - acc: 0.9406 - val_loss: 0.3505 - val_acc: 0.9006
Epoch 24/25
 - 3s - loss: 0.2295 - acc: 0.9412 - val_loss: 0.3346 - val_acc: 0.8989
Epoch 25/25
 - 3s - loss: 0.2549 - acc: 0.9343 - val_loss: 0.4912 - val_acc: 0.8761
Train accuracy 0.9477693144722524 Test accuracy: 0.8761452324397693
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_173 (Conv1D)	(None, 122, 42)	2688
conv1d_174 (Conv1D)	(None, 120, 24)	3048
dropout_87 (Dropout)	(None, 120, 24)	0
max_pooling1d_87 (MaxPooling	(None, 40, 24)	0
flatten_87 (Flatten)	(None, 960)	0
dense_173 (Dense)	(None, 64)	61504
dense_174 (Dense)	(None, 6)	390

```
Total params: 67,630
Trainable params: 67,630
Non-trainable params: 0
```

```
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 7s - loss: 6.4041 - acc: 0.7979 - val_loss: 0.7415 - val_acc: 0.8646
Epoch 2/30
 - 3s - loss: 0.4519 - acc: 0.8988 - val_loss: 0.6598 - val_acc: 0.8541
Epoch 3/30
 - 3s - loss: 0.3949 - acc: 0.9063 - val_loss: 0.5617 - val_acc: 0.8568
Epoch 4/30
 - 3s - loss: 0.3700 - acc: 0.9094 - val_loss: 0.5769 - val_acc: 0.8738
Epoch 5/30
 - 3s - loss: 0.3228 - acc: 0.9202 - val_loss: 0.4916 - val_acc: 0.8965
Epoch 6/30
 - 3s - loss: 0.3155 - acc: 0.9189 - val_loss: 0.5600 - val_acc: 0.8524
Epoch 7/30
 - 3s - loss: 0.3133 - acc: 0.9177 - val_loss: 0.4715 - val_acc: 0.8802
Epoch 8/30
 - 3s - loss: 0.3089 - acc: 0.9219 - val_loss: 0.4474 - val_acc: 0.8938
Epoch 9/30
 - 3s - loss: 0.2975 - acc: 0.9208 - val_loss: 0.4962 - val_acc: 0.8880
Epoch 10/30
 - 3s - loss: 0.2819 - acc: 0.9293 - val_loss: 0.4874 - val_acc: 0.8524
Epoch 11/30
 - 3s - loss: 0.2846 - acc: 0.9242 - val_loss: 0.4823 - val_acc: 0.8554
Epoch 12/30
 - 3s - loss: 0.2776 - acc: 0.9294 - val_loss: 0.4660 - val_acc: 0.8982
Epoch 13/30
 - 3s - loss: 0.2513 - acc: 0.9312 - val_loss: 0.4275 - val_acc: 0.8843
Epoch 14/30
 - 3s - loss: 0.2539 - acc: 0.9319 - val_loss: 0.4575 - val_acc: 0.8738
Epoch 15/30
 - 3s - loss: 0.2619 - acc: 0.9327 - val_loss: 0.5884 - val_acc: 0.7743
Epoch 16/30
 - 3s - loss: 0.2529 - acc: 0.9339 - val_loss: 0.4617 - val_acc: 0.8446
Epoch 17/30
 - 3s - loss: 0.2438 - acc: 0.9343 - val_loss: 0.4071 - val_acc: 0.9030
Epoch 18/30
 - 3s - loss: 0.2294 - acc: 0.9396 - val_loss: 0.4409 - val_acc: 0.8561
Epoch 19/30
 - 3s - loss: 0.2393 - acc: 0.9342 - val_loss: 0.4331 - val_acc: 0.8660
Epoch 20/30
 - 3s - loss: 0.2593 - acc: 0.9334 - val_loss: 0.4077 - val_acc: 0.8887
```

```
Epoch 21/30
 - 3s - loss: 0.2261 - acc: 0.9385 - val_loss: 0.5520 - val_acc: 0.7978
Epoch 22/30
 - 3s - loss: 0.2192 - acc: 0.9400 - val_loss: 0.5806 - val_acc: 0.7584
Epoch 23/30
 - 3s - loss: 0.2232 - acc: 0.9389 - val_loss: 0.4462 - val_acc: 0.8965
Epoch 24/30
 - 3s - loss: 0.2285 - acc: 0.9414 - val_loss: 0.3967 - val_acc: 0.8856
Epoch 25/30
 - 3s - loss: 0.2349 - acc: 0.9388 - val_loss: 0.3968 - val_acc: 0.8853
Epoch 26/30
 - 3s - loss: 0.2248 - acc: 0.9393 - val_loss: 0.4679 - val_acc: 0.8751
Epoch 27/30
 - 3s - loss: 0.2454 - acc: 0.9380 - val_loss: 0.4199 - val_acc: 0.8941
Epoch 28/30
 - 3s - loss: 0.2097 - acc: 0.9418 - val_loss: 0.4381 - val_acc: 0.8442
Epoch 29/30
 - 3s - loss: 0.2247 - acc: 0.9385 - val_loss: 0.4897 - val_acc: 0.8548
Epoch 30/30
 - 3s - loss: 0.2471 - acc: 0.9351 - val_loss: 0.4025 - val_acc: 0.8843
Train accuracy 0.9313112078346029 Test accuracy: 0.8842891075670173
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_175 (Conv1D)	(None, 124, 28)	1288
conv1d_176 (Conv1D)	(None, 120, 32)	4512
dropout_88 (Dropout)	(None, 120, 32)	0
max_pooling1d_88 (MaxPooling	(None, 60, 32)	0
flatten_88 (Flatten)	(None, 1920)	0
dense_175 (Dense)	(None, 64)	122944
dense_176 (Dense)	(None, 6)	390

```
Total params: 129,134
Trainable params: 129,134
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 47.0935 - acc: 0.7297 - val_loss: 7.2658 - val_acc: 0.6956
Epoch 2/25
 - 3s - loss: 2.5430 - acc: 0.8290 - val_loss: 1.1666 - val_acc: 0.7004
Epoch 3/25
 - 3s - loss: 0.6609 - acc: 0.8626 - val_loss: 0.7725 - val_acc: 0.8439
Epoch 4/25
 - 3s - loss: 0.5659 - acc: 0.8773 - val_loss: 0.7246 - val_acc: 0.8324
Epoch 5/25
 - 3s - loss: 0.5049 - acc: 0.8885 - val_loss: 0.7236 - val_acc: 0.8093
Epoch 6/25
 - 3s - loss: 0.5300 - acc: 0.8726 - val_loss: 0.7429 - val_acc: 0.8191
Epoch 7/25
 - 3s - loss: 0.4973 - acc: 0.8856 - val_loss: 0.6963 - val_acc: 0.8497
Epoch 8/25
 - 3s - loss: 0.4534 - acc: 0.8893 - val_loss: 0.6538 - val_acc: 0.8649
Epoch 9/25
 - 3s - loss: 0.4438 - acc: 0.8928 - val_loss: 0.7178 - val_acc: 0.8059
Epoch 10/25
 - 3s - loss: 0.4176 - acc: 0.9019 - val_loss: 0.5815 - val_acc: 0.8741
Epoch 11/25
 - 3s - loss: 0.4012 - acc: 0.9045 - val_loss: 0.6130 - val_acc: 0.8544
Epoch 12/25
 - 3s - loss: 0.4266 - acc: 0.8961 - val_loss: 0.5841 - val_acc: 0.8802
Epoch 13/25
 - 3s - loss: 0.4083 - acc: 0.9010 - val_loss: 0.5891 - val_acc: 0.8544
Epoch 14/25
 - 3s - loss: 0.3928 - acc: 0.9026 - val_loss: 0.5575 - val_acc: 0.8687
Epoch 15/25
 - 3s - loss: 0.3791 - acc: 0.9070 - val_loss: 0.6087 - val_acc: 0.8361
Epoch 16/25
 - 3s - loss: 0.3757 - acc: 0.9064 - val_loss: 0.5359 - val_acc: 0.8548
Epoch 17/25
 - 3s - loss: 0.3535 - acc: 0.9094 - val_loss: 0.5105 - val_acc: 0.8799
Epoch 18/25
 - 3s - loss: 0.3697 - acc: 0.9094 - val_loss: 0.6789 - val_acc: 0.8198
Epoch 19/25
 - 3s - loss: 0.3585 - acc: 0.9100 - val_loss: 0.4999 - val_acc: 0.8836
Epoch 20/25
 - 3s - loss: 0.3670 - acc: 0.9059 - val_loss: 0.4836 - val_acc: 0.8816
Epoch 21/25
```

```
 - 3s - loss: 0.4010 - acc: 0.8980 - val_loss: 0.5057 - val_acc: 0.8683
Epoch 22/25
 - 3s - loss: 0.3616 - acc: 0.9071 - val_loss: 0.5459 - val_acc: 0.8677
Epoch 23/25
 - 3s - loss: 0.3730 - acc: 0.9087 - val_loss: 0.5147 - val_acc: 0.8690
Epoch 24/25
 - 3s - loss: 0.3451 - acc: 0.9129 - val_loss: 0.5736 - val_acc: 0.8643
Epoch 25/25
 - 3s - loss: 0.3576 - acc: 0.9100 - val_loss: 0.5336 - val_acc: 0.8599
Train accuracy 0.9292709466811752 Test accuracy: 0.8598574821852731
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_177 (Conv1D)	(None, 122, 32)	2048
conv1d_178 (Conv1D)	(None, 116, 24)	5400
dropout_89 (Dropout)	(None, 116, 24)	0
max_pooling1d_89 (MaxPooling	(None, 38, 24)	0
flatten_89 (Flatten)	(None, 912)	0
dense_177 (Dense)	(None, 32)	29216
dense_178 (Dense)	(None, 6)	198

```
Total params: 36,862
Trainable params: 36,862
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 8s - loss: 3.5413 - acc: 0.7752 - val_loss: 0.5786 - val_acc: 0.8965
Epoch 2/35
 - 4s - loss: 0.4774 - acc: 0.8917 - val_loss: 0.5546 - val_acc: 0.8602
Epoch 3/35
 - 4s - loss: 0.3988 - acc: 0.8979 - val_loss: 0.6636 - val_acc: 0.7628
Epoch 4/35
 - 4s - loss: 0.3867 - acc: 0.8989 - val_loss: 0.4883 - val_acc: 0.8731
Epoch 5/35
```

```
             - 4s - loss: 0.3563 - acc: 0.9087 - val_loss: 0.5667 - val_acc: 0.8354
    Epoch 6/35
             - 4s - loss: 0.3477 - acc: 0.9076 - val_loss: 0.6794 - val_acc: 0.7995
    Epoch 7/35
             - 4s - loss: 0.3332 - acc: 0.9151 - val_loss: 0.4841 - val_acc: 0.8602
    Epoch 8/35
             - 4s - loss: 0.3369 - acc: 0.9115 - val_loss: 0.9915 - val_acc: 0.7122
    Epoch 9/35
             - 4s - loss: 0.3366 - acc: 0.9119 - val_loss: 0.4709 - val_acc: 0.8639
    Epoch 10/35
             - 4s - loss: 0.3364 - acc: 0.9087 - val_loss: 0.4429 - val_acc: 0.8873
    Epoch 11/35
             - 4s - loss: 0.3399 - acc: 0.9101 - val_loss: 0.4360 - val_acc: 0.8697
    Epoch 12/35
             - 4s - loss: 0.3455 - acc: 0.9101 - val_loss: 0.3995 - val_acc: 0.8826
    Epoch 13/35
             - 4s - loss: 0.3320 - acc: 0.9157 - val_loss: 0.4001 - val_acc: 0.8880
    Epoch 14/35
             - 4s - loss: 0.3362 - acc: 0.9083 - val_loss: 0.4408 - val_acc: 0.8711
    Epoch 15/35
             - 4s - loss: 0.3263 - acc: 0.9153 - val_loss: 0.4200 - val_acc: 0.8911
    Epoch 16/35
             - 4s - loss: 0.3398 - acc: 0.9117 - val_loss: 0.5621 - val_acc: 0.7838
    Epoch 17/35
             - 4s - loss: 0.3224 - acc: 0.9117 - val_loss: 0.6668 - val_acc: 0.8130
    Epoch 18/35
             - 4s - loss: 0.3120 - acc: 0.9193 - val_loss: 0.3908 - val_acc: 0.8907
    Epoch 19/35
             - 4s - loss: 0.3382 - acc: 0.9098 - val_loss: 0.4669 - val_acc: 0.8537
    Epoch 20/35
             - 4s - loss: 0.3083 - acc: 0.9195 - val_loss: 0.3803 - val_acc: 0.8829
    Epoch 21/35
             - 4s - loss: 0.3204 - acc: 0.9154 - val_loss: 0.5205 - val_acc: 0.8327
    Epoch 22/35
             - 4s - loss: 0.3271 - acc: 0.9112 - val_loss: 0.4133 - val_acc: 0.8714
    Epoch 23/35
             - 4s - loss: 0.3307 - acc: 0.9163 - val_loss: 0.6200 - val_acc: 0.8337
    Epoch 24/35
             - 4s - loss: 0.3266 - acc: 0.9123 - val_loss: 1.5387 - val_acc: 0.7044
    Epoch 25/35
             - 4s - loss: 0.3280 - acc: 0.9168 - val_loss: 0.4148 - val_acc: 0.8894
    Epoch 26/35
             - 4s - loss: 0.3205 - acc: 0.9169 - val_loss: 0.4315 - val_acc: 0.8697
```

```
Epoch 27/35
 - 4s - loss: 0.3192 - acc: 0.9136 - val_loss: 0.5011 - val_acc: 0.8429
Epoch 28/35
 - 4s - loss: 0.3146 - acc: 0.9153 - val_loss: 0.4253 - val_acc: 0.8731
Epoch 29/35
 - 4s - loss: 0.3095 - acc: 0.9189 - val_loss: 0.4554 - val_acc: 0.8734
Epoch 30/35
 - 4s - loss: 0.3188 - acc: 0.9177 - val_loss: 0.4661 - val_acc: 0.8887
Epoch 31/35
 - 4s - loss: 0.3238 - acc: 0.9125 - val_loss: 0.4434 - val_acc: 0.8694
Epoch 32/35
 - 4s - loss: 0.3187 - acc: 0.9157 - val_loss: 0.4362 - val_acc: 0.8551
Epoch 33/35
 - 4s - loss: 0.3326 - acc: 0.9166 - val_loss: 0.4552 - val_acc: 0.8751
Epoch 34/35
 - 4s - loss: 0.3079 - acc: 0.9232 - val_loss: 0.5428 - val_acc: 0.8599
Epoch 35/35
 - 4s - loss: 0.3287 - acc: 0.9157 - val_loss: 0.3991 - val_acc: 0.8826
Train accuracy 0.9396082698585418 Test accuracy: 0.8825924669155073
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_179 (Conv1D)	(None, 124, 32)	1472
conv1d_180 (Conv1D)	(None, 122, 16)	1552
dropout_90 (Dropout)	(None, 122, 16)	0
max_pooling1d_90 (MaxPooling	(None, 61, 16)	0
flatten_90 (Flatten)	(None, 976)	0
dense_179 (Dense)	(None, 64)	62528
dense_180 (Dense)	(None, 6)	390

```
Total params: 65,942
Trainable params: 65,942
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
```

```
Epoch 1/25
 - 10s - loss: 11.4304 - acc: 0.8188 - val_loss: 1.3101 - val_acc: 0.8307
Epoch 2/25
 - 6s - loss: 0.5970 - acc: 0.9011 - val_loss: 0.6391 - val_acc: 0.8592
Epoch 3/25
 - 6s - loss: 0.4156 - acc: 0.9037 - val_loss: 0.5854 - val_acc: 0.8690
Epoch 4/25
 - 6s - loss: 0.3665 - acc: 0.9138 - val_loss: 0.5236 - val_acc: 0.8629
Epoch 5/25
 - 5s - loss: 0.3455 - acc: 0.9157 - val_loss: 0.5405 - val_acc: 0.8785
Epoch 6/25
 - 6s - loss: 0.3174 - acc: 0.9266 - val_loss: 0.4695 - val_acc: 0.8744
Epoch 7/25
 - 5s - loss: 0.2955 - acc: 0.9291 - val_loss: 0.4959 - val_acc: 0.8670
Epoch 8/25
 - 6s - loss: 0.2852 - acc: 0.9282 - val_loss: 0.5324 - val_acc: 0.8683
Epoch 9/25
 - 5s - loss: 0.2830 - acc: 0.9295 - val_loss: 0.4038 - val_acc: 0.8938
Epoch 10/25
 - 6s - loss: 0.2774 - acc: 0.9314 - val_loss: 0.4562 - val_acc: 0.8870
Epoch 11/25
 - 6s - loss: 0.2708 - acc: 0.9323 - val_loss: 0.4688 - val_acc: 0.8666
Epoch 12/25
 - 5s - loss: 0.2675 - acc: 0.9304 - val_loss: 0.4663 - val_acc: 0.8928
Epoch 13/25
 - 6s - loss: 0.2492 - acc: 0.9357 - val_loss: 0.4438 - val_acc: 0.8945
Epoch 14/25
 - 6s - loss: 0.2438 - acc: 0.9363 - val_loss: 0.5148 - val_acc: 0.8558
Epoch 15/25
 - 6s - loss: 0.2394 - acc: 0.9368 - val_loss: 0.4394 - val_acc: 0.8646
Epoch 16/25
 - 6s - loss: 0.2444 - acc: 0.9346 - val_loss: 0.4269 - val_acc: 0.8680
Epoch 17/25
 - 6s - loss: 0.2381 - acc: 0.9361 - val_loss: 0.3736 - val_acc: 0.8965
Epoch 18/25
 - 5s - loss: 0.2403 - acc: 0.9369 - val_loss: 0.4352 - val_acc: 0.8958
Epoch 19/25
 - 6s - loss: 0.2276 - acc: 0.9396 - val_loss: 0.5363 - val_acc: 0.8582
Epoch 20/25
 - 6s - loss: 0.2253 - acc: 0.9392 - val_loss: 0.4209 - val_acc: 0.8979
Epoch 21/25
 - 6s - loss: 0.2287 - acc: 0.9391 - val_loss: 0.4006 - val_acc: 0.8880
Epoch 22/25
```

```
 - 5s - loss: 0.2349 - acc: 0.9355 - val_loss: 0.4229 - val_acc: 0.8711
Epoch 23/25
 - 6s - loss: 0.2156 - acc: 0.9412 - val_loss: 0.4436 - val_acc: 0.8829
Epoch 24/25
 - 6s - loss: 0.2235 - acc: 0.9416 - val_loss: 0.4468 - val_acc: 0.8846
Epoch 25/25
 - 5s - loss: 0.2299 - acc: 0.9382 - val_loss: 0.4252 - val_acc: 0.8812
Train accuracy 0.9428726877040261 Test accuracy: 0.8812351543942993
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_181 (Conv1D)	(None, 122, 42)	2688
conv1d_182 (Conv1D)	(None, 116, 24)	7080
dropout_91 (Dropout)	(None, 116, 24)	0
max_pooling1d_91 (MaxPooling	(None, 38, 24)	0
flatten_91 (Flatten)	(None, 912)	0
dense_181 (Dense)	(None, 32)	29216
dense_182 (Dense)	(None, 6)	198

```
Total params: 39,182
Trainable params: 39,182
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 65.4656 - acc: 0.7164 - val_loss: 20.4675 - val_acc: 0.8402
Epoch 2/30
 - 2s - loss: 8.9991 - acc: 0.8847 - val_loss: 3.2005 - val_acc: 0.8361
Epoch 3/30
 - 2s - loss: 1.4730 - acc: 0.8987 - val_loss: 1.0053 - val_acc: 0.8775
Epoch 4/30
 - 2s - loss: 0.5934 - acc: 0.9066 - val_loss: 0.7331 - val_acc: 0.8812
Epoch 5/30
 - 2s - loss: 0.4703 - acc: 0.9187 - val_loss: 0.7268 - val_acc: 0.8561
Epoch 6/30
```

```
            - 2s - loss: 0.4237 - acc: 0.9225 - val_loss: 0.6516 - val_acc: 0.8483
        Epoch 7/30
            - 2s - loss: 0.3930 - acc: 0.9289 - val_loss: 0.6226 - val_acc: 0.8666
        Epoch 8/30
            - 2s - loss: 0.3979 - acc: 0.9207 - val_loss: 0.7269 - val_acc: 0.7581
        Epoch 9/30
            - 2s - loss: 0.3837 - acc: 0.9257 - val_loss: 0.5610 - val_acc: 0.8792
        Epoch 10/30
            - 2s - loss: 0.3744 - acc: 0.9200 - val_loss: 0.5664 - val_acc: 0.8595
        Epoch 11/30
            - 2s - loss: 0.3401 - acc: 0.9285 - val_loss: 0.5123 - val_acc: 0.8918
        Epoch 12/30
            - 2s - loss: 0.3287 - acc: 0.9319 - val_loss: 0.5590 - val_acc: 0.8680
        Epoch 13/30
            - 2s - loss: 0.3257 - acc: 0.9314 - val_loss: 0.5358 - val_acc: 0.8677
        Epoch 14/30
            - 2s - loss: 0.3241 - acc: 0.9276 - val_loss: 0.4924 - val_acc: 0.8948
        Epoch 15/30
            - 2s - loss: 0.3021 - acc: 0.9348 - val_loss: 0.4895 - val_acc: 0.8744
        Epoch 16/30
            - 2s - loss: 0.3010 - acc: 0.9351 - val_loss: 0.4600 - val_acc: 0.8884
        Epoch 17/30
            - 2s - loss: 0.3016 - acc: 0.9334 - val_loss: 0.4862 - val_acc: 0.8792
        Epoch 18/30
            - 2s - loss: 0.2983 - acc: 0.9343 - val_loss: 0.4652 - val_acc: 0.8897
        Epoch 19/30
            - 2s - loss: 0.3004 - acc: 0.9317 - val_loss: 0.4425 - val_acc: 0.8911
        Epoch 20/30
            - 2s - loss: 0.3095 - acc: 0.9310 - val_loss: 0.4278 - val_acc: 0.8955
        Epoch 21/30
            - 2s - loss: 0.2788 - acc: 0.9365 - val_loss: 0.4826 - val_acc: 0.8734
        Epoch 22/30
            - 2s - loss: 0.2768 - acc: 0.9347 - val_loss: 0.4380 - val_acc: 0.8873
        Epoch 23/30
            - 2s - loss: 0.2662 - acc: 0.9381 - val_loss: 0.4024 - val_acc: 0.8918
        Epoch 24/30
            - 2s - loss: 0.2836 - acc: 0.9327 - val_loss: 0.4422 - val_acc: 0.8884
        Epoch 25/30
            - 2s - loss: 0.2571 - acc: 0.9392 - val_loss: 0.4019 - val_acc: 0.8890
        Epoch 26/30
            - 2s - loss: 0.2722 - acc: 0.9346 - val_loss: 0.4365 - val_acc: 0.8931
        Epoch 27/30
            - 2s - loss: 0.2709 - acc: 0.9348 - val_loss: 0.4078 - val_acc: 0.8948
```

```
Epoch 28/30
 - 2s - loss: 0.2534 - acc: 0.9412 - val_loss: 0.4307 - val_acc: 0.8836
Epoch 29/30
 - 2s - loss: 0.2928 - acc: 0.9316 - val_loss: 0.4136 - val_acc: 0.8880
Epoch 30/30
 - 2s - loss: 0.2472 - acc: 0.9412 - val_loss: 0.3809 - val_acc: 0.8989
Train accuracy 0.9503536452665942 Test accuracy: 0.8988802171700034
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_183 (Conv1D)	(None, 124, 32)	1472
conv1d_184 (Conv1D)	(None, 120, 16)	2576
dropout_92 (Dropout)	(None, 120, 16)	0
max_pooling1d_92 (MaxPooling	(None, 60, 16)	0
flatten_92 (Flatten)	(None, 960)	0
dense_183 (Dense)	(None, 64)	61504
dense_184 (Dense)	(None, 6)	390

```
Total params: 65,942
Trainable params: 65,942
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 8s - loss: 14.0002 - acc: 0.7871 - val_loss: 0.8703 - val_acc: 0.8347
Epoch 2/25
 - 4s - loss: 0.5291 - acc: 0.8794 - val_loss: 0.6603 - val_acc: 0.8531
Epoch 3/25
 - 3s - loss: 0.4731 - acc: 0.8837 - val_loss: 0.6648 - val_acc: 0.8242
Epoch 4/25
 - 3s - loss: 0.4438 - acc: 0.8921 - val_loss: 0.6187 - val_acc: 0.8592
Epoch 5/25
 - 3s - loss: 0.4142 - acc: 0.8979 - val_loss: 0.5915 - val_acc: 0.8480
Epoch 6/25
 - 3s - loss: 0.3833 - acc: 0.9047 - val_loss: 0.5314 - val_acc: 0.8680
```

```
Epoch 7/25
 - 3s - loss: 0.3656 - acc: 0.9078 - val_loss: 0.4996 - val_acc: 0.8717
Epoch 8/25
 - 3s - loss: 0.3702 - acc: 0.9076 - val_loss: 0.4927 - val_acc: 0.8768
Epoch 9/25
 - 3s - loss: 0.3383 - acc: 0.9155 - val_loss: 0.4732 - val_acc: 0.8717
Epoch 10/25
 - 3s - loss: 0.3192 - acc: 0.9191 - val_loss: 0.5551 - val_acc: 0.8334
Epoch 11/25
 - 3s - loss: 0.3342 - acc: 0.9123 - val_loss: 0.4763 - val_acc: 0.8816
Epoch 12/25
 - 3s - loss: 0.3134 - acc: 0.9184 - val_loss: 0.4811 - val_acc: 0.8748
Epoch 13/25
 - 3s - loss: 0.3011 - acc: 0.9218 - val_loss: 0.5402 - val_acc: 0.8185
Epoch 14/25
 - 3s - loss: 0.3200 - acc: 0.9178 - val_loss: 0.4299 - val_acc: 0.8904
Epoch 15/25
 - 4s - loss: 0.2990 - acc: 0.9236 - val_loss: 0.4294 - val_acc: 0.8873
Epoch 16/25
 - 3s - loss: 0.2887 - acc: 0.9264 - val_loss: 0.5242 - val_acc: 0.8453
Epoch 17/25
 - 3s - loss: 0.2784 - acc: 0.9274 - val_loss: 0.4284 - val_acc: 0.8758
Epoch 18/25
 - 3s - loss: 0.2831 - acc: 0.9270 - val_loss: 0.5076 - val_acc: 0.8724
Epoch 19/25
 - 3s - loss: 0.3172 - acc: 0.9193 - val_loss: 0.4167 - val_acc: 0.8982
Epoch 20/25
 - 3s - loss: 0.2692 - acc: 0.9313 - val_loss: 0.3854 - val_acc: 0.8870
Epoch 21/25
 - 3s - loss: 0.2656 - acc: 0.9263 - val_loss: 0.3891 - val_acc: 0.8867
Epoch 22/25
 - 3s - loss: 0.2806 - acc: 0.9259 - val_loss: 0.4880 - val_acc: 0.8683
Epoch 23/25
 - 3s - loss: 0.3071 - acc: 0.9192 - val_loss: 0.3980 - val_acc: 0.8938
Epoch 24/25
 - 3s - loss: 0.2985 - acc: 0.9229 - val_loss: 0.4830 - val_acc: 0.8459
Epoch 25/25
 - 3s - loss: 0.2700 - acc: 0.9298 - val_loss: 0.4018 - val_acc: 0.8938
Train accuracy 0.9440968443960827 Test accuracy: 0.8937902952154734
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

```
conv1d_185 (Conv1D)            (None, 122, 28)              1792
_____
conv1d_186 (Conv1D)            (None, 120, 24)              2040
_____
dropout_93 (Dropout)           (None, 120, 24)              0
_____
max_pooling1d_93 (MaxPooling (None, 40, 24)                 0
_____
flatten_93 (Flatten)           (None, 960)                  0
_____
dense_185 (Dense)              (None, 32)                   30752
_____
dense_186 (Dense)              (None, 6)                    198
=================================================================
Total params: 34,782
Trainable params: 34,782
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 45.0374 - acc: 0.6583 - val_loss: 3.7365 - val_acc: 0.6742
Epoch 2/25
 - 2s - loss: 1.1796 - acc: 0.7501 - val_loss: 0.9649 - val_acc: 0.7353
Epoch 3/25
 - 2s - loss: 0.6859 - acc: 0.8123 - val_loss: 0.9124 - val_acc: 0.6837
Epoch 4/25
 - 2s - loss: 0.6300 - acc: 0.8271 - val_loss: 0.8109 - val_acc: 0.7950
Epoch 5/25
 - 2s - loss: 0.5839 - acc: 0.8406 - val_loss: 0.6856 - val_acc: 0.8446
Epoch 6/25
 - 2s - loss: 0.5430 - acc: 0.8504 - val_loss: 0.6407 - val_acc: 0.8544
Epoch 7/25
 - 2s - loss: 0.5274 - acc: 0.8547 - val_loss: 0.6374 - val_acc: 0.8463
Epoch 8/25
 - 2s - loss: 0.5008 - acc: 0.8652 - val_loss: 0.8488 - val_acc: 0.7465
Epoch 9/25
 - 2s - loss: 0.4984 - acc: 0.8602 - val_loss: 0.6576 - val_acc: 0.8446
Epoch 10/25
 - 2s - loss: 0.4782 - acc: 0.8652 - val_loss: 0.6564 - val_acc: 0.8151
Epoch 11/25
 - 2s - loss: 0.4433 - acc: 0.8799 - val_loss: 0.5606 - val_acc: 0.8660
Epoch 12/25
```

```
 - 2s - loss: 0.4360 - acc: 0.8784 - val_loss: 0.5541 - val_acc: 0.8575
Epoch 13/25
 - 2s - loss: 0.4313 - acc: 0.8825 - val_loss: 0.5527 - val_acc: 0.8480
Epoch 14/25
 - 2s - loss: 0.4226 - acc: 0.8856 - val_loss: 0.5068 - val_acc: 0.8636
Epoch 15/25
 - 2s - loss: 0.4041 - acc: 0.8898 - val_loss: 0.6078 - val_acc: 0.8551
Epoch 16/25
 - 2s - loss: 0.4050 - acc: 0.8936 - val_loss: 0.5353 - val_acc: 0.8670
Epoch 17/25
 - 2s - loss: 0.3961 - acc: 0.8951 - val_loss: 0.4961 - val_acc: 0.8568
Epoch 18/25
 - 2s - loss: 0.3962 - acc: 0.8908 - val_loss: 0.5917 - val_acc: 0.8646
Epoch 19/25
 - 2s - loss: 0.3949 - acc: 0.8946 - val_loss: 0.5251 - val_acc: 0.8463
Epoch 20/25
 - 2s - loss: 0.3806 - acc: 0.8955 - val_loss: 0.4659 - val_acc: 0.8823
Epoch 21/25
 - 2s - loss: 0.3818 - acc: 0.8988 - val_loss: 0.5506 - val_acc: 0.8188
Epoch 22/25
 - 2s - loss: 0.3927 - acc: 0.8939 - val_loss: 0.7946 - val_acc: 0.7801
Epoch 23/25
 - 2s - loss: 0.3684 - acc: 0.9022 - val_loss: 0.4481 - val_acc: 0.8792
Epoch 24/25
 - 2s - loss: 0.3731 - acc: 0.9006 - val_loss: 0.4714 - val_acc: 0.8748
Epoch 25/25
 - 2s - loss: 0.3646 - acc: 0.9027 - val_loss: 0.5423 - val_acc: 0.8286
Train accuracy 0.8978509249183896 Test accuracy: 0.8286392941974889
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_187 (Conv1D)	(None, 122, 32)	2048
conv1d_188 (Conv1D)	(None, 116, 32)	7200
dropout_94 (Dropout)	(None, 116, 32)	0
max_pooling1d_94 (MaxPooling	(None, 38, 32)	0
flatten_94 (Flatten)	(None, 1216)	0
dense_187 (Dense)	(None, 64)	77888

```
_____
dense_188 (Dense)            (None, 6)                   390
=================================================================
Total params: 87,526
Trainable params: 87,526
Non-trainable params: 0

_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 8s - loss: 13.5111 - acc: 0.8187 - val_loss: 1.4059 - val_acc: 0.8809
Epoch 2/35
 - 4s - loss: 0.5501 - acc: 0.9223 - val_loss: 0.6292 - val_acc: 0.8948
Epoch 3/35
 - 4s - loss: 0.3531 - acc: 0.9261 - val_loss: 0.6608 - val_acc: 0.8755
Epoch 4/35
 - 4s - loss: 0.3272 - acc: 0.9283 - val_loss: 0.5381 - val_acc: 0.8904
Epoch 5/35
 - 4s - loss: 0.2936 - acc: 0.9350 - val_loss: 0.4766 - val_acc: 0.8901
Epoch 6/35
 - 4s - loss: 0.2925 - acc: 0.9350 - val_loss: 0.4680 - val_acc: 0.8901
Epoch 7/35
 - 4s - loss: 0.2739 - acc: 0.9373 - val_loss: 0.4565 - val_acc: 0.8887
Epoch 8/35
 - 4s - loss: 0.2658 - acc: 0.9363 - val_loss: 0.4758 - val_acc: 0.8806
Epoch 9/35
 - 4s - loss: 0.2597 - acc: 0.9376 - val_loss: 0.4578 - val_acc: 0.8921
Epoch 10/35
 - 4s - loss: 0.2468 - acc: 0.9389 - val_loss: 0.4329 - val_acc: 0.8924
Epoch 11/35
 - 4s - loss: 0.2795 - acc: 0.9329 - val_loss: 0.4237 - val_acc: 0.8935
Epoch 12/35
 - 4s - loss: 0.2208 - acc: 0.9472 - val_loss: 0.3750 - val_acc: 0.9006
Epoch 13/35
 - 4s - loss: 0.2418 - acc: 0.9402 - val_loss: 0.3963 - val_acc: 0.8962
Epoch 14/35
 - 4s - loss: 0.2316 - acc: 0.9388 - val_loss: 0.3783 - val_acc: 0.8918
Epoch 15/35
 - 4s - loss: 0.2376 - acc: 0.9372 - val_loss: 0.4122 - val_acc: 0.9053
Epoch 16/35
 - 4s - loss: 0.2361 - acc: 0.9368 - val_loss: 0.4057 - val_acc: 0.8717
Epoch 17/35
 - 4s - loss: 0.2291 - acc: 0.9387 - val_loss: 0.3826 - val_acc: 0.8962
```

```
Epoch 18/35
 - 4s - loss: 0.2250 - acc: 0.9402 - val_loss: 0.3872 - val_acc: 0.8985
Epoch 19/35
 - 4s - loss: 0.2309 - acc: 0.9382 - val_loss: 0.3794 - val_acc: 0.8911
Epoch 20/35
 - 4s - loss: 0.2487 - acc: 0.9317 - val_loss: 0.4265 - val_acc: 0.8958
Epoch 21/35
 - 4s - loss: 0.2346 - acc: 0.9410 - val_loss: 0.4008 - val_acc: 0.8867
Epoch 22/35
 - 4s - loss: 0.2187 - acc: 0.9427 - val_loss: 0.3837 - val_acc: 0.9002
Epoch 23/35
 - 4s - loss: 0.2490 - acc: 0.9357 - val_loss: 0.3745 - val_acc: 0.8928
Epoch 24/35
 - 4s - loss: 0.2001 - acc: 0.9468 - val_loss: 0.3740 - val_acc: 0.8894
Epoch 25/35
 - 4s - loss: 0.2365 - acc: 0.9369 - val_loss: 0.3419 - val_acc: 0.8985
Epoch 26/35
 - 4s - loss: 0.2291 - acc: 0.9381 - val_loss: 0.3988 - val_acc: 0.8965
Epoch 27/35
 - 4s - loss: 0.2247 - acc: 0.9388 - val_loss: 0.3955 - val_acc: 0.8945
Epoch 28/35
 - 4s - loss: 0.2240 - acc: 0.9395 - val_loss: 0.4063 - val_acc: 0.8785
Epoch 29/35
 - 4s - loss: 0.2066 - acc: 0.9440 - val_loss: 0.3714 - val_acc: 0.8884
Epoch 30/35
 - 4s - loss: 0.2121 - acc: 0.9395 - val_loss: 0.3521 - val_acc: 0.8911
Epoch 31/35
 - 4s - loss: 0.2124 - acc: 0.9436 - val_loss: 0.3807 - val_acc: 0.8819
Epoch 32/35
 - 4s - loss: 0.2256 - acc: 0.9377 - val_loss: 0.4341 - val_acc: 0.8734
Epoch 33/35
 - 4s - loss: 0.2252 - acc: 0.9418 - val_loss: 0.4033 - val_acc: 0.8870
Epoch 34/35
 - 4s - loss: 0.2067 - acc: 0.9452 - val_loss: 0.3971 - val_acc: 0.8945
Epoch 35/35
 - 4s - loss: 0.2113 - acc: 0.9431 - val_loss: 0.3885 - val_acc: 0.8751
Train accuracy 0.9287268770402611 Test accuracy: 0.8751272480488632
----------------------------------------------------------------------------

_____
Layer (type)              Output Shape              Param #
================================================================
conv1d_189 (Conv1D)        (None, 124, 42)            1932
_____
```

```
conv1d_190 (Conv1D)          (None, 122, 16)          2032
_____
dropout_95 (Dropout)         (None, 122, 16)          0
_____
max_pooling1d_95 (MaxPooling (None, 61, 16)           0
_____
flatten_95 (Flatten)         (None, 976)              0
_____
dense_189 (Dense)            (None, 32)               31264
_____
dense_190 (Dense)            (None, 6)                198
=================================================================
Total params: 35,426
Trainable params: 35,426
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 101.5560 - acc: 0.6560 - val_loss: 44.9517 - val_acc: 0.7720
Epoch 2/30
 - 2s - loss: 23.1844 - acc: 0.8052 - val_loss: 9.8165 - val_acc: 0.7431
Epoch 3/30
 - 2s - loss: 4.8652 - acc: 0.8617 - val_loss: 2.3456 - val_acc: 0.8297
Epoch 4/30
 - 2s - loss: 1.2572 - acc: 0.8746 - val_loss: 1.0283 - val_acc: 0.8392
Epoch 5/30
 - 2s - loss: 0.6465 - acc: 0.8881 - val_loss: 0.7658 - val_acc: 0.8463
Epoch 6/30
 - 2s - loss: 0.5241 - acc: 0.8946 - val_loss: 0.7202 - val_acc: 0.8422
Epoch 7/30
 - 2s - loss: 0.4840 - acc: 0.8951 - val_loss: 0.6374 - val_acc: 0.8734
Epoch 8/30
 - 2s - loss: 0.4620 - acc: 0.8965 - val_loss: 0.7188 - val_acc: 0.8117
Epoch 9/30
 - 2s - loss: 0.4430 - acc: 0.8984 - val_loss: 0.6645 - val_acc: 0.8378
Epoch 10/30
 - 2s - loss: 0.4339 - acc: 0.9007 - val_loss: 0.6147 - val_acc: 0.8565
Epoch 11/30
 - 2s - loss: 0.4076 - acc: 0.9056 - val_loss: 0.5563 - val_acc: 0.8778
Epoch 12/30
 - 2s - loss: 0.4180 - acc: 0.9025 - val_loss: 0.5621 - val_acc: 0.8799
Epoch 13/30
```

```
                 - 2s - loss: 0.3738 - acc: 0.9127 - val_loss: 0.5695 - val_acc: 0.8320
         Epoch 14/30
                 - 2s - loss: 0.3912 - acc: 0.9032 - val_loss: 0.5305 - val_acc: 0.8799
         Epoch 15/30
                 - 2s - loss: 0.3719 - acc: 0.9106 - val_loss: 0.5372 - val_acc: 0.8765
         Epoch 16/30
                 - 2s - loss: 0.3717 - acc: 0.9098 - val_loss: 0.5217 - val_acc: 0.8846
         Epoch 17/30
                 - 2s - loss: 0.3756 - acc: 0.9110 - val_loss: 0.5204 - val_acc: 0.8609
         Epoch 18/30
                 - 2s - loss: 0.3356 - acc: 0.9219 - val_loss: 0.4466 - val_acc: 0.8850
         Epoch 19/30
                 - 2s - loss: 0.3470 - acc: 0.9134 - val_loss: 0.4731 - val_acc: 0.8741
         Epoch 20/30
                 - 2s - loss: 0.3342 - acc: 0.9184 - val_loss: 0.4912 - val_acc: 0.8860
         Epoch 21/30
                 - 2s - loss: 0.3280 - acc: 0.9208 - val_loss: 0.4896 - val_acc: 0.8914
         Epoch 22/30
                 - 2s - loss: 0.3140 - acc: 0.9222 - val_loss: 0.4720 - val_acc: 0.8802
         Epoch 23/30
                 - 2s - loss: 0.3299 - acc: 0.9163 - val_loss: 0.4775 - val_acc: 0.8904
         Epoch 24/30
                 - 2s - loss: 0.3059 - acc: 0.9274 - val_loss: 0.5021 - val_acc: 0.8660
         Epoch 25/30
                 - 2s - loss: 0.2991 - acc: 0.9253 - val_loss: 0.4421 - val_acc: 0.9009
         Epoch 26/30
                 - 2s - loss: 0.3073 - acc: 0.9253 - val_loss: 0.4416 - val_acc: 0.8907
         Epoch 27/30
                 - 2s - loss: 0.3129 - acc: 0.9202 - val_loss: 0.5320 - val_acc: 0.8558
         Epoch 28/30
                 - 2s - loss: 0.3017 - acc: 0.9290 - val_loss: 0.4403 - val_acc: 0.8996
         Epoch 29/30
                 - 2s - loss: 0.3007 - acc: 0.9267 - val_loss: 0.4520 - val_acc: 0.8979
         Epoch 30/30
                 - 2s - loss: 0.2998 - acc: 0.9270 - val_loss: 0.4421 - val_acc: 0.8823
         Train accuracy 0.9393362350380848 Test accuracy: 0.8822531387852053
         --------------------------------------------------------------------------------

         _____
         Layer (type)                 Output Shape              Param #
         ================================================================
         conv1d_191 (Conv1D)          (None, 122, 32)           2048
         _____
         conv1d_192 (Conv1D)          (None, 118, 24)           3864
```

```
dropout_96 (Dropout)          (None, 118, 24)              0
_____

max_pooling1d_96 (MaxPooling  (None, 39, 24)               0
_____

flatten_96 (Flatten)          (None, 936)                  0
_____

dense_191 (Dense)             (None, 64)               59968
_____

dense_192 (Dense)             (None, 6)                  390
===============================================================
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0
_____

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 11s - loss: 4.9231 - acc: 0.8377 - val_loss: 0.8762 - val_acc: 0.8985
Epoch 2/25
 - 6s - loss: 0.4481 - acc: 0.9313 - val_loss: 0.5428 - val_acc: 0.8507
Epoch 3/25
 - 7s - loss: 0.3025 - acc: 0.9295 - val_loss: 0.4260 - val_acc: 0.9006
Epoch 4/25
 - 7s - loss: 0.2469 - acc: 0.9410 - val_loss: 0.3910 - val_acc: 0.8931
Epoch 5/25
 - 7s - loss: 0.2328 - acc: 0.9426 - val_loss: 0.3538 - val_acc: 0.9074
Epoch 6/25
 - 7s - loss: 0.2245 - acc: 0.9408 - val_loss: 0.3913 - val_acc: 0.8867
Epoch 7/25
 - 7s - loss: 0.2118 - acc: 0.9434 - val_loss: 0.3481 - val_acc: 0.8972
Epoch 8/25
 - 7s - loss: 0.2128 - acc: 0.9418 - val_loss: 0.3904 - val_acc: 0.8731
Epoch 9/25
 - 7s - loss: 0.2049 - acc: 0.9429 - val_loss: 0.3794 - val_acc: 0.8877
Epoch 10/25
 - 7s - loss: 0.2063 - acc: 0.9400 - val_loss: 0.3409 - val_acc: 0.9121
Epoch 11/25
 - 7s - loss: 0.1903 - acc: 0.9431 - val_loss: 0.3484 - val_acc: 0.8924
Epoch 12/25
 - 7s - loss: 0.1928 - acc: 0.9436 - val_loss: 0.3431 - val_acc: 0.8884
Epoch 13/25
 - 7s - loss: 0.1965 - acc: 0.9434 - val_loss: 0.3697 - val_acc: 0.8948
```

```
Epoch 14/25
 - 7s - loss: 0.1908 - acc: 0.9457 - val_loss: 0.3354 - val_acc: 0.8914
Epoch 15/25
 - 7s - loss: 0.1900 - acc: 0.9467 - val_loss: 0.3377 - val_acc: 0.8873
Epoch 16/25
 - 6s - loss: 0.1932 - acc: 0.9421 - val_loss: 0.3192 - val_acc: 0.8962
Epoch 17/25
 - 7s - loss: 0.1807 - acc: 0.9457 - val_loss: 0.3560 - val_acc: 0.8839
Epoch 18/25
 - 7s - loss: 0.2014 - acc: 0.9444 - val_loss: 0.4726 - val_acc: 0.8619
Epoch 19/25
 - 7s - loss: 0.1910 - acc: 0.9456 - val_loss: 0.3210 - val_acc: 0.9097
Epoch 20/25
 - 7s - loss: 0.1807 - acc: 0.9463 - val_loss: 0.3456 - val_acc: 0.9026
Epoch 21/25
 - 7s - loss: 0.1802 - acc: 0.9470 - val_loss: 0.4341 - val_acc: 0.8935
Epoch 22/25
 - 7s - loss: 0.1832 - acc: 0.9484 - val_loss: 0.3219 - val_acc: 0.8924
Epoch 23/25
 - 7s - loss: 0.1814 - acc: 0.9489 - val_loss: 0.3298 - val_acc: 0.8975
Epoch 24/25
 - 7s - loss: 0.1912 - acc: 0.9437 - val_loss: 0.3173 - val_acc: 0.9101
Epoch 25/25
 - 7s - loss: 0.1712 - acc: 0.9514 - val_loss: 0.3109 - val_acc: 0.9030
Train accuracy 0.9502176278563657 Test accuracy: 0.9029521547336274
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_193 (Conv1D)	(None, 124, 42)	1932
conv1d_194 (Conv1D)	(None, 118, 16)	4720
dropout_97 (Dropout)	(None, 118, 16)	0
max_pooling1d_97 (MaxPooling	(None, 59, 16)	0
flatten_97 (Flatten)	(None, 944)	0
dense_193 (Dense)	(None, 32)	30240
dense_194 (Dense)	(None, 6)	198

```
          Total params: 37,090
          Trainable params: 37,090
          Non-trainable params: 0
          _____
          None
          Train on 7352 samples, validate on 2947 samples
          Epoch 1/25
           - 7s - loss: 20.0633 - acc: 0.7391 - val_loss: 2.1763 - val_acc: 0.8130
          Epoch 2/25
           - 3s - loss: 0.8582 - acc: 0.8762 - val_loss: 0.7603 - val_acc: 0.8293
          Epoch 3/25
           - 3s - loss: 0.4883 - acc: 0.8893 - val_loss: 0.6756 - val_acc: 0.8171
          Epoch 4/25
           - 3s - loss: 0.4394 - acc: 0.8945 - val_loss: 0.5831 - val_acc: 0.8656
          Epoch 5/25
           - 3s - loss: 0.4184 - acc: 0.9032 - val_loss: 0.5638 - val_acc: 0.8741
          Epoch 6/25
           - 3s - loss: 0.3750 - acc: 0.9139 - val_loss: 0.6264 - val_acc: 0.8575
          Epoch 7/25
           - 3s - loss: 0.3726 - acc: 0.9121 - val_loss: 0.5143 - val_acc: 0.8765
          Epoch 8/25
           - 3s - loss: 0.3521 - acc: 0.9165 - val_loss: 0.5094 - val_acc: 0.8724
          Epoch 9/25
           - 3s - loss: 0.3458 - acc: 0.9158 - val_loss: 0.4961 - val_acc: 0.8734
          Epoch 10/25
           - 3s - loss: 0.3458 - acc: 0.9146 - val_loss: 0.5334 - val_acc: 0.8697
          Epoch 11/25
           - 3s - loss: 0.3104 - acc: 0.9229 - val_loss: 0.5088 - val_acc: 0.8778
          Epoch 12/25
           - 3s - loss: 0.3058 - acc: 0.9242 - val_loss: 0.4776 - val_acc: 0.8704
          Epoch 13/25
           - 3s - loss: 0.3059 - acc: 0.9252 - val_loss: 0.4857 - val_acc: 0.8639
          Epoch 14/25
           - 3s - loss: 0.3034 - acc: 0.9293 - val_loss: 0.4869 - val_acc: 0.8751
          Epoch 15/25
           - 3s - loss: 0.3074 - acc: 0.9226 - val_loss: 0.4195 - val_acc: 0.8884
          Epoch 16/25
           - 3s - loss: 0.2977 - acc: 0.9253 - val_loss: 0.4551 - val_acc: 0.8826
          Epoch 17/25
           - 3s - loss: 0.2872 - acc: 0.9302 - val_loss: 0.4481 - val_acc: 0.9030
          Epoch 18/25
           - 3s - loss: 0.2909 - acc: 0.9286 - val_loss: 0.5166 - val_acc: 0.8646
          Epoch 19/25
```

```
 - 3s - loss: 0.2792 - acc: 0.9308 - val_loss: 0.4778 - val_acc: 0.8670
Epoch 20/25
 - 3s - loss: 0.2778 - acc: 0.9286 - val_loss: 0.4626 - val_acc: 0.8782
Epoch 21/25
 - 3s - loss: 0.2897 - acc: 0.9279 - val_loss: 0.5614 - val_acc: 0.8310
Epoch 22/25
 - 3s - loss: 0.2848 - acc: 0.9266 - val_loss: 0.4592 - val_acc: 0.8548
Epoch 23/25
 - 3s - loss: 0.2725 - acc: 0.9323 - val_loss: 0.4801 - val_acc: 0.8392
Epoch 24/25
 - 3s - loss: 0.2913 - acc: 0.9271 - val_loss: 0.4791 - val_acc: 0.8856
Epoch 25/25
 - 3s - loss: 0.2956 - acc: 0.9301 - val_loss: 0.4798 - val_acc: 0.8649
Train accuracy 0.9468171926006529 Test accuracy: 0.8649474041398032
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_195 (Conv1D)	(None, 122, 28)	1792
conv1d_196 (Conv1D)	(None, 120, 24)	2040
dropout_98 (Dropout)	(None, 120, 24)	0
max_pooling1d_98 (MaxPooling	(None, 40, 24)	0
flatten_98 (Flatten)	(None, 960)	0
dense_195 (Dense)	(None, 64)	61504
dense_196 (Dense)	(None, 6)	390

```
Total params: 65,726
Trainable params: 65,726
Non-trainable params: 0
```

```
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 8.3842 - acc: 0.7356 - val_loss: 1.2760 - val_acc: 0.8602
Epoch 2/30
 - 2s - loss: 0.6686 - acc: 0.8787 - val_loss: 0.6373 - val_acc: 0.8907
Epoch 3/30
```

```
             - 2s - loss: 0.4356 - acc: 0.9079 - val_loss: 0.5604 - val_acc: 0.8649
         Epoch 4/30
             - 2s - loss: 0.3612 - acc: 0.9134 - val_loss: 0.4945 - val_acc: 0.8755
         Epoch 5/30
             - 2s - loss: 0.3316 - acc: 0.9169 - val_loss: 0.3994 - val_acc: 0.9053
         Epoch 6/30
             - 2s - loss: 0.3078 - acc: 0.9223 - val_loss: 0.3707 - val_acc: 0.9104
         Epoch 7/30
             - 2s - loss: 0.2969 - acc: 0.9257 - val_loss: 0.4432 - val_acc: 0.8707
         Epoch 8/30
             - 2s - loss: 0.2853 - acc: 0.9271 - val_loss: 0.3801 - val_acc: 0.8924
         Epoch 9/30
             - 2s - loss: 0.2797 - acc: 0.9272 - val_loss: 0.4271 - val_acc: 0.8744
         Epoch 10/30
             - 2s - loss: 0.2716 - acc: 0.9282 - val_loss: 0.4296 - val_acc: 0.8670
         Epoch 11/30
             - 2s - loss: 0.2632 - acc: 0.9334 - val_loss: 0.5736 - val_acc: 0.8327
         Epoch 12/30
             - 2s - loss: 0.2748 - acc: 0.9286 - val_loss: 0.3467 - val_acc: 0.9186
         Epoch 13/30
             - 2s - loss: 0.2599 - acc: 0.9310 - val_loss: 0.3441 - val_acc: 0.8992
         Epoch 14/30
             - 2s - loss: 0.2646 - acc: 0.9295 - val_loss: 0.3369 - val_acc: 0.9203
         Epoch 15/30
             - 2s - loss: 0.2677 - acc: 0.9298 - val_loss: 0.3484 - val_acc: 0.9040
         Epoch 16/30
             - 2s - loss: 0.2497 - acc: 0.9336 - val_loss: 0.3331 - val_acc: 0.9019
         Epoch 17/30
             - 2s - loss: 0.2481 - acc: 0.9327 - val_loss: 0.3384 - val_acc: 0.8941
         Epoch 18/30
             - 2s - loss: 0.2477 - acc: 0.9335 - val_loss: 0.3527 - val_acc: 0.9040
         Epoch 19/30
             - 2s - loss: 0.2343 - acc: 0.9366 - val_loss: 0.3344 - val_acc: 0.9036
         Epoch 20/30
             - 2s - loss: 0.2463 - acc: 0.9359 - val_loss: 0.3297 - val_acc: 0.8982
         Epoch 21/30
             - 2s - loss: 0.2494 - acc: 0.9347 - val_loss: 0.3404 - val_acc: 0.9057
         Epoch 22/30
             - 2s - loss: 0.2552 - acc: 0.9304 - val_loss: 0.3234 - val_acc: 0.9087
         Epoch 23/30
             - 2s - loss: 0.2522 - acc: 0.9353 - val_loss: 0.3195 - val_acc: 0.8962
         Epoch 24/30
             - 2s - loss: 0.2428 - acc: 0.9331 - val_loss: 0.3441 - val_acc: 0.8914
```

```
Epoch 25/30
 - 2s - loss: 0.2451 - acc: 0.9323 - val_loss: 0.4233 - val_acc: 0.8639
Epoch 26/30
 - 2s - loss: 0.2443 - acc: 0.9325 - val_loss: 0.3649 - val_acc: 0.8901
Epoch 27/30
 - 2s - loss: 0.2268 - acc: 0.9385 - val_loss: 0.3710 - val_acc: 0.8728
Epoch 28/30
 - 2s - loss: 0.2675 - acc: 0.9327 - val_loss: 0.3127 - val_acc: 0.9019
Epoch 29/30
 - 2s - loss: 0.2410 - acc: 0.9368 - val_loss: 0.3636 - val_acc: 0.8897
Epoch 30/30
 - 2s - loss: 0.2271 - acc: 0.9384 - val_loss: 0.3242 - val_acc: 0.9013
Train accuracy 0.9357997823721437 Test accuracy: 0.9012555140821175
-----------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_197 (Conv1D)          (None, 124, 32)           1472
_____
conv1d_198 (Conv1D)          (None, 120, 16)           2576
_____
dropout_99 (Dropout)         (None, 120, 16)           0
_____
max_pooling1d_99 (MaxPooling (None, 40, 16)            0
_____
flatten_99 (Flatten)         (None, 640)               0
_____
dense_197 (Dense)            (None, 32)                20512
_____
dense_198 (Dense)            (None, 6)                 198
=================================================================
Total params: 24,758
Trainable params: 24,758
Non-trainable params: 0
_____
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 9s - loss: 4.5669 - acc: 0.7935 - val_loss: 0.8646 - val_acc: 0.8656
Epoch 2/25
 - 4s - loss: 0.4426 - acc: 0.9064 - val_loss: 0.5971 - val_acc: 0.8748
Epoch 3/25
 - 5s - loss: 0.3473 - acc: 0.9214 - val_loss: 0.5384 - val_acc: 0.8819
```

```
Epoch 4/25
 - 5s - loss: 0.3153 - acc: 0.9227 - val_loss: 0.5751 - val_acc: 0.8578
Epoch 5/25
 - 4s - loss: 0.2910 - acc: 0.9291 - val_loss: 0.5726 - val_acc: 0.8276
Epoch 6/25
 - 4s - loss: 0.2886 - acc: 0.9325 - val_loss: 0.4760 - val_acc: 0.8853
Epoch 7/25
 - 5s - loss: 0.2862 - acc: 0.9293 - val_loss: 0.4660 - val_acc: 0.8918
Epoch 8/25
 - 4s - loss: 0.2534 - acc: 0.9365 - val_loss: 0.4801 - val_acc: 0.8714
Epoch 9/25
 - 5s - loss: 0.2551 - acc: 0.9380 - val_loss: 0.4702 - val_acc: 0.8795
Epoch 10/25
 - 5s - loss: 0.2356 - acc: 0.9374 - val_loss: 0.4707 - val_acc: 0.8707
Epoch 11/25
 - 4s - loss: 0.2498 - acc: 0.9328 - val_loss: 0.4411 - val_acc: 0.8853
Epoch 12/25
 - 4s - loss: 0.2408 - acc: 0.9373 - val_loss: 0.4557 - val_acc: 0.8744
Epoch 13/25
 - 5s - loss: 0.2391 - acc: 0.9388 - val_loss: 0.4413 - val_acc: 0.8609
Epoch 14/25
 - 4s - loss: 0.2460 - acc: 0.9351 - val_loss: 0.4033 - val_acc: 0.8795
Epoch 15/25
 - 5s - loss: 0.2366 - acc: 0.9380 - val_loss: 0.3867 - val_acc: 0.8921
Epoch 16/25
 - 4s - loss: 0.2438 - acc: 0.9358 - val_loss: 0.4143 - val_acc: 0.8802
Epoch 17/25
 - 5s - loss: 0.2167 - acc: 0.9416 - val_loss: 0.4161 - val_acc: 0.8639
Epoch 18/25
 - 5s - loss: 0.2247 - acc: 0.9377 - val_loss: 0.3815 - val_acc: 0.8914
Epoch 19/25
 - 4s - loss: 0.2324 - acc: 0.9393 - val_loss: 0.4458 - val_acc: 0.8717
Epoch 20/25
 - 4s - loss: 0.2228 - acc: 0.9407 - val_loss: 0.4284 - val_acc: 0.8802
Epoch 21/25
 - 5s - loss: 0.2199 - acc: 0.9406 - val_loss: 0.5000 - val_acc: 0.8191
Epoch 22/25
 - 4s - loss: 0.2427 - acc: 0.9357 - val_loss: 0.4173 - val_acc: 0.8921
Epoch 23/25
 - 5s - loss: 0.2445 - acc: 0.9347 - val_loss: 0.3632 - val_acc: 0.8955
Epoch 24/25
 - 5s - loss: 0.2191 - acc: 0.9425 - val_loss: 0.4164 - val_acc: 0.8982
Epoch 25/25
```

```
      - 4s - loss: 0.2149 - acc: 0.9446 - val_loss: 0.5544 - val_acc: 0.8432
     Train accuracy 0.899619151186502 Test accuracy: 0.8432304038004751
     ----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_199 (Conv1D)	(None, 122, 32)	2048
conv1d_200 (Conv1D)	(None, 120, 32)	3104
dropout_100 (Dropout)	(None, 120, 32)	0
max_pooling1d_100 (MaxPoolin	(None, 60, 32)	0
flatten_100 (Flatten)	(None, 1920)	0
dense_199 (Dense)	(None, 64)	122944
dense_200 (Dense)	(None, 6)	390

```
     Total params: 128,486
     Trainable params: 128,486
     Non-trainable params: 0
     _____

     None
     Train on 7352 samples, validate on 2947 samples
     Epoch 1/30
      - 7s - loss: 30.5532 - acc: 0.7618 - val_loss: 2.2024 - val_acc: 0.8246
     Epoch 2/30
      - 3s - loss: 0.8391 - acc: 0.8853 - val_loss: 0.8323 - val_acc: 0.8035
     Epoch 3/30
      - 3s - loss: 0.5331 - acc: 0.8849 - val_loss: 0.7406 - val_acc: 0.8147
     Epoch 4/30
      - 3s - loss: 0.4779 - acc: 0.9004 - val_loss: 0.6211 - val_acc: 0.8778
     Epoch 5/30
      - 3s - loss: 0.4147 - acc: 0.9128 - val_loss: 0.5577 - val_acc: 0.8792
     Epoch 6/30
      - 3s - loss: 0.4284 - acc: 0.9057 - val_loss: 0.6300 - val_acc: 0.8334
     Epoch 7/30
      - 3s - loss: 0.3658 - acc: 0.9218 - val_loss: 0.5696 - val_acc: 0.8660
     Epoch 8/30
      - 3s - loss: 0.4054 - acc: 0.9089 - val_loss: 0.5670 - val_acc: 0.8371
     Epoch 9/30
```

```
           - 3s - loss: 0.3656 - acc: 0.9154 - val_loss: 0.5273 - val_acc: 0.8904
Epoch 10/30
           - 3s - loss: 0.3714 - acc: 0.9166 - val_loss: 0.5122 - val_acc: 0.8812
Epoch 11/30
           - 3s - loss: 0.3268 - acc: 0.9274 - val_loss: 0.5266 - val_acc: 0.8660
Epoch 12/30
           - 3s - loss: 0.3229 - acc: 0.9298 - val_loss: 0.4563 - val_acc: 0.9026
Epoch 13/30
           - 3s - loss: 0.3243 - acc: 0.9245 - val_loss: 0.5118 - val_acc: 0.8945
Epoch 14/30
           - 3s - loss: 0.3167 - acc: 0.9264 - val_loss: 0.4692 - val_acc: 0.8792
Epoch 15/30
           - 3s - loss: 0.3177 - acc: 0.9264 - val_loss: 0.5565 - val_acc: 0.8677
Epoch 16/30
           - 3s - loss: 0.3127 - acc: 0.9290 - val_loss: 0.4644 - val_acc: 0.8938
Epoch 17/30
           - 3s - loss: 0.2869 - acc: 0.9319 - val_loss: 0.4130 - val_acc: 0.9023
Epoch 18/30
           - 3s - loss: 0.2899 - acc: 0.9289 - val_loss: 0.4489 - val_acc: 0.8938
Epoch 19/30
           - 3s - loss: 0.3160 - acc: 0.9229 - val_loss: 0.4860 - val_acc: 0.8843
Epoch 20/30
           - 3s - loss: 0.3489 - acc: 0.9193 - val_loss: 0.5221 - val_acc: 0.8683
Epoch 21/30
           - 3s - loss: 0.3036 - acc: 0.9339 - val_loss: 0.5230 - val_acc: 0.8537
Epoch 22/30
           - 3s - loss: 0.3286 - acc: 0.9260 - val_loss: 0.4599 - val_acc: 0.8887
Epoch 23/30
           - 3s - loss: 0.2815 - acc: 0.9335 - val_loss: 0.4687 - val_acc: 0.8768
Epoch 24/30
           - 3s - loss: 0.2894 - acc: 0.9331 - val_loss: 0.4849 - val_acc: 0.8636
Epoch 25/30
           - 3s - loss: 0.2874 - acc: 0.9340 - val_loss: 0.4531 - val_acc: 0.8755
Epoch 26/30
           - 3s - loss: 0.2595 - acc: 0.9376 - val_loss: 0.4596 - val_acc: 0.8758
Epoch 27/30
           - 3s - loss: 0.2937 - acc: 0.9287 - val_loss: 0.4175 - val_acc: 0.9050
Epoch 28/30
           - 3s - loss: 0.2621 - acc: 0.9381 - val_loss: 0.4344 - val_acc: 0.8819
Epoch 29/30
           - 3s - loss: 0.2722 - acc: 0.9325 - val_loss: 0.4049 - val_acc: 0.8887
Epoch 30/30
           - 3s - loss: 0.2669 - acc: 0.9340 - val_loss: 0.3827 - val_acc: 0.9145
```

```
Train accuracy 0.9525299238302503 Test accuracy: 0.9144893111638955
---------------------------------------------------------------------------
```

In [10]:
```python
from hyperas.utils import eval_hyperopt_space
total_trials = dict()
total_list = []
for t, trial in enumerate(trials):
        vals = trial.get('misc').get('vals')
        z = eval_hyperopt_space(space, vals)
        total_trials['M'+str(t+1)] = z
```

In [11]: `best_run`

Out[11]:
```
{'Dense': 1,
 'Dropout': 0.6397045095598795,
 'batch_size': 2,
 'choiceval': 0,
 'filters': 1,
 'filters_1': 1,
 'kernel_size': 2,
 'kernel_size_1': 0,
 'l2': 0.07999281751224634,
 'l2_1': 0.0012673510937627475,
 'lr': 0.0011215010543928203,
 'lr_1': 0.0021517590741381726,
 'nb_epoch': 0,
 'pool_size': 1}
```

In [12]: *#best Hyper params from hyperas*
eval_hyperopt_space(space, best_run)

Out[12]: {'Dense': 64,
'Dropout': 0.6397045095598795,
'batch_size': 64,
'choiceval': 'adam',
'filters': 32,
'filters_1': 24,
'kernel_size': 7,
'kernel_size_1': 3,
'l2': 0.07999281751224634,
'l2_1': 0.0012673510937627475,
'lr': 0.0011215010543928203,
'lr_1': 0.0021517590741381726,
'nb_epoch': 25,
'pool_size': 3}

In [13]: best_model.summary()

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_119 (Conv1D)          (None, 122, 32)           2048
_____
conv1d_120 (Conv1D)          (None, 120, 24)           2328
_____
dropout_60 (Dropout)         (None, 120, 24)           0
_____
max_pooling1d_60 (MaxPooling (None, 40, 24)            0
_____
flatten_60 (Flatten)         (None, 960)               0
_____
dense_119 (Dense)            (None, 64)                61504
_____
dense_120 (Dense)            (None, 6)                 390
=================================================================
Total params: 66,270
Trainable params: 66,270
Non-trainable params: 0
_____
```

In [14]:
```python
_,acc_val = best_model.evaluate(X_val,Y_val,verbose=0)
_,acc_train = best_model.evaluate(X_train,Y_train,verbose=0)
print('Train_accuracy',acc_train,'test_accuracy',acc_val)
```

Train_accuracy 0.963139281828074 test_accuracy 0.9229725144214456

In [35]:
```python
# Confusion Matrix
print(confusion_matrix_rnn(Y_val, best_model.predict(X_val)))
```

```
[[537   0   0   0   0   0]
 [  0 385  81   0   0  25]
 [  0  80 452   0   0   0]
 [  0   0   0 484  10   2]
 [  0   0   0   0 415   5]
 [  0   1   0   0  23 447]]
```

```
In [44]: import matplotlib.pyplot as plt
         plt.figure(figsize=(8,8))
         cm = confusion_matrix_rnn(Y_val, best_model.predict(X_val))
         plot_confusion_matrix(cm, classes=labels, normalize=True, title='Normalized confusion matrix', cmap = plt.cm.
         Greens)
         plt.show()
```

```
<matplotlib.figure.Figure at 0x14f2465d4da0>

<matplotlib.figure.Figure at 0x14f24226c4a8>

<matplotlib.figure.Figure at 0x14f234cbe860>
```


Normalized confusion matrix
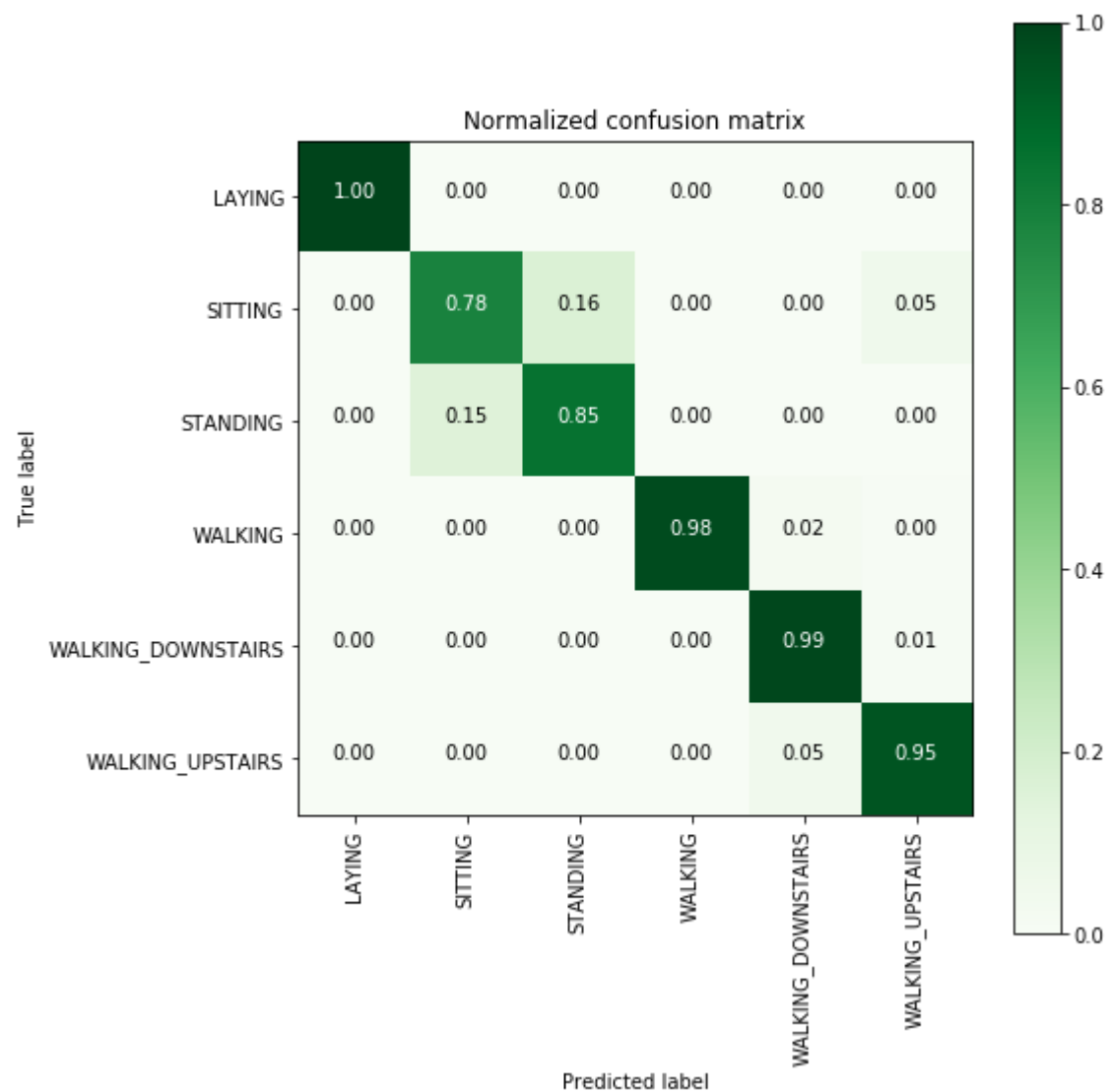
We can observe some overfitting in the model. and it is also giving some good results and error is mainly due to static activities. so below model came up wit some different approch to overcome this problem.

Divide and Conquer-Based:

In the dataset, Y_labels are represented as numbers from 1 to 6 as their identifiers.
WALKING as 1
WALKING_UPSTAIRS as 2
WALKING_DOWNSTAIRS as 3
SITTING as 4
STANDING as 5
LAYING as 6

- in Data exploration section we observed that we can divide the data into dynamic and static type so devided walking,waling_upstairs,walking_downstairs into category 0 i.e Dynamic, sitting, standing, laying into category 1 i.e. static.
- Will use 2 more classifiers seperatly for classifying classes of dynamic and static activities. so that model can learn differnt features for static and dynamic activities

referred below paper
Divide and Conquer-Based 1D CNN Human Activity Recognition Using Test Data Sharpening (https://www.mdpi.com/1424-8220/18/4/1055/pdf (https://www.mdpi.com/1424-8220/18/4/1055/pdf))

In [2]:
```python
import os
os.environ['PYTHONHASHSEED'] = '0'
import numpy as np
import tensorflow as tf
import random as rn
np.random.seed(0)
rn.seed(0)
tf.set_random_seed(0)
session_conf = tf.ConfigProto(intra_op_parallelism_threads=1,
                              inter_op_parallelism_threads=1)

from keras import backend as K

# The below tf.set_random_seed() will make random number generation
# in the TensorFlow backend have a well-defined initial state.
# For further details, see:
# https://www.tensorflow.org/api_docs/python/tf/set_random_seed

tf.set_random_seed(0)

sess = tf.Session(graph=tf.get_default_graph(), config=session_conf)
K.set_session(sess)

# Importing libraries
import pandas as pd
from matplotlib import pyplot
from sklearn.preprocessing import StandardScaler
from keras.models import Sequential
from keras.layers import Dense
from keras.layers import Flatten
from keras.layers import Dropout
from keras.layers.convolutional import Conv1D
from keras.layers.convolutional import MaxPooling1D
from keras.utils import to_categorical
from keras.models import Sequential
from keras.layers import LSTM
from keras.layers.core import Dense, Dropout
```

Using TensorFlow backend.

```
In [145]:  ## Classifying data as 2 class dynamic vs static
           ##data preparation
           def data_scaled_2class():
               """
               Obtain the dataset from multiple files.
               Returns: X_train, X_test, y_train, y_test
               """
               # Data directory
               DATADIR = 'UCI_HAR_Dataset'
               # Raw data signals
               # Signals are from Accelerometer and Gyroscope
               # The signals are in x,y,z directions
               # Sensor signals are filtered to have only body acceleration
               # excluding the acceleration due to gravity
               # Triaxial acceleration from the accelerometer is total acceleration
               SIGNALS = [
                   "body_acc_x",
                   "body_acc_y",
                   "body_acc_z",
                   "body_gyro_x",
                   "body_gyro_y",
                   "body_gyro_z",
                   "total_acc_x",
                   "total_acc_y",
                   "total_acc_z"
                   ]
               from sklearn.base import BaseEstimator, TransformerMixin
               class scaling_tseries_data(BaseEstimator, TransformerMixin):
                   from sklearn.preprocessing import StandardScaler
                   def __init__(self):
                       self.scale = None

                   def transform(self, X):
                       temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
                       temp_X1 = self.scale.transform(temp_X1)
                       return temp_X1.reshape(X.shape)

                   def fit(self, X):
                       # remove overlaping
                       remove = int(X.shape[1] / 2)
                       temp_X = X[:, -remove:, :]
                       # flatten data
```

```python
        temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
        scale = StandardScaler()
        scale.fit(temp_X)
        ##saving for furter usage
        ## will use in predicton pipeline
        pickle.dump(scale,open('Scale_2class.p','wb'))
        self.scale = scale
        return self

    # Utility function to read the data from csv file
    def _read_csv(filename):
        return pd.read_csv(filename, delim_whitespace=True, header=None)

    # Utility function to load the load
    def load_signals(subset):
        signals_data = []

        for signal in SIGNALS:
            filename = f'UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
            signals_data.append( _read_csv(filename).as_matrix())

        # Transpose is used to change the dimensionality of the output,
        # aggregating the signals by combination of sample/timestep.
        # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
        return np.transpose(signals_data, (1, 2, 0))

    def load_y(subset):
        """
        The objective that we are trying to predict is a integer, from 1 to 6,
        that represents a human activity. We return a binary representation of
        every sample objective as a 6 bits vector using One Hot Encoding
        (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
        """
        filename = f'UCI_HAR_Dataset/{subset}/y_{subset}.txt'
        y = _read_csv(filename)[0]
        y[y<=3] = 0
        y[y>3] = 1
        return pd.get_dummies(y).as_matrix()

X_train_2c, X_val_2c = load_signals('train'), load_signals('test')
Y_train_2c, Y_val_2c = load_y('train'), load_y('test')
###Scling data
Scale = scaling_tseries_data()
```

```
        Scale.fit(X_train_2c)
        X_train_2c = Scale.transform(X_train_2c)
        X_val_2c = Scale.transform(X_val_2c)
        return X_train_2c, Y_train_2c, X_val_2c,  Y_val_2c
```

In [144]:
```
X_train_2c, Y_train_2c, X_val_2c,  Y_val_2c = data_scaled_2class()
```

In [68]:
```
print(Y_train_2c.shape)
print(Y_val_2c.shape)
```

```
(7352, 2)
(2947, 2)
```

Model for classifying data into Static and Dynamic activities

In [72]:
```python
K.clear_session()
np.random.seed(0)
tf.set_random_seed(0)
sess = tf.Session(graph=tf.get_default_graph())
K.set_session(sess)
model = Sequential()
model.add(Conv1D(filters=32, kernel_size=3, activation='relu',kernel_initializer='he_uniform',input_shape=(12
8,9)))
model.add(Conv1D(filters=32, kernel_size=3, activation='relu',kernel_initializer='he_uniform'))
model.add(Dropout(0.6))
model.add(MaxPooling1D(pool_size=2))
model.add(Flatten())
model.add(Dense(50, activation='relu'))
model.add(Dense(2, activation='softmax'))
model.summary()
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 126, 32)           896
_____
conv1d_2 (Conv1D)            (None, 124, 32)           3104
_____
dropout_1 (Dropout)          (None, 124, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 62, 32)            0
_____
flatten_1 (Flatten)          (None, 1984)              0
_____
dense_1 (Dense)              (None, 50)                99250
_____
dense_2 (Dense)              (None, 2)                 102
=================================================================
Total params: 103,352
Trainable params: 103,352
Non-trainable params: 0
_____
```

In [73]:
```python
import math
adam = keras.optimizers.Adam(lr=0.001)
```

```python
model.compile(loss='categorical_crossentropy', optimizer=adam, metrics=['accuracy'])
model.fit(X_train_2c,Y_train_2c, epochs=20, batch_size=16,validation_data=(X_val_2c, Y_val_2c), verbose=1)
```

In [74]:

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/20
7352/7352 [==============================] - 4s 580us/step - loss: 0.0549 - acc: 0.9791 - val_loss: 0.0127 -
val_acc: 0.9973
Epoch 2/20
7352/7352 [==============================] - 4s 482us/step - loss: 0.0021 - acc: 0.9995 - val_loss: 0.0120 -
val_acc: 0.9969
Epoch 3/20
7352/7352 [==============================] - 4s 484us/step - loss: 7.9422e-04 - acc: 0.9997 - val_loss: 0.012
2 - val_acc: 0.9936
Epoch 4/20
7352/7352 [==============================] - 4s 483us/step - loss: 0.0029 - acc: 0.9990 - val_loss: 0.0168 -
val_acc: 0.9963
Epoch 5/20
7352/7352 [==============================] - 4s 481us/step - loss: 1.3106e-04 - acc: 1.0000 - val_loss: 0.010
2 - val_acc: 0.9986
Epoch 6/20
7352/7352 [==============================] - 4s 480us/step - loss: 1.7091e-05 - acc: 1.0000 - val_loss: 0.012
4 - val_acc: 0.9983
Epoch 7/20
7352/7352 [==============================] - 4s 480us/step - loss: 0.0022 - acc: 0.9997 - val_loss: 0.0162 -
val_acc: 0.9932
Epoch 8/20
7352/7352 [==============================] - 4s 481us/step - loss: 0.0051 - acc: 0.9989 - val_loss: 0.0063 -
val_acc: 0.9993
Epoch 9/20
7352/7352 [==============================] - 4s 480us/step - loss: 3.4291e-05 - acc: 1.0000 - val_loss: 0.010
1 - val_acc: 0.9966
Epoch 10/20
7352/7352 [==============================] - 4s 478us/step - loss: 2.1046e-04 - acc: 0.9999 - val_loss: 0.005
6 - val_acc: 0.9993
Epoch 11/20
7352/7352 [==============================] - 4s 482us/step - loss: 3.0157e-05 - acc: 1.0000 - val_loss: 0.007
9 - val_acc: 0.9986
Epoch 12/20
7352/7352 [==============================] - 4s 482us/step - loss: 5.7799e-06 - acc: 1.0000 - val_loss: 0.007
0 - val_acc: 0.9990
Epoch 13/20
7352/7352 [==============================] - 4s 481us/step - loss: 1.4363e-06 - acc: 1.0000 - val_loss: 0.007
1 - val_acc: 0.9990
Epoch 14/20
7352/7352 [==============================] - 4s 480us/step - loss: 1.1018e-06 - acc: 1.0000 - val_loss: 0.007
1 - val_acc: 0.9990
```

```
Epoch 15/20
7352/7352 [==============================] - 4s 483us/step - loss: 7.5717e-07 - acc: 1.0000 - val_loss: 0.007
0 - val_acc: 0.9990
Epoch 16/20
7352/7352 [==============================] - 4s 480us/step - loss: 4.7786e-07 - acc: 1.0000 - val_loss: 0.007
1 - val_acc: 0.9990
Epoch 17/20
7352/7352 [==============================] - 4s 480us/step - loss: 1.0220e-06 - acc: 1.0000 - val_loss: 0.007
1 - val_acc: 0.9990
Epoch 18/20
7352/7352 [==============================] - 4s 480us/step - loss: 1.7438e-06 - acc: 1.0000 - val_loss: 0.006
6 - val_acc: 0.9990
Epoch 19/20
7352/7352 [==============================] - 4s 487us/step - loss: 6.3406e-07 - acc: 1.0000 - val_loss: 0.006
9 - val_acc: 0.9990
Epoch 20/20
7352/7352 [==============================] - 4s 480us/step - loss: 5.5710e-07 - acc: 1.0000 - val_loss: 0.007
2 - val_acc: 0.9990
```

Out[74]: `<keras.callbacks.History at 0x1474816b9358>`

In [75]:
```python
_,acc_val = model.evaluate(X_val_2c,Y_val_2c,verbose=0)
_,acc_train = model.evaluate(X_train_2c,Y_train_2c,verbose=0)
print('Train_accuracy',acc_train,'test_accuracy',acc_val)
```

Train_accuracy 1.0 test_accuracy 0.9989820156090939

In [76]:
```python
##saving model
model.save('final_model_2class.h5')
```

This model is almost classifying data into dynammic or static correctly with very hig accuracy.

Classificaton of Static activities

```python
In [149]: ##data preparation
          def data_scaled_static():
              """

              Obtain the dataset from multiple files.
              Returns: X_train, X_test, y_train, y_test
              """
              # Data directory
              DATADIR = 'UCI_HAR_Dataset'
              # Raw data signals
              # Signals are from Accelerometer and Gyroscope
              # The signals are in x,y,z directions
              # Sensor signals are filtered to have only body acceleration
              # excluding the acceleration due to gravity
              # Triaxial acceleration from the accelerometer is total acceleration
              SIGNALS = [
                  "body_acc_x",
                  "body_acc_y",
                  "body_acc_z",
                  "body_gyro_x",
                  "body_gyro_y",
                  "body_gyro_z",
                  "total_acc_x",
                  "total_acc_y",
                  "total_acc_z"
                  ]
              from sklearn.base import BaseEstimator, TransformerMixin
              class scaling_tseries_data(BaseEstimator, TransformerMixin):
                  from sklearn.preprocessing import StandardScaler
                  def __init__(self):
                      self.scale = None

                  def transform(self, X):
                      temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
                      temp_X1 = self.scale.transform(temp_X1)
                      return temp_X1.reshape(X.shape)

                  def fit(self, X):
                      # remove overlaping
                      remove = int(X.shape[1] / 2)
                      temp_X = X[:, -remove:, :]
                      # flatten data
                      temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
```

```python
            scale = StandardScaler()
            scale.fit(temp_X)
            #for furter use at prediction pipeline
            pickle.dump(scale,open('Scale_static.p','wb'))
            self.scale = scale
            return self

    # Utility function to read the data from csv file
    def _read_csv(filename):
        return pd.read_csv(filename, delim_whitespace=True, header=None)

    # Utility function to load the load
    def load_signals(subset):
        signals_data = []

        for signal in SIGNALS:
            filename = f'UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
            signals_data.append( _read_csv(filename).as_matrix())

        # Transpose is used to change the dimensionality of the output,
        # aggregating the signals by combination of sample/timestep.
        # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
        return np.transpose(signals_data, (1, 2, 0))

    def load_y(subset):
        """
        The objective that we are trying to predict is a integer, from 1 to 6,
        that represents a human activity. We return a binary representation of
        every sample objective as a 6 bits vector using One Hot Encoding
        (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
        """
        filename = f'UCI_HAR_Dataset/{subset}/y_{subset}.txt'
        y = _read_csv(filename)[0]
        y_subset = y>3
        y = y[y_subset]
        return pd.get_dummies(y).as_matrix(),y_subset

    Y_train_s,y_train_sub = load_y('train')
    Y_val_s,y_test_sub = load_y('test')
    X_train_s, X_val_s = load_signals('train'), load_signals('test')
    X_train_s = X_train_s[y_train_sub]
    X_val_s = X_val_s[y_test_sub]
```

```
        ###Scling data
        Scale = scaling_tseries_data()
        Scale.fit(X_train_s)
        X_train_s = Scale.transform(X_train_s)
        X_val_s = Scale.transform(X_val_s)

        return X_train_s, Y_train_s, X_val_s,  Y_val_s
```

In [150]:
```
X_train_s, Y_train_s, X_val_s,  Y_val_s = data_scaled_static()
```

In [7]:
```
print('X Shape of train data',X_train_s.shape, 'Y shape', Y_train_s.shape)
print('X Shape of val data',X_val_s.shape,'Y shape',Y_val_s.shape)
```

```
X Shape of train data (4067, 128, 9) Y shape (4067, 3)
X Shape of val data (1560, 128, 9) Y shape (1560, 3)
```

In [8]:
```
import keras
```

Baseline Model

```
In [24]:  np.random.seed(0)
          tf.set_random_seed(0)
          sess = tf.Session(graph=tf.get_default_graph())
          K.set_session(sess)
          model = Sequential()
          model.add(Conv1D(filters=64, kernel_size=7, activation='relu',kernel_initializer='he_uniform',input_shape=(12
          8,9)))
          model.add(Conv1D(filters=32, kernel_size=3, activation='relu',kernel_initializer='he_uniform'))
          model.add(Dropout(0.6))
          model.add(MaxPooling1D(pool_size=3))
          model.add(Flatten())
          model.add(Dense(30, activation='relu'))
          model.add(Dense(3, activation='softmax'))
          model.summary()
```

Layer (type)	Output Shape	Param #
conv1d_3 (Conv1D)	(None, 122, 64)	4096
conv1d_4 (Conv1D)	(None, 120, 32)	6176
dropout_2 (Dropout)	(None, 120, 32)	0
max_pooling1d_2 (MaxPooling1	(None, 40, 32)	0
flatten_2 (Flatten)	(None, 1280)	0
dense_3 (Dense)	(None, 30)	38430
dense_4 (Dense)	(None, 3)	93

```
Total params: 48,795
Trainable params: 48,795
Non-trainable params: 0
```

In [25]:
```python
import math
adam = keras.optimizers.Adam(lr=0.004)
model.compile(loss='categorical_crossentropy', optimizer=adam, metrics=['accuracy'])
model.fit(X_train_s,Y_train_s, epochs=20, batch_size=32,validation_data=(X_val_s, Y_val_s), verbose=1)
K.clear_session()
```

```
Train on 4067 samples, validate on 1560 samples
Epoch 1/20
4067/4067 [==============================] - 2s 530us/step - loss: 0.4023 - acc: 0.8773 - val_loss: 0.2665 -
val_acc: 0.8974
Epoch 2/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.2302 - acc: 0.9240 - val_loss: 0.2560 -
val_acc: 0.8942
Epoch 3/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.2163 - acc: 0.9235 - val_loss: 0.2900 -
val_acc: 0.8878
Epoch 4/20
4067/4067 [==============================] - 1s 351us/step - loss: 0.1732 - acc: 0.9348 - val_loss: 0.3296 -
val_acc: 0.8910
Epoch 5/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.1471 - acc: 0.9432 - val_loss: 0.2661 -
val_acc: 0.9000
Epoch 6/20
4067/4067 [==============================] - 1s 354us/step - loss: 0.1296 - acc: 0.9498 - val_loss: 0.2430 -
val_acc: 0.9109
Epoch 7/20
4067/4067 [==============================] - 1s 353us/step - loss: 0.1704 - acc: 0.9422 - val_loss: 0.3748 -
val_acc: 0.8795
Epoch 8/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.2979 - acc: 0.9171 - val_loss: 0.2355 -
val_acc: 0.8929
Epoch 9/20
4067/4067 [==============================] - 1s 353us/step - loss: 0.2093 - acc: 0.9375 - val_loss: 0.1853 -
val_acc: 0.9083
Epoch 10/20
4067/4067 [==============================] - 1s 353us/step - loss: 0.2048 - acc: 0.9405 - val_loss: 0.3305 -
val_acc: 0.9218
Epoch 11/20
4067/4067 [==============================] - 1s 355us/step - loss: 0.2393 - acc: 0.9405 - val_loss: 0.2739 -
val_acc: 0.9051
Epoch 12/20
4067/4067 [==============================] - 1s 351us/step - loss: 0.2640 - acc: 0.9299 - val_loss: 0.1967 -
val_acc: 0.9295
Epoch 13/20
4067/4067 [==============================] - 1s 353us/step - loss: 0.2083 - acc: 0.9388 - val_loss: 0.2722 -
val_acc: 0.9051
Epoch 14/20
4067/4067 [==============================] - 1s 353us/step - loss: 0.1886 - acc: 0.9474 - val_loss: 0.2411 -
val_acc: 0.9122
```

```
Epoch 15/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.1870 - acc: 0.9484 - val_loss: 0.1946 -
val_acc: 0.9115
Epoch 16/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.1710 - acc: 0.9552 - val_loss: 0.2320 -
val_acc: 0.9090
Epoch 17/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.1718 - acc: 0.9506 - val_loss: 0.2120 -
val_acc: 0.9032
Epoch 18/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.1699 - acc: 0.9501 - val_loss: 0.1729 -
val_acc: 0.9282
Epoch 19/20
4067/4067 [==============================] - 1s 353us/step - loss: 0.1520 - acc: 0.9636 - val_loss: 0.1997 -
val_acc: 0.9179
Epoch 20/20
4067/4067 [==============================] - 1s 352us/step - loss: 0.1927 - acc: 0.9592 - val_loss: 0.2545 -
val_acc: 0.9096
```

```
In [40]:  def model_cnn(X_train_s, Y_train_s, X_val_s, Y_val_s):
              np.random.seed(0)
              tf.set_random_seed(0)
              sess = tf.Session(graph=tf.get_default_graph())
              K.set_session(sess)
              # Initiliazing the sequential model
              model = Sequential()

              model.add(Conv1D(filters={{choice([28,32,42])}}, kernel_size={{choice([3,5,7])}},activation='relu',kernel
          _initializer='he_uniform',
                          kernel_regularizer=l2({{uniform(0,3)}})),input_shape=(128,9)))

              model.add(Conv1D(filters={{choice([16,24,32])}}, kernel_size={{choice([3,5,7])}},
                            activation='relu',kernel_regularizer=l2({{uniform(0,2)}}),kernel_initializer='he_unifor
          m'))
              model.add(Dropout({{uniform(0.45,0.7)}}))
              model.add(MaxPooling1D(pool_size={{choice([2,3,5])}}))
              model.add(Flatten())
              model.add(Dense({{choice([16,32,64])}}, activation='relu'))
              model.add(Dense(3, activation='softmax'))

              adam = keras.optimizers.Adam(lr={{uniform(0.00065,0.004)}})
              rmsprop = keras.optimizers.RMSprop(lr={{uniform(0.00065,0.004)}})

              choiceval = {{choice(['adam', 'rmsprop'])}}

              if choiceval == 'adam':
                  optim = adam
              else:
                  optim = rmsprop

              print(model.summary())

              model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)

              result = model.fit(X_train_s, Y_train_s,
                        batch_size={{choice([16,32,64])}},
                        nb_epoch={{choice([25,30,35])}},
                        verbose=2,
                        validation_data=(X_val_s, Y_val_s))

              score, acc = model.evaluate(X_val_s, Y_val_s, verbose=0)
```

```python
        score1, acc1 = model.evaluate(X_train_s, Y_train_s, verbose=0)
        print('Train accuracy',acc1,'Test accuracy:', acc)
        print('--------------------------------------------------------------------------')
        K.clear_session()
        return {'loss': -acc, 'status': STATUS_OK,'train_acc':acc1}
```

```
In [9]:  X_train, Y_train, X_val, Y_val = data_scaled_static()
         trials = Trials()
         best_run, best_model, space = optim.minimize(model=model_cnn,
                                           data=data_scaled_static,
                                           algo=tpe.suggest,
                                           max_evals=120,rseed = 0,
                                           trials=trials,notebook_name = 'Human Activity Detection',
                                           return_space = True)
```

```
>>> Imports:
#coding=utf-8

try:
    import os
except:
    pass

try:
    import numpy as np
except:
    pass

try:
    import tensorflow as tf
except:
    pass

try:
    import random as rn
except:
    pass

try:
    from keras import backend as K
except:
    pass

try:
    import pickle
except:
    pass

try:
    import keras
except:
    pass

try:
    from keras.models import Sequential
except:
    pass
```

```
try:
    from keras.layers import LSTM
except:
    pass

try:
    from keras.layers.core import Dense, Dropout
except:
    pass

try:
    from hyperopt import Trials, STATUS_OK, tpe
except:
    pass

try:
    from hyperas import optim
except:
    pass

try:
    from hyperas.distributions import choice, uniform
except:
    pass

try:
    import pandas as pd
except:
    pass

try:
    from matplotlib import pyplot
except:
    pass

try:
    from sklearn.preprocessing import StandardScaler
except:
    pass

try:
    from keras.models import Sequential
except:
```

```
            pass

    try:
        from keras.layers import Flatten
    except:
        pass

    try:
        from keras.regularizers import l2
    except:
        pass

    try:
        from keras.layers.convolutional import Conv1D
    except:
        pass

    try:
        from keras.layers.convolutional import MaxPooling1D
    except:
        pass

    try:
        from keras.utils import to_categorical
    except:
        pass

    try:
        from sklearn.base import BaseEstimator, TransformerMixin
    except:
        pass

    try:
        from sklearn.preprocessing import StandardScaler
    except:
        pass

    >>> Hyperas search space:

    def get_space():
        return {
            'filters': hp.choice('filters', [28,32,42]),
            'kernel_size': hp.choice('kernel_size', [3,5,7]),
```

```
                    'l2': hp.uniform('l2', 0,3),
                    'filters_1': hp.choice('filters_1', [16,24,32]),
                    'kernel_size_1': hp.choice('kernel_size_1', [3,5,7]),
                    'l2_1': hp.uniform('l2_1', 0,2),
                    'Dropout': hp.uniform('Dropout', 0.45,0.7),
                    'pool_size': hp.choice('pool_size', [2,3,5]),
                    'Dense': hp.choice('Dense', [16,32,64]),
                    'lr': hp.uniform('lr', 0.00065,0.004),
                    'lr_1': hp.uniform('lr_1', 0.00065,0.004),
                    'choiceval': hp.choice('choiceval', ['adam', 'rmsprop']),
                    'Dense_1': hp.choice('Dense_1', [16,32,64]),
                    'nb_epoch': hp.choice('nb_epoch', [25,30,35]),
                }

    >>> Data
      1:
      2: """
      3: Obtain the dataset from multiple files.
      4: Returns: X_train, X_test, y_train, y_test
      5: """
      6: # Data directory
      7: DATADIR = 'UCI_HAR_Dataset'
      8: # Raw data signals
      9: # Signals are from Accelerometer and Gyroscope
     10: # The signals are in x,y,z directions
     11: # Sensor signals are filtered to have only body acceleration
     12: # excluding the acceleration due to gravity
     13: # Triaxial acceleration from the accelerometer is total acceleration
     14: SIGNALS = [
     15:     "body_acc_x",
     16:     "body_acc_y",
     17:     "body_acc_z",
     18:     "body_gyro_x",
     19:     "body_gyro_y",
     20:     "body_gyro_z",
     21:     "total_acc_x",
     22:     "total_acc_y",
     23:     "total_acc_z"
     24:     ]
     25: from sklearn.base import BaseEstimator, TransformerMixin
     26: class scaling_tseries_data(BaseEstimator, TransformerMixin):
     27:     from sklearn.preprocessing import StandardScaler
     28:     def __init__(self):
```

```
29:            self.scale = None
30:
31:    def transform(self, X):
32:        temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
33:        temp_X1 = self.scale.transform(temp_X1)
34:        return temp_X1.reshape(X.shape)
35:
36:    def fit(self, X):
37:        # remove overlaping
38:        remove = int(X.shape[1] / 2)
39:        temp_X = X[:, -remove:, :]
40:        # flatten data
41:        temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
42:        scale = StandardScaler()
43:        scale.fit(temp_X)
44:        self.scale = scale
45:        return self
46:
47: # Utility function to read the data from csv file
48: def _read_csv(filename):
49:     return pd.read_csv(filename, delim_whitespace=True, header=None)
50:
51: # Utility function to load the load
52: def load_signals(subset):
53:     signals_data = []
54:
55:     for signal in SIGNALS:
56:         filename = f'HAR/UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
57:         signals_data.append( _read_csv(filename).as_matrix())
58:
59:     # Transpose is used to change the dimensionality of the output,
60:     # aggregating the signals by combination of sample/timestep.
61:     # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
62:     return np.transpose(signals_data, (1, 2, 0))
63:
64: def load_y(subset):
65:     """
66:     The objective that we are trying to predict is a integer, from 1 to 6,
67:     that represents a human activity. We return a binary representation of
68:     every sample objective as a 6 bits vector using One Hot Encoding
69:     (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
70:     """
71:     filename = f'HAR/UCI_HAR_Dataset/{subset}/y_{subset}.txt'
```

```
72:      y = _read_csv(filename)[0]
73:      y_subset = y>3
74:      y = y[y_subset]
75:      return pd.get_dummies(y).as_matrix(),y_subset
76:
77: Y_train_s,y_train_sub = load_y('train')
78: Y_val_s,y_test_sub = load_y('test')
79: X_train_s, X_val_s = load_signals('train'), load_signals('test')
80: X_train_s = X_train_s[y_train_sub]
81: X_val_s = X_val_s[y_test_sub]
82:
83: ###Scling data
84: Scale = scaling_tseries_data()
85: Scale.fit(X_train_s)
86: X_train_s = Scale.transform(X_train_s)
87: X_val_s = Scale.transform(X_val_s)
88:
89:
90:
91:
>>> Resulting replaced keras model:

 1: def keras_fmin_fnct(space):
 2:
 3:      np.random.seed(0)
 4:      tf.set_random_seed(0)
 5:      sess = tf.Session(graph=tf.get_default_graph())
 6:      K.set_session(sess)
 7:      # Initiliazing the sequential model
 8:      model = Sequential()
 9:
10:      model.add(Conv1D(filters=space['filters'], kernel_size=space['kernel_size'],activation='relu',kerne
l_initializer='he_uniform',
11:                   kernel_regularizer=l2(space['l2']),input_shape=(128,9)))
12:
13:      model.add(Conv1D(filters=space['filters_1'], kernel_size=space['kernel_size_1'],
14:                   activation='relu',kernel_regularizer=l2(space['l2_1']),kernel_initializer='he_unif
orm'))
15:      model.add(Dropout(space['Dropout']))
16:      model.add(MaxPooling1D(pool_size=space['pool_size']))
17:      model.add(Flatten())
18:      model.add(Dense(space['Dense'], activation='relu'))
19:      model.add(Dense(3, activation='softmax'))
```

```
20:
21:        adam = keras.optimizers.Adam(lr=space['lr'])
22:        rmsprop = keras.optimizers.RMSprop(lr=space['lr_1'])
23:
24:        choiceval = space['choiceval']
25:
26:        if choiceval == 'adam':
27:            optim = adam
28:        else:
29:            optim = rmsprop
30:
31:        print(model.summary())
32:
33:        model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
34:
35:        result = model.fit(X_train_s, Y_train_s,
36:                    batch_size=space['Dense_1'],
37:                    nb_epoch=space['nb_epoch'],
38:                    verbose=2,
39:                    validation_data=(X_val_s, Y_val_s))
40:
41:        score, acc = model.evaluate(X_val_s, Y_val_s, verbose=0)
42:        score1, acc1 = model.evaluate(X_train_s, Y_train_s, verbose=0)
43:        print('Train accuracy',acc1,'Test accuracy:', acc)
44:        print('-------------------------------------------------------------------------------------')
45:        K.clear_session()
46:        return {'loss': -acc, 'status': STATUS_OK,'train_acc':acc1}
47:
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 120, 32)	5152
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 32)	0
flatten_1 (Flatten)	(None, 1920)	0
dense_1 (Dense)	(None, 64)	122944

```
dense_2 (Dense)                 (None, 3)                    195
=================================================================
Total params: 129,763
Trainable params: 129,763
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 3s - loss: 42.9670 - acc: 0.8372 - val_loss: 4.9234 - val_acc: 0.7782
Epoch 2/35
 - 3s - loss: 1.3776 - acc: 0.8694 - val_loss: 0.5038 - val_acc: 0.8436
Epoch 3/35
 - 3s - loss: 0.3892 - acc: 0.8783 - val_loss: 0.5130 - val_acc: 0.8173
Epoch 4/35
 - 3s - loss: 0.3540 - acc: 0.8825 - val_loss: 0.4280 - val_acc: 0.8526
Epoch 5/35
 - 3s - loss: 0.3478 - acc: 0.8827 - val_loss: 0.3993 - val_acc: 0.8545
Epoch 6/35
 - 3s - loss: 0.3120 - acc: 0.8906 - val_loss: 0.4376 - val_acc: 0.8141
Epoch 7/35
 - 3s - loss: 0.3080 - acc: 0.8889 - val_loss: 0.3521 - val_acc: 0.8756
Epoch 8/35
 - 3s - loss: 0.3173 - acc: 0.8874 - val_loss: 0.4250 - val_acc: 0.8340
Epoch 9/35
 - 3s - loss: 0.2989 - acc: 0.8989 - val_loss: 0.3376 - val_acc: 0.8782
Epoch 10/35
 - 3s - loss: 0.3032 - acc: 0.8987 - val_loss: 0.3549 - val_acc: 0.8756
Epoch 11/35
 - 2s - loss: 0.3064 - acc: 0.8886 - val_loss: 0.6224 - val_acc: 0.6756
Epoch 12/35
 - 3s - loss: 0.3078 - acc: 0.8894 - val_loss: 0.4546 - val_acc: 0.8135
Epoch 13/35
 - 3s - loss: 0.3044 - acc: 0.8925 - val_loss: 0.4411 - val_acc: 0.8154
Epoch 14/35
 - 2s - loss: 0.3060 - acc: 0.8940 - val_loss: 0.5506 - val_acc: 0.7077
Epoch 15/35
 - 2s - loss: 0.3053 - acc: 0.8886 - val_loss: 0.3330 - val_acc: 0.8763
Epoch 16/35
 - 3s - loss: 0.3068 - acc: 0.8945 - val_loss: 0.3525 - val_acc: 0.8731
Epoch 17/35
 - 2s - loss: 0.3072 - acc: 0.8916 - val_loss: 0.3374 - val_acc: 0.8731
Epoch 18/35
```

```
 - 3s - loss: 0.3192 - acc: 0.8911 - val_loss: 0.4121 - val_acc: 0.8128
Epoch 19/35
 - 2s - loss: 0.3016 - acc: 0.8886 - val_loss: 0.4873 - val_acc: 0.8513
Epoch 20/35
 - 3s - loss: 0.2928 - acc: 0.8977 - val_loss: 0.4111 - val_acc: 0.8590
Epoch 21/35
 - 3s - loss: 0.2822 - acc: 0.8953 - val_loss: 0.4154 - val_acc: 0.8538
Epoch 22/35
 - 3s - loss: 0.2985 - acc: 0.8930 - val_loss: 0.4039 - val_acc: 0.8090
Epoch 23/35
 - 2s - loss: 0.2939 - acc: 0.8925 - val_loss: 0.3331 - val_acc: 0.8756
Epoch 24/35
 - 3s - loss: 0.3030 - acc: 0.8923 - val_loss: 0.3315 - val_acc: 0.8750
Epoch 25/35
 - 3s - loss: 0.2921 - acc: 0.8916 - val_loss: 0.3216 - val_acc: 0.8750
Epoch 26/35
 - 3s - loss: 0.3054 - acc: 0.8948 - val_loss: 0.3465 - val_acc: 0.8776
Epoch 27/35
 - 3s - loss: 0.2949 - acc: 0.8970 - val_loss: 0.4477 - val_acc: 0.8474
Epoch 28/35
 - 3s - loss: 0.2960 - acc: 0.8948 - val_loss: 0.3987 - val_acc: 0.8558
Epoch 29/35
 - 3s - loss: 0.3110 - acc: 0.8945 - val_loss: 0.3383 - val_acc: 0.8750
Epoch 30/35
 - 3s - loss: 0.2854 - acc: 0.8972 - val_loss: 0.3260 - val_acc: 0.8744
Epoch 31/35
 - 2s - loss: 0.2999 - acc: 0.8930 - val_loss: 0.4587 - val_acc: 0.8538
Epoch 32/35
 - 3s - loss: 0.2874 - acc: 0.8982 - val_loss: 0.3296 - val_acc: 0.8750
Epoch 33/35
 - 2s - loss: 0.2900 - acc: 0.8945 - val_loss: 0.4240 - val_acc: 0.7878
Epoch 34/35
 - 3s - loss: 0.3173 - acc: 0.8886 - val_loss: 0.3402 - val_acc: 0.8744
Epoch 35/35
 - 3s - loss: 0.2850 - acc: 0.8965 - val_loss: 0.4223 - val_acc: 0.8494
Train accuracy 0.8623063683304647 Test accuracy: 0.8493589743589743
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 120, 24)	2040

```
_____

dropout_1 (Dropout)          (None, 120, 24)            0
_____

max_pooling1d_1 (MaxPooling1 (None, 40, 24)             0
_____

flatten_1 (Flatten)          (None, 960)                0
_____

dense_1 (Dense)              (None, 64)                 61504
_____

dense_2 (Dense)              (None, 3)                  195
=============================================================
Total params: 65,531
Trainable params: 65,531
Non-trainable params: 0

_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 107.7755 - acc: 0.8156 - val_loss: 27.1620 - val_acc: 0.8718
Epoch 2/25
 - 1s - loss: 9.8363 - acc: 0.8943 - val_loss: 2.0358 - val_acc: 0.8731
Epoch 3/25
 - 1s - loss: 0.8329 - acc: 0.8911 - val_loss: 0.5357 - val_acc: 0.8519
Epoch 4/25
 - 1s - loss: 0.4220 - acc: 0.8753 - val_loss: 0.4997 - val_acc: 0.8321
Epoch 5/25
 - 1s - loss: 0.3914 - acc: 0.8783 - val_loss: 0.4897 - val_acc: 0.8526
Epoch 6/25
 - 1s - loss: 0.3726 - acc: 0.8894 - val_loss: 0.5682 - val_acc: 0.8506
Epoch 7/25
 - 1s - loss: 0.3854 - acc: 0.8771 - val_loss: 0.5066 - val_acc: 0.8538
Epoch 8/25
 - 1s - loss: 0.3577 - acc: 0.8891 - val_loss: 0.4740 - val_acc: 0.8513
Epoch 9/25
 - 1s - loss: 0.3472 - acc: 0.8891 - val_loss: 0.4676 - val_acc: 0.8609
Epoch 10/25
 - 1s - loss: 0.3437 - acc: 0.8901 - val_loss: 0.4649 - val_acc: 0.8397
Epoch 11/25
 - 1s - loss: 0.3913 - acc: 0.8817 - val_loss: 0.4772 - val_acc: 0.8692
Epoch 12/25
 - 1s - loss: 0.3470 - acc: 0.8866 - val_loss: 0.4665 - val_acc: 0.8359
Epoch 13/25
 - 1s - loss: 0.3419 - acc: 0.8953 - val_loss: 0.4225 - val_acc: 0.8545
```

```
Epoch 14/25
 - 1s - loss: 0.3535 - acc: 0.8812 - val_loss: 0.5233 - val_acc: 0.8346
Epoch 15/25
 - 1s - loss: 0.3765 - acc: 0.8832 - val_loss: 0.4568 - val_acc: 0.8583
Epoch 16/25
 - 1s - loss: 0.3415 - acc: 0.8950 - val_loss: 0.4650 - val_acc: 0.8385
Epoch 17/25
 - 1s - loss: 0.3771 - acc: 0.8800 - val_loss: 0.4210 - val_acc: 0.8641
Epoch 18/25
 - 1s - loss: 0.3484 - acc: 0.8916 - val_loss: 0.4836 - val_acc: 0.8519
Epoch 19/25
 - 1s - loss: 0.3492 - acc: 0.8852 - val_loss: 0.4335 - val_acc: 0.8500
Epoch 20/25
 - 1s - loss: 0.3388 - acc: 0.8879 - val_loss: 0.4112 - val_acc: 0.8724
Epoch 21/25
 - 1s - loss: 0.3380 - acc: 0.8901 - val_loss: 0.4494 - val_acc: 0.8224
Epoch 22/25
 - 1s - loss: 0.3294 - acc: 0.8923 - val_loss: 0.4383 - val_acc: 0.8699
Epoch 23/25
 - 1s - loss: 0.3349 - acc: 0.8925 - val_loss: 0.4344 - val_acc: 0.8603
Epoch 24/25
 - 1s - loss: 0.3206 - acc: 0.8921 - val_loss: 0.4220 - val_acc: 0.8718
Epoch 25/25
 - 1s - loss: 0.3043 - acc: 0.8960 - val_loss: 0.4598 - val_acc: 0.8468
Train accuracy 0.8782886648635357 Test accuracy: 0.8467948717948718
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 122, 16)	2576
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 16)	0
flatten_1 (Flatten)	(None, 640)	0
dense_1 (Dense)	(None, 32)	20512
dense_2 (Dense)	(None, 3)	99

```
                   Total params: 24,083
                   Trainable params: 24,083
                   Non-trainable params: 0

                   _____

                   None
                   Train on 4067 samples, validate on 1560 samples
                   Epoch 1/35
                    - 2s - loss: 25.2528 - acc: 0.8618 - val_loss: 13.1982 - val_acc: 0.8904
                   Epoch 2/35
                    - 1s - loss: 7.7455 - acc: 0.9056 - val_loss: 4.0894 - val_acc: 0.8814
                   Epoch 3/35
                    - 1s - loss: 2.3235 - acc: 0.9095 - val_loss: 1.3512 - val_acc: 0.8744
                   Epoch 4/35
                    - 1s - loss: 0.7613 - acc: 0.9164 - val_loss: 0.5820 - val_acc: 0.8891
                   Epoch 5/35
                    - 1s - loss: 0.3998 - acc: 0.9026 - val_loss: 0.4254 - val_acc: 0.8891
                   Epoch 6/35
                    - 1s - loss: 0.2983 - acc: 0.9110 - val_loss: 0.5666 - val_acc: 0.8205
                   Epoch 7/35
                    - 1s - loss: 0.3196 - acc: 0.9002 - val_loss: 0.3998 - val_acc: 0.8750
                   Epoch 8/35
                    - 1s - loss: 0.2803 - acc: 0.9098 - val_loss: 0.3911 - val_acc: 0.8635
                   Epoch 9/35
                    - 1s - loss: 0.2686 - acc: 0.9196 - val_loss: 0.3725 - val_acc: 0.8776
                   Epoch 10/35
                    - 1s - loss: 0.2638 - acc: 0.9157 - val_loss: 0.3477 - val_acc: 0.9045
                   Epoch 11/35
                    - 1s - loss: 0.2896 - acc: 0.9083 - val_loss: 0.3604 - val_acc: 0.8878
                   Epoch 12/35
                    - 1s - loss: 0.2636 - acc: 0.9132 - val_loss: 0.3318 - val_acc: 0.9045
                   Epoch 13/35
                    - 1s - loss: 0.2411 - acc: 0.9223 - val_loss: 0.3369 - val_acc: 0.8769
                   Epoch 14/35
                    - 1s - loss: 0.2641 - acc: 0.9144 - val_loss: 0.3250 - val_acc: 0.8962
                   Epoch 15/35
                    - 1s - loss: 0.2551 - acc: 0.9206 - val_loss: 0.3202 - val_acc: 0.8923
                   Epoch 16/35
                    - 1s - loss: 0.2431 - acc: 0.9169 - val_loss: 0.3543 - val_acc: 0.8667
                   Epoch 17/35
                    - 1s - loss: 0.2763 - acc: 0.9088 - val_loss: 0.3336 - val_acc: 0.8795
                   Epoch 18/35
                    - 1s - loss: 0.2791 - acc: 0.9093 - val_loss: 0.3168 - val_acc: 0.8942
                   Epoch 19/35
```

```
          - 1s - loss: 0.2573 - acc: 0.9171 - val_loss: 0.3173 - val_acc: 0.9064
Epoch 20/35
          - 1s - loss: 0.2531 - acc: 0.9203 - val_loss: 0.3584 - val_acc: 0.8750
Epoch 21/35
          - 1s - loss: 0.2530 - acc: 0.9223 - val_loss: 0.3800 - val_acc: 0.8538
Epoch 22/35
          - 1s - loss: 0.2505 - acc: 0.9154 - val_loss: 0.3242 - val_acc: 0.8923
Epoch 23/35
          - 1s - loss: 0.2536 - acc: 0.9191 - val_loss: 0.3269 - val_acc: 0.8763
Epoch 24/35
          - 1s - loss: 0.2311 - acc: 0.9262 - val_loss: 0.2929 - val_acc: 0.9199
Epoch 25/35
          - 1s - loss: 0.2499 - acc: 0.9174 - val_loss: 0.3113 - val_acc: 0.8917
Epoch 26/35
          - 1s - loss: 0.2573 - acc: 0.9171 - val_loss: 0.3467 - val_acc: 0.8923
Epoch 27/35
          - 1s - loss: 0.2287 - acc: 0.9282 - val_loss: 0.3835 - val_acc: 0.8500
Epoch 28/35
          - 1s - loss: 0.2560 - acc: 0.9142 - val_loss: 0.3170 - val_acc: 0.9103
Epoch 29/35
          - 1s - loss: 0.2708 - acc: 0.9169 - val_loss: 0.3516 - val_acc: 0.8974
Epoch 30/35
          - 1s - loss: 0.2454 - acc: 0.9225 - val_loss: 0.2972 - val_acc: 0.9096
Epoch 31/35
          - 1s - loss: 0.2307 - acc: 0.9265 - val_loss: 0.3133 - val_acc: 0.9051
Epoch 32/35
          - 1s - loss: 0.2350 - acc: 0.9240 - val_loss: 0.2859 - val_acc: 0.8994
Epoch 33/35
          - 1s - loss: 0.2247 - acc: 0.9319 - val_loss: 0.3358 - val_acc: 0.8718
Epoch 34/35
          - 1s - loss: 0.2702 - acc: 0.9093 - val_loss: 0.3891 - val_acc: 0.8545
Epoch 35/35
          - 1s - loss: 0.2614 - acc: 0.9196 - val_loss: 0.3144 - val_acc: 0.8917
Train accuracy 0.9358249323825916 Test accuracy: 0.8916666666666667
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0

```
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 24)            0
_____
flatten_1 (Flatten)          (None, 1464)              0
_____
dense_1 (Dense)              (None, 64)                93760
_____
dense_2 (Dense)              (None, 3)                 195
=========================================================
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 48.6761 - acc: 0.8208 - val_loss: 36.4390 - val_acc: 0.8769
Epoch 2/30
 - 1s - loss: 27.6787 - acc: 0.9056 - val_loss: 19.9078 - val_acc: 0.8609
Epoch 3/30
 - 1s - loss: 14.3425 - acc: 0.9130 - val_loss: 9.7273 - val_acc: 0.8538
Epoch 4/30
 - 1s - loss: 6.6277 - acc: 0.9208 - val_loss: 4.2976 - val_acc: 0.8590
Epoch 5/30
 - 1s - loss: 2.7216 - acc: 0.9107 - val_loss: 1.6937 - val_acc: 0.8737
Epoch 6/30
 - 1s - loss: 1.0326 - acc: 0.9115 - val_loss: 0.7342 - val_acc: 0.8692
Epoch 7/30
 - 1s - loss: 0.4824 - acc: 0.9088 - val_loss: 0.5077 - val_acc: 0.8558
Epoch 8/30
 - 1s - loss: 0.3487 - acc: 0.9122 - val_loss: 0.4903 - val_acc: 0.8301
Epoch 9/30
 - 1s - loss: 0.3156 - acc: 0.9127 - val_loss: 0.4162 - val_acc: 0.8705
Epoch 10/30
 - 1s - loss: 0.2960 - acc: 0.9073 - val_loss: 0.3542 - val_acc: 0.8897
Epoch 11/30
 - 1s - loss: 0.2776 - acc: 0.9088 - val_loss: 0.3476 - val_acc: 0.8635
Epoch 12/30
 - 1s - loss: 0.2708 - acc: 0.9125 - val_loss: 0.3557 - val_acc: 0.8660
Epoch 13/30
 - 1s - loss: 0.2656 - acc: 0.9093 - val_loss: 0.3381 - val_acc: 0.8788
Epoch 14/30
 - 1s - loss: 0.2538 - acc: 0.9171 - val_loss: 0.4070 - val_acc: 0.8583
```

```
Epoch 15/30
 - 1s - loss: 0.2552 - acc: 0.9154 - val_loss: 0.4458 - val_acc: 0.8455
Epoch 16/30
 - 1s - loss: 0.2529 - acc: 0.9122 - val_loss: 0.3219 - val_acc: 0.8872
Epoch 17/30
 - 1s - loss: 0.2471 - acc: 0.9181 - val_loss: 0.3488 - val_acc: 0.8692
Epoch 18/30
 - 1s - loss: 0.2490 - acc: 0.9147 - val_loss: 0.3467 - val_acc: 0.8679
Epoch 19/30
 - 1s - loss: 0.2426 - acc: 0.9157 - val_loss: 0.3126 - val_acc: 0.8833
Epoch 20/30
 - 1s - loss: 0.2403 - acc: 0.9196 - val_loss: 0.3161 - val_acc: 0.8827
Epoch 21/30
 - 1s - loss: 0.2355 - acc: 0.9208 - val_loss: 0.3398 - val_acc: 0.8660
Epoch 22/30
 - 1s - loss: 0.2326 - acc: 0.9186 - val_loss: 0.3187 - val_acc: 0.8853
Epoch 23/30
 - 1s - loss: 0.2339 - acc: 0.9157 - val_loss: 0.2852 - val_acc: 0.9058
Epoch 24/30
 - 1s - loss: 0.2328 - acc: 0.9201 - val_loss: 0.2829 - val_acc: 0.9051
Epoch 25/30
 - 1s - loss: 0.2294 - acc: 0.9211 - val_loss: 0.2957 - val_acc: 0.8910
Epoch 26/30
 - 1s - loss: 0.2294 - acc: 0.9201 - val_loss: 0.2893 - val_acc: 0.8917
Epoch 27/30
 - 1s - loss: 0.2217 - acc: 0.9240 - val_loss: 0.2877 - val_acc: 0.8878
Epoch 28/30
 - 1s - loss: 0.2242 - acc: 0.9253 - val_loss: 0.3036 - val_acc: 0.9013
Epoch 29/30
 - 1s - loss: 0.2226 - acc: 0.9297 - val_loss: 0.2802 - val_acc: 0.9103
Epoch 30/30
 - 1s - loss: 0.2286 - acc: 0.9203 - val_loss: 0.2794 - val_acc: 0.9141
Train accuracy 0.9250061470371281 Test accuracy: 0.9141025641025641
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 118, 16)	4720
dropout_1 (Dropout)	(None, 118, 16)	0

```
max_pooling1d_1 (MaxPooling1 (None, 39, 16)              0
_____
flatten_1 (Flatten)          (None, 624)                 0
_____
dense_1 (Dense)              (None, 32)                  20000
_____
dense_2 (Dense)              (None, 3)                   99
=================================================================
Total params: 26,751
Trainable params: 26,751
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 17.6417 - acc: 0.8552 - val_loss: 0.5933 - val_acc: 0.8391
Epoch 2/30
 - 2s - loss: 0.3888 - acc: 0.8810 - val_loss: 0.4008 - val_acc: 0.8622
Epoch 3/30
 - 2s - loss: 0.3217 - acc: 0.8871 - val_loss: 0.4081 - val_acc: 0.8372
Epoch 4/30
 - 2s - loss: 0.3013 - acc: 0.8950 - val_loss: 0.3550 - val_acc: 0.8699
Epoch 5/30
 - 2s - loss: 0.2945 - acc: 0.8957 - val_loss: 0.3787 - val_acc: 0.8590
Epoch 6/30
 - 2s - loss: 0.2898 - acc: 0.8923 - val_loss: 0.3767 - val_acc: 0.8500
Epoch 7/30
 - 2s - loss: 0.2779 - acc: 0.8960 - val_loss: 0.3403 - val_acc: 0.8699
Epoch 8/30
 - 2s - loss: 0.2820 - acc: 0.8933 - val_loss: 0.4185 - val_acc: 0.8506
Epoch 9/30
 - 2s - loss: 0.2794 - acc: 0.8962 - val_loss: 0.3474 - val_acc: 0.8782
Epoch 10/30
 - 2s - loss: 0.2821 - acc: 0.8970 - val_loss: 0.3557 - val_acc: 0.8731
Epoch 11/30
 - 2s - loss: 0.2805 - acc: 0.8987 - val_loss: 0.4081 - val_acc: 0.8186
Epoch 12/30
 - 2s - loss: 0.2887 - acc: 0.8911 - val_loss: 0.3503 - val_acc: 0.8667
Epoch 13/30
 - 2s - loss: 0.2782 - acc: 0.8985 - val_loss: 0.3569 - val_acc: 0.8622
Epoch 14/30
 - 2s - loss: 0.2811 - acc: 0.8980 - val_loss: 0.3981 - val_acc: 0.8481
Epoch 15/30
```

```
        - 2s - loss: 0.2918 - acc: 0.9002 - val_loss: 0.3573 - val_acc: 0.8776
Epoch 16/30
        - 2s - loss: 0.2798 - acc: 0.9051 - val_loss: 0.3547 - val_acc: 0.8731
Epoch 17/30
        - 2s - loss: 0.2874 - acc: 0.8997 - val_loss: 0.3736 - val_acc: 0.8679
Epoch 18/30
        - 2s - loss: 0.2732 - acc: 0.9036 - val_loss: 0.3300 - val_acc: 0.8859
Epoch 19/30
        - 2s - loss: 0.2780 - acc: 0.9016 - val_loss: 0.3151 - val_acc: 0.8897
Epoch 20/30
        - 2s - loss: 0.2679 - acc: 0.9041 - val_loss: 0.4124 - val_acc: 0.8744
Epoch 21/30
        - 2s - loss: 0.2640 - acc: 0.9048 - val_loss: 0.3168 - val_acc: 0.8782
Epoch 22/30
        - 2s - loss: 0.2778 - acc: 0.8987 - val_loss: 0.4950 - val_acc: 0.7391
Epoch 23/30
        - 2s - loss: 0.2816 - acc: 0.8992 - val_loss: 0.4877 - val_acc: 0.8654
Epoch 24/30
        - 2s - loss: 0.2774 - acc: 0.9036 - val_loss: 0.4370 - val_acc: 0.8692
Epoch 25/30
        - 2s - loss: 0.2853 - acc: 0.9019 - val_loss: 0.3551 - val_acc: 0.8821
Epoch 26/30
        - 2s - loss: 0.2749 - acc: 0.9071 - val_loss: 0.3258 - val_acc: 0.8846
Epoch 27/30
        - 2s - loss: 0.2759 - acc: 0.9075 - val_loss: 0.3863 - val_acc: 0.8699
Epoch 28/30
        - 2s - loss: 0.2863 - acc: 0.9078 - val_loss: 0.4269 - val_acc: 0.8609
Epoch 29/30
        - 2s - loss: 0.2785 - acc: 0.9061 - val_loss: 0.4088 - val_acc: 0.8699
Epoch 30/30
        - 2s - loss: 0.2684 - acc: 0.9115 - val_loss: 0.2964 - val_acc: 0.9032
Train accuracy 0.9149250061470371 Test accuracy: 0.9032051282051282
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 118, 24)	7080
dropout_1 (Dropout)	(None, 118, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 24)	0

```
_____
flatten_1 (Flatten)          (None, 936)                0
_____
dense_1 (Dense)              (None, 32)                 29984
_____
dense_2 (Dense)              (None, 3)                  99
=================================================================
Total params: 39,095
Trainable params: 39,095
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 3s - loss: 42.3929 - acc: 0.8367 - val_loss: 0.5708 - val_acc: 0.7955
Epoch 2/35
 - 2s - loss: 0.4337 - acc: 0.8621 - val_loss: 0.4548 - val_acc: 0.8397
Epoch 3/35
 - 2s - loss: 0.3726 - acc: 0.8758 - val_loss: 0.5142 - val_acc: 0.8019
Epoch 4/35
 - 2s - loss: 0.3619 - acc: 0.8803 - val_loss: 0.3876 - val_acc: 0.8673
Epoch 5/35
 - 2s - loss: 0.3459 - acc: 0.8844 - val_loss: 0.3709 - val_acc: 0.8635
Epoch 6/35
 - 2s - loss: 0.3610 - acc: 0.8822 - val_loss: 0.4755 - val_acc: 0.8122
Epoch 7/35
 - 2s - loss: 0.3397 - acc: 0.8817 - val_loss: 0.3920 - val_acc: 0.8487
Epoch 8/35
 - 2s - loss: 0.3407 - acc: 0.8830 - val_loss: 0.4564 - val_acc: 0.8256
Epoch 9/35
 - 2s - loss: 0.3428 - acc: 0.8859 - val_loss: 0.4021 - val_acc: 0.8545
Epoch 10/35
 - 2s - loss: 0.3523 - acc: 0.8773 - val_loss: 0.4094 - val_acc: 0.8724
Epoch 11/35
 - 2s - loss: 0.3453 - acc: 0.8874 - val_loss: 0.5456 - val_acc: 0.6987
Epoch 12/35
 - 2s - loss: 0.3416 - acc: 0.8805 - val_loss: 0.4425 - val_acc: 0.8321
Epoch 13/35
 - 2s - loss: 0.3460 - acc: 0.8790 - val_loss: 0.5230 - val_acc: 0.8263
Epoch 14/35
 - 2s - loss: 0.3423 - acc: 0.8852 - val_loss: 0.5578 - val_acc: 0.7731
Epoch 15/35
 - 2s - loss: 0.3401 - acc: 0.8803 - val_loss: 0.3589 - val_acc: 0.8699
```

```
Epoch 16/35
 - 2s - loss: 0.3376 - acc: 0.8869 - val_loss: 0.3667 - val_acc: 0.8718
Epoch 17/35
 - 2s - loss: 0.3445 - acc: 0.8800 - val_loss: 0.5077 - val_acc: 0.8551
Epoch 18/35
 - 2s - loss: 0.3437 - acc: 0.8874 - val_loss: 0.4615 - val_acc: 0.8641
Epoch 19/35
 - 2s - loss: 0.3384 - acc: 0.8847 - val_loss: 0.4151 - val_acc: 0.8615
Epoch 20/35
 - 2s - loss: 0.3290 - acc: 0.8854 - val_loss: 0.3880 - val_acc: 0.8705
Epoch 21/35
 - 2s - loss: 0.3244 - acc: 0.8891 - val_loss: 0.3474 - val_acc: 0.8699
Epoch 22/35
 - 2s - loss: 0.3478 - acc: 0.8842 - val_loss: 0.4395 - val_acc: 0.8058
Epoch 23/35
 - 2s - loss: 0.3419 - acc: 0.8857 - val_loss: 0.3777 - val_acc: 0.8737
Epoch 24/35
 - 2s - loss: 0.3326 - acc: 0.8871 - val_loss: 0.3558 - val_acc: 0.8833
Epoch 25/35
 - 2s - loss: 0.3369 - acc: 0.8825 - val_loss: 0.3804 - val_acc: 0.8699
Epoch 26/35
 - 2s - loss: 0.3399 - acc: 0.8901 - val_loss: 0.3880 - val_acc: 0.8853
Epoch 27/35
 - 2s - loss: 0.3344 - acc: 0.8891 - val_loss: 0.3479 - val_acc: 0.8763
Epoch 28/35
 - 2s - loss: 0.3375 - acc: 0.8862 - val_loss: 0.4381 - val_acc: 0.7756
Epoch 29/35
 - 2s - loss: 0.3308 - acc: 0.8886 - val_loss: 0.3927 - val_acc: 0.8622
Epoch 30/35
 - 2s - loss: 0.3339 - acc: 0.8925 - val_loss: 0.3587 - val_acc: 0.8827
Epoch 31/35
 - 2s - loss: 0.3289 - acc: 0.8869 - val_loss: 0.3735 - val_acc: 0.8615
Epoch 32/35
 - 2s - loss: 0.3222 - acc: 0.8916 - val_loss: 0.3662 - val_acc: 0.8654
Epoch 33/35
 - 2s - loss: 0.3339 - acc: 0.8891 - val_loss: 0.5826 - val_acc: 0.7212
Epoch 34/35
 - 2s - loss: 0.3293 - acc: 0.8891 - val_loss: 0.3959 - val_acc: 0.8827
Epoch 35/35
 - 2s - loss: 0.3349 - acc: 0.8857 - val_loss: 0.5930 - val_acc: 0.7122
Train accuracy 0.6958446029014015 Test accuracy: 0.7121794871794872
-------------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)               (None, 122, 28)           1792

conv1d_2 (Conv1D)               (None, 118, 32)           4512

dropout_1 (Dropout)             (None, 118, 32)           0

max_pooling1d_1 (MaxPooling1    (None, 39, 32)            0

flatten_1 (Flatten)             (None, 1248)              0

dense_1 (Dense)                 (None, 64)                79936

dense_2 (Dense)                 (None, 3)                 195
=================================================================
Total params: 86,435
Trainable params: 86,435
Non-trainable params: 0


None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 3s - loss: 6.9600 - acc: 0.8235 - val_loss: 0.5693 - val_acc: 0.8179
Epoch 2/35
 - 2s - loss: 0.4846 - acc: 0.8581 - val_loss: 0.5166 - val_acc: 0.8103
Epoch 3/35
 - 2s - loss: 0.4538 - acc: 0.8667 - val_loss: 0.5572 - val_acc: 0.7910
Epoch 4/35
 - 2s - loss: 0.4473 - acc: 0.8662 - val_loss: 0.4365 - val_acc: 0.8545
Epoch 5/35
 - 2s - loss: 0.4592 - acc: 0.8716 - val_loss: 0.5709 - val_acc: 0.8359
Epoch 6/35
 - 2s - loss: 0.4279 - acc: 0.8736 - val_loss: 0.4444 - val_acc: 0.8449
Epoch 7/35
 - 2s - loss: 0.4495 - acc: 0.8721 - val_loss: 0.6148 - val_acc: 0.8551
Epoch 8/35
 - 2s - loss: 0.4238 - acc: 0.8785 - val_loss: 0.5658 - val_acc: 0.8077
Epoch 9/35
 - 2s - loss: 0.4255 - acc: 0.8746 - val_loss: 0.3969 - val_acc: 0.8692
Epoch 10/35
 - 2s - loss: 0.4254 - acc: 0.8704 - val_loss: 0.4922 - val_acc: 0.8641
Epoch 11/35
```

```
           - 2s - loss: 0.4141 - acc: 0.8795 - val_loss: 0.7674 - val_acc: 0.6583
Epoch 12/35
           - 2s - loss: 0.4166 - acc: 0.8771 - val_loss: 0.4749 - val_acc: 0.8481
Epoch 13/35
           - 2s - loss: 0.3977 - acc: 0.8734 - val_loss: 0.4262 - val_acc: 0.8564
Epoch 14/35
           - 2s - loss: 0.3995 - acc: 0.8807 - val_loss: 0.5386 - val_acc: 0.8192
Epoch 15/35
           - 2s - loss: 0.4260 - acc: 0.8756 - val_loss: 0.4063 - val_acc: 0.8840
Epoch 16/35
           - 2s - loss: 0.4157 - acc: 0.8830 - val_loss: 0.4773 - val_acc: 0.8673
Epoch 17/35
           - 2s - loss: 0.4085 - acc: 0.8736 - val_loss: 0.6763 - val_acc: 0.8506
Epoch 18/35
           - 2s - loss: 0.4150 - acc: 0.8822 - val_loss: 0.8862 - val_acc: 0.6949
Epoch 19/35
           - 2s - loss: 0.3998 - acc: 0.8800 - val_loss: 0.3981 - val_acc: 0.8846
Epoch 20/35
           - 2s - loss: 0.4064 - acc: 0.8766 - val_loss: 0.4759 - val_acc: 0.8487
Epoch 21/35
           - 2s - loss: 0.4031 - acc: 0.8798 - val_loss: 0.4083 - val_acc: 0.8654
Epoch 22/35
           - 2s - loss: 0.4187 - acc: 0.8756 - val_loss: 0.6439 - val_acc: 0.8429
Epoch 23/35
           - 2s - loss: 0.4130 - acc: 0.8694 - val_loss: 0.3951 - val_acc: 0.8724
Epoch 24/35
           - 2s - loss: 0.4047 - acc: 0.8780 - val_loss: 0.6084 - val_acc: 0.8500
Epoch 25/35
           - 2s - loss: 0.4010 - acc: 0.8827 - val_loss: 0.5251 - val_acc: 0.8205
Epoch 26/35
           - 2s - loss: 0.4013 - acc: 0.8753 - val_loss: 0.5734 - val_acc: 0.8673
Epoch 27/35
           - 2s - loss: 0.4101 - acc: 0.8773 - val_loss: 0.5612 - val_acc: 0.8551
Epoch 28/35
           - 2s - loss: 0.3949 - acc: 0.8866 - val_loss: 0.6224 - val_acc: 0.7526
Epoch 29/35
           - 2s - loss: 0.3920 - acc: 0.8776 - val_loss: 0.4070 - val_acc: 0.8718
Epoch 30/35
           - 2s - loss: 0.3930 - acc: 0.8830 - val_loss: 0.4015 - val_acc: 0.8686
Epoch 31/35
           - 2s - loss: 0.4058 - acc: 0.8830 - val_loss: 0.5066 - val_acc: 0.8590
Epoch 32/35
           - 2s - loss: 0.3982 - acc: 0.8835 - val_loss: 0.3849 - val_acc: 0.8731
```

```
Epoch 33/35
 - 2s - loss: 0.3962 - acc: 0.8837 - val_loss: 0.5838 - val_acc: 0.8615
Epoch 34/35
 - 2s - loss: 0.3887 - acc: 0.8820 - val_loss: 1.1173 - val_acc: 0.6744
Epoch 35/35
 - 2s - loss: 0.4125 - acc: 0.8751 - val_loss: 1.0478 - val_acc: 0.6333
Train accuracy 0.6282271944922547 Test accuracy: 0.6333333333333333
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 124, 32)	4064
dropout_1 (Dropout)	(None, 124, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 62, 32)	0
flatten_1 (Flatten)	(None, 1984)	0
dense_1 (Dense)	(None, 16)	31760
dense_2 (Dense)	(None, 3)	51

```
Total params: 37,051
Trainable params: 37,051
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 19.3203 - acc: 0.8380 - val_loss: 1.0916 - val_acc: 0.8000
Epoch 2/25
 - 1s - loss: 0.4815 - acc: 0.8697 - val_loss: 0.4513 - val_acc: 0.8551
Epoch 3/25
 - 1s - loss: 0.3589 - acc: 0.8768 - val_loss: 0.4089 - val_acc: 0.8571
Epoch 4/25
 - 1s - loss: 0.3488 - acc: 0.8837 - val_loss: 0.4222 - val_acc: 0.8462
Epoch 5/25
 - 1s - loss: 0.3456 - acc: 0.8839 - val_loss: 0.3923 - val_acc: 0.8551
Epoch 6/25
 - 1s - loss: 0.3302 - acc: 0.8884 - val_loss: 0.4464 - val_acc: 0.8051
```

```
Epoch 7/25
 - 1s - loss: 0.3224 - acc: 0.8866 - val_loss: 0.3477 - val_acc: 0.8865
Epoch 8/25
 - 1s - loss: 0.3257 - acc: 0.8852 - val_loss: 0.3964 - val_acc: 0.8301
Epoch 9/25
 - 1s - loss: 0.3064 - acc: 0.8938 - val_loss: 0.3364 - val_acc: 0.8731
Epoch 10/25
 - 1s - loss: 0.3178 - acc: 0.8903 - val_loss: 0.3454 - val_acc: 0.8840
Epoch 11/25
 - 1s - loss: 0.3077 - acc: 0.8903 - val_loss: 0.6779 - val_acc: 0.6994
Epoch 12/25
 - 1s - loss: 0.3128 - acc: 0.8933 - val_loss: 0.4286 - val_acc: 0.8147
Epoch 13/25
 - 1s - loss: 0.3156 - acc: 0.8854 - val_loss: 0.4041 - val_acc: 0.8346
Epoch 14/25
 - 1s - loss: 0.3018 - acc: 0.9004 - val_loss: 0.5115 - val_acc: 0.7333
Epoch 15/25
 - 1s - loss: 0.3136 - acc: 0.8933 - val_loss: 0.3453 - val_acc: 0.8769
Epoch 16/25
 - 1s - loss: 0.3068 - acc: 0.8918 - val_loss: 0.3599 - val_acc: 0.8724
Epoch 17/25
 - 1s - loss: 0.3069 - acc: 0.8884 - val_loss: 0.3407 - val_acc: 0.8756
Epoch 18/25
 - 1s - loss: 0.3059 - acc: 0.8935 - val_loss: 0.5186 - val_acc: 0.7224
Epoch 19/25
 - 1s - loss: 0.3055 - acc: 0.8864 - val_loss: 0.3272 - val_acc: 0.8769
Epoch 20/25
 - 1s - loss: 0.2908 - acc: 0.8950 - val_loss: 0.3611 - val_acc: 0.8705
Epoch 21/25
 - 1s - loss: 0.3072 - acc: 0.8913 - val_loss: 0.3415 - val_acc: 0.8769
Epoch 22/25
 - 1s - loss: 0.3055 - acc: 0.8901 - val_loss: 0.4698 - val_acc: 0.7353
Epoch 23/25
 - 1s - loss: 0.3106 - acc: 0.8935 - val_loss: 0.3426 - val_acc: 0.8846
Epoch 24/25
 - 1s - loss: 0.3179 - acc: 0.8940 - val_loss: 0.3598 - val_acc: 0.8718
Epoch 25/25
 - 1s - loss: 0.2975 - acc: 0.8972 - val_loss: 0.3509 - val_acc: 0.8808
Train accuracy 0.916892058028035 Test accuracy: 0.8807692307692307
---------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

```
conv1d_1 (Conv1D)              (None, 126, 28)              784
_____
conv1d_2 (Conv1D)              (None, 122, 16)              2256
_____
dropout_1 (Dropout)            (None, 122, 16)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 61, 16)               0
_____
flatten_1 (Flatten)            (None, 976)                  0
_____
dense_1 (Dense)                (None, 32)                   31264
_____
dense_2 (Dense)                (None, 3)                    99
=================================================================
Total params: 34,403
Trainable params: 34,403
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 126.6348 - acc: 0.8188 - val_loss: 71.3596 - val_acc: 0.8724
Epoch 2/35
 - 1s - loss: 45.1661 - acc: 0.8945 - val_loss: 26.1391 - val_acc: 0.8667
Epoch 3/35
 - 1s - loss: 16.3547 - acc: 0.8977 - val_loss: 9.2923 - val_acc: 0.8724
Epoch 4/35
 - 1s - loss: 5.6638 - acc: 0.8938 - val_loss: 3.1821 - val_acc: 0.8705
Epoch 5/35
 - 1s - loss: 1.9140 - acc: 0.8965 - val_loss: 1.1921 - val_acc: 0.8622
Epoch 6/35
 - 1s - loss: 0.7577 - acc: 0.8943 - val_loss: 0.6856 - val_acc: 0.8494
Epoch 7/35
 - 1s - loss: 0.4549 - acc: 0.8898 - val_loss: 0.4904 - val_acc: 0.8571
Epoch 8/35
 - 1s - loss: 0.4150 - acc: 0.8776 - val_loss: 0.5124 - val_acc: 0.8321
Epoch 9/35
 - 1s - loss: 0.3590 - acc: 0.8943 - val_loss: 0.4545 - val_acc: 0.8545
Epoch 10/35
 - 1s - loss: 0.3550 - acc: 0.8918 - val_loss: 0.4451 - val_acc: 0.8667
Epoch 11/35
 - 1s - loss: 0.3504 - acc: 0.8903 - val_loss: 0.4579 - val_acc: 0.8750
Epoch 12/35
```

```
             - 1s - loss: 0.3546 - acc: 0.8825 - val_loss: 0.4139 - val_acc: 0.8526
Epoch 13/35
             - 1s - loss: 0.3386 - acc: 0.8928 - val_loss: 0.4422 - val_acc: 0.8538
Epoch 14/35
             - 1s - loss: 0.3176 - acc: 0.9016 - val_loss: 0.4978 - val_acc: 0.7391
Epoch 15/35
             - 1s - loss: 0.3263 - acc: 0.8911 - val_loss: 0.4150 - val_acc: 0.8705
Epoch 16/35
             - 1s - loss: 0.3287 - acc: 0.8928 - val_loss: 0.4119 - val_acc: 0.8462
Epoch 17/35
             - 1s - loss: 0.3106 - acc: 0.8967 - val_loss: 0.3799 - val_acc: 0.8615
Epoch 18/35
             - 1s - loss: 0.3089 - acc: 0.8967 - val_loss: 0.3751 - val_acc: 0.8756
Epoch 19/35
             - 1s - loss: 0.3030 - acc: 0.8985 - val_loss: 0.4225 - val_acc: 0.8506
Epoch 20/35
             - 1s - loss: 0.3029 - acc: 0.8967 - val_loss: 0.3877 - val_acc: 0.8558
Epoch 21/35
             - 1s - loss: 0.3004 - acc: 0.8985 - val_loss: 0.3855 - val_acc: 0.8615
Epoch 22/35
             - 1s - loss: 0.3023 - acc: 0.8989 - val_loss: 0.3827 - val_acc: 0.8596
Epoch 23/35
             - 1s - loss: 0.3152 - acc: 0.8901 - val_loss: 0.3668 - val_acc: 0.8705
Epoch 24/35
             - 1s - loss: 0.3059 - acc: 0.8962 - val_loss: 0.4014 - val_acc: 0.8558
Epoch 25/35
             - 1s - loss: 0.3043 - acc: 0.8975 - val_loss: 0.3759 - val_acc: 0.8712
Epoch 26/35
             - 1s - loss: 0.2853 - acc: 0.9024 - val_loss: 0.3676 - val_acc: 0.8756
Epoch 27/35
             - 1s - loss: 0.2797 - acc: 0.9019 - val_loss: 0.3599 - val_acc: 0.8628
Epoch 28/35
             - 1s - loss: 0.2869 - acc: 0.8980 - val_loss: 0.3489 - val_acc: 0.8769
Epoch 29/35
             - 1s - loss: 0.2780 - acc: 0.9039 - val_loss: 0.3629 - val_acc: 0.8705
Epoch 30/35
             - 1s - loss: 0.2892 - acc: 0.8972 - val_loss: 0.3431 - val_acc: 0.8865
Epoch 31/35
             - 1s - loss: 0.2787 - acc: 0.8989 - val_loss: 0.3500 - val_acc: 0.8827
Epoch 32/35
             - 1s - loss: 0.2762 - acc: 0.9026 - val_loss: 0.3930 - val_acc: 0.8686
Epoch 33/35
             - 1s - loss: 0.2804 - acc: 0.9051 - val_loss: 0.3565 - val_acc: 0.8833
```

```
Epoch 34/35
 - 1s - loss: 0.2750 - acc: 0.9004 - val_loss: 0.3396 - val_acc: 0.8827
Epoch 35/35
 - 1s - loss: 0.2847 - acc: 0.8997 - val_loss: 0.3395 - val_acc: 0.8859
Train accuracy 0.8937791984263584 Test accuracy: 0.8858974358974359
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 120, 24)	5064
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 24)	0
flatten_1 (Flatten)	(None, 576)	0
dense_1 (Dense)	(None, 32)	18464
dense_2 (Dense)	(None, 3)	99

```
Total params: 25,559
Trainable params: 25,559
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 25.7420 - acc: 0.7937 - val_loss: 0.6374 - val_acc: 0.8109
Epoch 2/35
 - 2s - loss: 0.5072 - acc: 0.8532 - val_loss: 0.5647 - val_acc: 0.8186
Epoch 3/35
 - 2s - loss: 0.4717 - acc: 0.8579 - val_loss: 0.5768 - val_acc: 0.7904
Epoch 4/35
 - 2s - loss: 0.4442 - acc: 0.8660 - val_loss: 0.5064 - val_acc: 0.8628
Epoch 5/35
 - 2s - loss: 0.4605 - acc: 0.8672 - val_loss: 0.5048 - val_acc: 0.8679
Epoch 6/35
 - 2s - loss: 0.4261 - acc: 0.8697 - val_loss: 0.5736 - val_acc: 0.8077
Epoch 7/35
 - 2s - loss: 0.4209 - acc: 0.8736 - val_loss: 0.4956 - val_acc: 0.8423
```

```
Epoch 8/35
 - 2s - loss: 0.4291 - acc: 0.8724 - val_loss: 0.6130 - val_acc: 0.8103
Epoch 9/35
 - 2s - loss: 0.4383 - acc: 0.8716 - val_loss: 0.5028 - val_acc: 0.8494
Epoch 10/35
 - 2s - loss: 0.4121 - acc: 0.8689 - val_loss: 0.4916 - val_acc: 0.8474
Epoch 11/35
 - 2s - loss: 0.4157 - acc: 0.8807 - val_loss: 0.7591 - val_acc: 0.6526
Epoch 12/35
 - 2s - loss: 0.4192 - acc: 0.8726 - val_loss: 0.6396 - val_acc: 0.7776
Epoch 13/35
 - 2s - loss: 0.4135 - acc: 0.8677 - val_loss: 0.5069 - val_acc: 0.8429
Epoch 14/35
 - 2s - loss: 0.4164 - acc: 0.8712 - val_loss: 0.6237 - val_acc: 0.6949
Epoch 15/35
 - 2s - loss: 0.4076 - acc: 0.8788 - val_loss: 0.5072 - val_acc: 0.8718
Epoch 16/35
 - 2s - loss: 0.4046 - acc: 0.8778 - val_loss: 0.4822 - val_acc: 0.8404
Epoch 17/35
 - 2s - loss: 0.4090 - acc: 0.8685 - val_loss: 0.5593 - val_acc: 0.8551
Epoch 18/35
 - 2s - loss: 0.4041 - acc: 0.8795 - val_loss: 0.5904 - val_acc: 0.7865
Epoch 19/35
 - 2s - loss: 0.4018 - acc: 0.8805 - val_loss: 0.5366 - val_acc: 0.8147
Epoch 20/35
 - 2s - loss: 0.4003 - acc: 0.8736 - val_loss: 0.5941 - val_acc: 0.8506
Epoch 21/35
 - 2s - loss: 0.3941 - acc: 0.8768 - val_loss: 0.4866 - val_acc: 0.8641
Epoch 22/35
 - 2s - loss: 0.3997 - acc: 0.8812 - val_loss: 0.8116 - val_acc: 0.5897
Epoch 23/35
 - 2s - loss: 0.4156 - acc: 0.8721 - val_loss: 0.6770 - val_acc: 0.7885
Epoch 24/35
 - 2s - loss: 0.3940 - acc: 0.8773 - val_loss: 0.5612 - val_acc: 0.8263
Epoch 25/35
 - 2s - loss: 0.4056 - acc: 0.8758 - val_loss: 0.6364 - val_acc: 0.6936
Epoch 26/35
 - 2s - loss: 0.3937 - acc: 0.8854 - val_loss: 0.7403 - val_acc: 0.7583
Epoch 27/35
 - 2s - loss: 0.4134 - acc: 0.8790 - val_loss: 0.5800 - val_acc: 0.8385
Epoch 28/35
 - 2s - loss: 0.3979 - acc: 0.8803 - val_loss: 0.9663 - val_acc: 0.6635
Epoch 29/35
```

```
 - 2s - loss: 0.4070 - acc: 0.8736 - val_loss: 0.4899 - val_acc: 0.8212
Epoch 30/35
 - 2s - loss: 0.3978 - acc: 0.8761 - val_loss: 0.5087 - val_acc: 0.8462
Epoch 31/35
 - 2s - loss: 0.3901 - acc: 0.8761 - val_loss: 0.6601 - val_acc: 0.8301
Epoch 32/35
 - 2s - loss: 0.3889 - acc: 0.8800 - val_loss: 0.4782 - val_acc: 0.8500
Epoch 33/35
 - 2s - loss: 0.4267 - acc: 0.8746 - val_loss: 0.9585 - val_acc: 0.6679
Epoch 34/35
 - 2s - loss: 0.4026 - acc: 0.8761 - val_loss: 0.7081 - val_acc: 0.6647
Epoch 35/35
 - 2s - loss: 0.4083 - acc: 0.8748 - val_loss: 0.9453 - val_acc: 0.5968
Train accuracy 0.5706909269731989 Test accuracy: 0.5967948721005366
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 122, 32)	4064
dropout_1 (Dropout)	(None, 122, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 32)	0
flatten_1 (Flatten)	(None, 768)	0
dense_1 (Dense)	(None, 16)	12304
dense_2 (Dense)	(None, 3)	51

```
Total params: 18,351
Trainable params: 18,351
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 44.1078 - acc: 0.8404 - val_loss: 0.7388 - val_acc: 0.7981
Epoch 2/25
 - 2s - loss: 0.4274 - acc: 0.8763 - val_loss: 0.5307 - val_acc: 0.8462
Epoch 3/25
```

```
         - 2s - loss: 0.3543 - acc: 0.8825 - val_loss: 0.4717 - val_acc: 0.8397
Epoch 4/25
         - 2s - loss: 0.3200 - acc: 0.8913 - val_loss: 0.4563 - val_acc: 0.8545
Epoch 5/25
         - 2s - loss: 0.3197 - acc: 0.8881 - val_loss: 0.4099 - val_acc: 0.8782
Epoch 6/25
         - 2s - loss: 0.3199 - acc: 0.8839 - val_loss: 0.4773 - val_acc: 0.8173
Epoch 7/25
         - 2s - loss: 0.3045 - acc: 0.8938 - val_loss: 0.3985 - val_acc: 0.8635
Epoch 8/25
         - 2s - loss: 0.3084 - acc: 0.8918 - val_loss: 0.4285 - val_acc: 0.8429
Epoch 9/25
         - 2s - loss: 0.3070 - acc: 0.8923 - val_loss: 0.4075 - val_acc: 0.8737
Epoch 10/25
         - 2s - loss: 0.3134 - acc: 0.8886 - val_loss: 0.4194 - val_acc: 0.8692
Epoch 11/25
         - 2s - loss: 0.3057 - acc: 0.8957 - val_loss: 0.4943 - val_acc: 0.7558
Epoch 12/25
         - 2s - loss: 0.3159 - acc: 0.8830 - val_loss: 0.4176 - val_acc: 0.8635
Epoch 13/25
         - 2s - loss: 0.3093 - acc: 0.8822 - val_loss: 0.4172 - val_acc: 0.8391
Epoch 14/25
         - 2s - loss: 0.3075 - acc: 0.8896 - val_loss: 0.4675 - val_acc: 0.8019
Epoch 15/25
         - 2s - loss: 0.3047 - acc: 0.8923 - val_loss: 0.3886 - val_acc: 0.8731
Epoch 16/25
         - 2s - loss: 0.3086 - acc: 0.8898 - val_loss: 0.3817 - val_acc: 0.8795
Epoch 17/25
         - 2s - loss: 0.3056 - acc: 0.8871 - val_loss: 0.3888 - val_acc: 0.8609
Epoch 18/25
         - 2s - loss: 0.3090 - acc: 0.8908 - val_loss: 0.3714 - val_acc: 0.8904
Epoch 19/25
         - 2s - loss: 0.2967 - acc: 0.8967 - val_loss: 0.3731 - val_acc: 0.8917
Epoch 20/25
         - 2s - loss: 0.3028 - acc: 0.8891 - val_loss: 0.3904 - val_acc: 0.8622
Epoch 21/25
         - 2s - loss: 0.2918 - acc: 0.8953 - val_loss: 0.3799 - val_acc: 0.8705
Epoch 22/25
         - 2s - loss: 0.3016 - acc: 0.8960 - val_loss: 0.4320 - val_acc: 0.8615
Epoch 23/25
         - 2s - loss: 0.3132 - acc: 0.8866 - val_loss: 0.3772 - val_acc: 0.8776
Epoch 24/25
         - 2s - loss: 0.3000 - acc: 0.8948 - val_loss: 0.3870 - val_acc: 0.8673
```

```
Epoch 25/25
 - 2s - loss: 0.2930 - acc: 0.8918 - val_loss: 0.3706 - val_acc: 0.8821
Train accuracy 0.9195967543643964 Test accuracy: 0.882051282051282
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 120, 16)	4720
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 16)	0
flatten_1 (Flatten)	(None, 640)	0
dense_1 (Dense)	(None, 32)	20512
dense_2 (Dense)	(None, 3)	99

```
Total params: 26,507
Trainable params: 26,507
Non-trainable params: 0


None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 3s - loss: 23.6945 - acc: 0.8611 - val_loss: 4.4418 - val_acc: 0.8712
Epoch 2/35
 - 2s - loss: 1.5054 - acc: 0.9007 - val_loss: 0.6027 - val_acc: 0.8788
Epoch 3/35
 - 2s - loss: 0.3698 - acc: 0.8876 - val_loss: 0.4359 - val_acc: 0.8538
Epoch 4/35
 - 2s - loss: 0.3561 - acc: 0.8891 - val_loss: 0.4283 - val_acc: 0.8776
Epoch 5/35
 - 2s - loss: 0.3218 - acc: 0.8948 - val_loss: 0.4960 - val_acc: 0.8282
Epoch 6/35
 - 2s - loss: 0.3091 - acc: 0.9004 - val_loss: 0.4005 - val_acc: 0.8769
Epoch 7/35
 - 2s - loss: 0.2971 - acc: 0.8953 - val_loss: 0.3997 - val_acc: 0.8827
Epoch 8/35
 - 2s - loss: 0.3001 - acc: 0.9002 - val_loss: 0.4082 - val_acc: 0.8686
```

```
Epoch 9/35
 - 2s - loss: 0.3001 - acc: 0.8994 - val_loss: 0.3827 - val_acc: 0.8782
Epoch 10/35
 - 2s - loss: 0.2818 - acc: 0.9044 - val_loss: 0.3744 - val_acc: 0.8737
Epoch 11/35
 - 2s - loss: 0.2805 - acc: 0.9004 - val_loss: 0.3885 - val_acc: 0.8769
Epoch 12/35
 - 2s - loss: 0.2967 - acc: 0.8955 - val_loss: 0.3843 - val_acc: 0.8808
Epoch 13/35
 - 2s - loss: 0.2948 - acc: 0.8999 - val_loss: 0.3550 - val_acc: 0.8788
Epoch 14/35
 - 2s - loss: 0.3038 - acc: 0.8955 - val_loss: 0.4180 - val_acc: 0.8353
Epoch 15/35
 - 2s - loss: 0.3014 - acc: 0.8999 - val_loss: 0.3713 - val_acc: 0.8840
Epoch 16/35
 - 2s - loss: 0.2854 - acc: 0.8997 - val_loss: 0.3789 - val_acc: 0.8686
Epoch 17/35
 - 2s - loss: 0.2919 - acc: 0.8950 - val_loss: 0.3503 - val_acc: 0.8776
Epoch 18/35
 - 2s - loss: 0.2644 - acc: 0.9036 - val_loss: 0.3684 - val_acc: 0.8596
Epoch 19/35
 - 2s - loss: 0.2798 - acc: 0.8982 - val_loss: 0.3606 - val_acc: 0.8679
Epoch 20/35
 - 2s - loss: 0.2815 - acc: 0.9036 - val_loss: 0.3350 - val_acc: 0.8750
Epoch 21/35
 - 2s - loss: 0.2722 - acc: 0.9029 - val_loss: 0.3828 - val_acc: 0.8577
Epoch 22/35
 - 2s - loss: 0.2834 - acc: 0.8962 - val_loss: 0.3561 - val_acc: 0.8769
Epoch 23/35
 - 2s - loss: 0.2709 - acc: 0.9034 - val_loss: 0.3602 - val_acc: 0.8750
Epoch 24/35
 - 2s - loss: 0.2750 - acc: 0.9019 - val_loss: 0.3588 - val_acc: 0.8718
Epoch 25/35
 - 2s - loss: 0.2736 - acc: 0.8977 - val_loss: 0.3973 - val_acc: 0.8551
Epoch 26/35
 - 2s - loss: 0.2718 - acc: 0.9016 - val_loss: 0.3525 - val_acc: 0.8827
Epoch 27/35
 - 2s - loss: 0.2721 - acc: 0.9007 - val_loss: 0.3368 - val_acc: 0.8788
Epoch 28/35
 - 2s - loss: 0.2748 - acc: 0.9004 - val_loss: 0.3609 - val_acc: 0.8795
Epoch 29/35
 - 2s - loss: 0.2644 - acc: 0.9044 - val_loss: 0.3624 - val_acc: 0.8686
Epoch 30/35
```

```
 - 2s - loss: 0.2784 - acc: 0.9002 - val_loss: 0.3454 - val_acc: 0.8763
Epoch 31/35
 - 2s - loss: 0.2835 - acc: 0.8982 - val_loss: 0.3417 - val_acc: 0.8756
Epoch 32/35
 - 2s - loss: 0.2633 - acc: 0.9024 - val_loss: 0.3908 - val_acc: 0.8679
Epoch 33/35
 - 2s - loss: 0.2602 - acc: 0.9014 - val_loss: 0.3514 - val_acc: 0.8737
Epoch 34/35
 - 2s - loss: 0.2580 - acc: 0.9019 - val_loss: 0.3546 - val_acc: 0.8679
Epoch 35/35
 - 2s - loss: 0.2597 - acc: 0.9071 - val_loss: 0.3402 - val_acc: 0.8718
Train accuracy 0.9009097614949594 Test accuracy: 0.8717948717948718
--------------------------------------------------------------------------------
```

```
_____
Layer (type)                   Output Shape              Param #
================================================================
conv1d_1 (Conv1D)              (None, 122, 42)           2688

conv1d_2 (Conv1D)              (None, 116, 24)           7080

dropout_1 (Dropout)            (None, 116, 24)           0

max_pooling1d_1 (MaxPooling1   (None, 58, 24)            0

flatten_1 (Flatten)            (None, 1392)              0

dense_1 (Dense)                (None, 32)                44576

dense_2 (Dense)                (None, 3)                 99
================================================================
Total params: 54,443
Trainable params: 54,443
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 3s - loss: 35.9853 - acc: 0.8471 - val_loss: 0.5876 - val_acc: 0.8538
Epoch 2/35
 - 2s - loss: 0.4546 - acc: 0.8719 - val_loss: 0.4936 - val_acc: 0.8423
Epoch 3/35
 - 2s - loss: 0.4331 - acc: 0.8712 - val_loss: 0.4578 - val_acc: 0.8314
Epoch 4/35
```

```
        - 2s - loss: 0.4523 - acc: 0.8746 - val_loss: 0.4865 - val_acc: 0.8442
Epoch 5/35
        - 2s - loss: 0.3968 - acc: 0.8753 - val_loss: 0.5295 - val_acc: 0.8026
Epoch 6/35
        - 2s - loss: 0.3934 - acc: 0.8803 - val_loss: 0.4169 - val_acc: 0.8750
Epoch 7/35
        - 2s - loss: 0.4000 - acc: 0.8756 - val_loss: 0.4696 - val_acc: 0.8673
Epoch 8/35
        - 2s - loss: 0.3884 - acc: 0.8842 - val_loss: 0.6348 - val_acc: 0.7872
Epoch 9/35
        - 2s - loss: 0.4052 - acc: 0.8771 - val_loss: 0.4995 - val_acc: 0.8385
Epoch 10/35
        - 2s - loss: 0.3876 - acc: 0.8812 - val_loss: 0.4794 - val_acc: 0.8692
Epoch 11/35
        - 2s - loss: 0.3827 - acc: 0.8815 - val_loss: 0.4938 - val_acc: 0.8263
Epoch 12/35
        - 2s - loss: 0.3801 - acc: 0.8837 - val_loss: 0.3967 - val_acc: 0.8654
Epoch 13/35
        - 2s - loss: 0.4064 - acc: 0.8721 - val_loss: 0.4692 - val_acc: 0.8558
Epoch 14/35
        - 2s - loss: 0.3925 - acc: 0.8830 - val_loss: 0.4389 - val_acc: 0.8731
Epoch 15/35
        - 2s - loss: 0.4079 - acc: 0.8751 - val_loss: 0.4130 - val_acc: 0.8538
Epoch 16/35
        - 2s - loss: 0.3715 - acc: 0.8817 - val_loss: 0.4582 - val_acc: 0.8333
Epoch 17/35
        - 2s - loss: 0.4056 - acc: 0.8763 - val_loss: 0.4515 - val_acc: 0.8429
Epoch 18/35
        - 2s - loss: 0.3747 - acc: 0.8751 - val_loss: 0.4263 - val_acc: 0.8519
Epoch 19/35
        - 2s - loss: 0.3943 - acc: 0.8729 - val_loss: 0.4198 - val_acc: 0.8667
Epoch 20/35
        - 2s - loss: 0.3564 - acc: 0.8894 - val_loss: 0.3832 - val_acc: 0.8705
Epoch 21/35
        - 2s - loss: 0.3771 - acc: 0.8778 - val_loss: 0.3932 - val_acc: 0.8603
Epoch 22/35
        - 2s - loss: 0.3992 - acc: 0.8704 - val_loss: 0.5431 - val_acc: 0.8487
Epoch 23/35
        - 2s - loss: 0.4005 - acc: 0.8714 - val_loss: 0.4083 - val_acc: 0.8712
Epoch 24/35
        - 2s - loss: 0.3853 - acc: 0.8734 - val_loss: 0.4257 - val_acc: 0.8667
Epoch 25/35
        - 2s - loss: 0.3590 - acc: 0.8847 - val_loss: 0.4321 - val_acc: 0.8442
```

```
Epoch 26/35
 - 2s - loss: 0.4065 - acc: 0.8667 - val_loss: 0.3918 - val_acc: 0.8622
Epoch 27/35
 - 2s - loss: 0.3874 - acc: 0.8748 - val_loss: 0.3983 - val_acc: 0.8641
Epoch 28/35
 - 2s - loss: 0.3794 - acc: 0.8773 - val_loss: 0.4910 - val_acc: 0.8686
Epoch 29/35
 - 2s - loss: 0.3890 - acc: 0.8822 - val_loss: 0.3878 - val_acc: 0.8718
Epoch 30/35
 - 2s - loss: 0.3871 - acc: 0.8736 - val_loss: 0.4352 - val_acc: 0.8647
Epoch 31/35
 - 2s - loss: 0.3995 - acc: 0.8748 - val_loss: 0.3998 - val_acc: 0.8692
Epoch 32/35
 - 2s - loss: 0.3908 - acc: 0.8785 - val_loss: 0.4617 - val_acc: 0.8186
Epoch 33/35
 - 2s - loss: 0.3608 - acc: 0.8778 - val_loss: 0.4415 - val_acc: 0.8583
Epoch 34/35
 - 2s - loss: 0.3528 - acc: 0.8744 - val_loss: 0.4880 - val_acc: 0.8577
Epoch 35/35
 - 2s - loss: 0.3879 - acc: 0.8783 - val_loss: 0.5049 - val_acc: 0.8212
Train accuracy 0.8568969756577329 Test accuracy: 0.8211538461538461
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 122, 24)	3864
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 64)	93760
dense_2 (Dense)	(None, 3)	195

```
Total params: 98,715
Trainable params: 98,715
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 3s - loss: 68.8837 - acc: 0.8512 - val_loss: 8.5622 - val_acc: 0.8256
Epoch 2/35
 - 2s - loss: 2.5736 - acc: 0.8837 - val_loss: 0.6541 - val_acc: 0.8615
Epoch 3/35
 - 2s - loss: 0.4448 - acc: 0.8783 - val_loss: 0.4645 - val_acc: 0.8365
Epoch 4/35
 - 2s - loss: 0.4352 - acc: 0.8648 - val_loss: 0.4886 - val_acc: 0.8436
Epoch 5/35
 - 2s - loss: 0.3960 - acc: 0.8805 - val_loss: 0.4923 - val_acc: 0.8583
Epoch 6/35
 - 2s - loss: 0.3543 - acc: 0.8916 - val_loss: 0.4373 - val_acc: 0.8622
Epoch 7/35
 - 2s - loss: 0.3430 - acc: 0.8906 - val_loss: 0.4473 - val_acc: 0.8397
Epoch 8/35
 - 2s - loss: 0.4080 - acc: 0.8803 - val_loss: 0.4994 - val_acc: 0.8333
Epoch 9/35
 - 2s - loss: 0.4065 - acc: 0.8911 - val_loss: 0.4119 - val_acc: 0.8577
Epoch 10/35
 - 2s - loss: 0.3674 - acc: 0.8896 - val_loss: 0.4190 - val_acc: 0.8718
Epoch 11/35
 - 2s - loss: 0.3980 - acc: 0.8736 - val_loss: 0.4793 - val_acc: 0.8628
Epoch 12/35
 - 2s - loss: 0.3569 - acc: 0.8835 - val_loss: 0.3857 - val_acc: 0.8647
Epoch 13/35
 - 2s - loss: 0.3408 - acc: 0.8871 - val_loss: 0.4287 - val_acc: 0.8577
Epoch 14/35
 - 2s - loss: 0.3523 - acc: 0.8862 - val_loss: 0.4451 - val_acc: 0.8590
Epoch 15/35
 - 2s - loss: 0.3410 - acc: 0.8908 - val_loss: 0.4039 - val_acc: 0.8795
Epoch 16/35
 - 2s - loss: 0.3681 - acc: 0.8830 - val_loss: 0.4105 - val_acc: 0.8590
Epoch 17/35
 - 2s - loss: 0.3326 - acc: 0.8911 - val_loss: 0.4004 - val_acc: 0.8596
Epoch 18/35
 - 2s - loss: 0.3502 - acc: 0.8879 - val_loss: 0.4274 - val_acc: 0.8429
Epoch 19/35
 - 2s - loss: 0.3403 - acc: 0.8881 - val_loss: 0.3823 - val_acc: 0.8609
Epoch 20/35
 - 2s - loss: 0.3332 - acc: 0.8911 - val_loss: 0.3868 - val_acc: 0.8596
Epoch 21/35
```

```
 - 2s - loss: 0.3756 - acc: 0.8862 - val_loss: 0.3719 - val_acc: 0.8724
Epoch 22/35
 - 2s - loss: 0.3579 - acc: 0.8837 - val_loss: 0.4066 - val_acc: 0.8673
Epoch 23/35
 - 2s - loss: 0.3363 - acc: 0.8928 - val_loss: 0.3755 - val_acc: 0.8699
Epoch 24/35
 - 2s - loss: 0.3443 - acc: 0.8812 - val_loss: 0.4512 - val_acc: 0.8295
Epoch 25/35
 - 2s - loss: 0.3777 - acc: 0.8849 - val_loss: 0.4027 - val_acc: 0.8494
Epoch 26/35
 - 2s - loss: 0.3442 - acc: 0.8876 - val_loss: 0.4848 - val_acc: 0.8404
Epoch 27/35
 - 2s - loss: 0.3339 - acc: 0.8940 - val_loss: 0.3780 - val_acc: 0.8737
Epoch 28/35
 - 2s - loss: 0.3419 - acc: 0.8859 - val_loss: 0.4035 - val_acc: 0.8660
Epoch 29/35
 - 2s - loss: 0.3246 - acc: 0.8965 - val_loss: 0.4492 - val_acc: 0.8340
Epoch 30/35
 - 2s - loss: 0.3968 - acc: 0.8771 - val_loss: 0.4436 - val_acc: 0.8660
Epoch 31/35
 - 2s - loss: 0.3378 - acc: 0.8884 - val_loss: 0.3835 - val_acc: 0.8673
Epoch 32/35
 - 2s - loss: 0.3199 - acc: 0.8898 - val_loss: 0.4012 - val_acc: 0.8590
Epoch 33/35
 - 2s - loss: 0.3410 - acc: 0.8921 - val_loss: 0.4443 - val_acc: 0.8737
Epoch 34/35
 - 2s - loss: 0.3391 - acc: 0.8898 - val_loss: 0.4033 - val_acc: 0.8506
Epoch 35/35
 - 2s - loss: 0.3347 - acc: 0.8938 - val_loss: 0.3564 - val_acc: 0.8840
Train accuracy 0.8982050651585936 Test accuracy: 0.8839743589743589
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 120, 24)	3864
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 24)	0
flatten_1 (Flatten)	(None, 576)	0

```
_____
dense_1 (Dense)                 (None, 32)                 18464
_____
dense_2 (Dense)                 (None, 3)                  99
=================================================================
Total params: 23,899
Trainable params: 23,899
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 96.9605 - acc: 0.8603 - val_loss: 44.1102 - val_acc: 0.8776
Epoch 2/25
 - 2s - loss: 23.5065 - acc: 0.8972 - val_loss: 10.4376 - val_acc: 0.8712
Epoch 3/25
 - 2s - loss: 5.3069 - acc: 0.8997 - val_loss: 2.4245 - val_acc: 0.8647
Epoch 4/25
 - 2s - loss: 1.2289 - acc: 0.8894 - val_loss: 0.8433 - val_acc: 0.8551
Epoch 5/25
 - 2s - loss: 0.4823 - acc: 0.8945 - val_loss: 0.5879 - val_acc: 0.8609
Epoch 6/25
 - 2s - loss: 0.3460 - acc: 0.9007 - val_loss: 0.5154 - val_acc: 0.8538
Epoch 7/25
 - 2s - loss: 0.3476 - acc: 0.8921 - val_loss: 0.4774 - val_acc: 0.8821
Epoch 8/25
 - 2s - loss: 0.4090 - acc: 0.8859 - val_loss: 0.5254 - val_acc: 0.8545
Epoch 9/25
 - 2s - loss: 0.3254 - acc: 0.8987 - val_loss: 0.4918 - val_acc: 0.8558
Epoch 10/25
 - 2s - loss: 0.3318 - acc: 0.8925 - val_loss: 0.4649 - val_acc: 0.8776
Epoch 11/25
 - 2s - loss: 0.3300 - acc: 0.8923 - val_loss: 0.5354 - val_acc: 0.8712
Epoch 12/25
 - 2s - loss: 0.3297 - acc: 0.8896 - val_loss: 0.4586 - val_acc: 0.8808
Epoch 13/25
 - 2s - loss: 0.3230 - acc: 0.8948 - val_loss: 0.4854 - val_acc: 0.8615
Epoch 14/25
 - 2s - loss: 0.3037 - acc: 0.8977 - val_loss: 0.4693 - val_acc: 0.8500
Epoch 15/25
 - 2s - loss: 0.3085 - acc: 0.8962 - val_loss: 0.5329 - val_acc: 0.8122
Epoch 16/25
 - 2s - loss: 0.3080 - acc: 0.9004 - val_loss: 0.4325 - val_acc: 0.8667
```

```
Epoch 17/25
 - 2s - loss: 0.3061 - acc: 0.8999 - val_loss: 0.4220 - val_acc: 0.8628
Epoch 18/25
 - 2s - loss: 0.2914 - acc: 0.8975 - val_loss: 0.4093 - val_acc: 0.8782
Epoch 19/25
 - 2s - loss: 0.3017 - acc: 0.8985 - val_loss: 0.4726 - val_acc: 0.8365
Epoch 20/25
 - 2s - loss: 0.3069 - acc: 0.8953 - val_loss: 0.4155 - val_acc: 0.8788
Epoch 21/25
 - 2s - loss: 0.2890 - acc: 0.9083 - val_loss: 0.4151 - val_acc: 0.8763
Epoch 22/25
 - 2s - loss: 0.2849 - acc: 0.9039 - val_loss: 0.4144 - val_acc: 0.8801
Epoch 23/25
 - 2s - loss: 0.3571 - acc: 0.8793 - val_loss: 0.4062 - val_acc: 0.8756
Epoch 24/25
 - 2s - loss: 0.2914 - acc: 0.8953 - val_loss: 0.4044 - val_acc: 0.8782
Epoch 25/25
 - 2s - loss: 0.2989 - acc: 0.8935 - val_loss: 0.4068 - val_acc: 0.8724
Train accuracy 0.8996803540693386 Test accuracy: 0.8724358974358974
----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 28)	784
conv1d_2 (Conv1D)	(None, 124, 16)	1360
dropout_1 (Dropout)	(None, 124, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 41, 16)	0
flatten_1 (Flatten)	(None, 656)	0
dense_1 (Dense)	(None, 64)	42048
dense_2 (Dense)	(None, 3)	195

```
Total params: 44,387
Trainable params: 44,387
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
```

```
Epoch 1/25
 - 2s - loss: 39.6450 - acc: 0.8488 - val_loss: 1.7554 - val_acc: 0.8455
Epoch 2/25
 - 2s - loss: 0.5191 - acc: 0.8741 - val_loss: 0.4689 - val_acc: 0.8635
Epoch 3/25
 - 2s - loss: 0.3547 - acc: 0.8822 - val_loss: 0.4486 - val_acc: 0.8365
Epoch 4/25
 - 2s - loss: 0.3319 - acc: 0.8849 - val_loss: 0.4397 - val_acc: 0.8532
Epoch 5/25
 - 2s - loss: 0.3319 - acc: 0.8876 - val_loss: 0.3727 - val_acc: 0.8769
Epoch 6/25
 - 2s - loss: 0.3347 - acc: 0.8847 - val_loss: 0.4408 - val_acc: 0.8224
Epoch 7/25
 - 2s - loss: 0.3234 - acc: 0.8869 - val_loss: 0.3747 - val_acc: 0.8635
Epoch 8/25
 - 2s - loss: 0.3283 - acc: 0.8891 - val_loss: 0.4439 - val_acc: 0.8327
Epoch 9/25
 - 2s - loss: 0.3320 - acc: 0.8876 - val_loss: 0.3903 - val_acc: 0.8750
Epoch 10/25
 - 2s - loss: 0.3321 - acc: 0.8795 - val_loss: 0.3975 - val_acc: 0.8667
Epoch 11/25
 - 2s - loss: 0.3207 - acc: 0.8906 - val_loss: 0.5501 - val_acc: 0.6981
Epoch 12/25
 - 2s - loss: 0.3241 - acc: 0.8844 - val_loss: 0.3841 - val_acc: 0.8673
Epoch 13/25
 - 2s - loss: 0.3204 - acc: 0.8862 - val_loss: 0.3810 - val_acc: 0.8603
Epoch 14/25
 - 2s - loss: 0.3107 - acc: 0.8889 - val_loss: 0.4732 - val_acc: 0.7513
Epoch 15/25
 - 2s - loss: 0.3162 - acc: 0.8918 - val_loss: 0.3644 - val_acc: 0.8763
Epoch 16/25
 - 2s - loss: 0.3065 - acc: 0.8916 - val_loss: 0.3972 - val_acc: 0.8731
Epoch 17/25
 - 2s - loss: 0.3073 - acc: 0.8876 - val_loss: 0.4707 - val_acc: 0.8571
Epoch 18/25
 - 2s - loss: 0.3132 - acc: 0.8913 - val_loss: 0.4235 - val_acc: 0.8622
Epoch 19/25
 - 2s - loss: 0.3105 - acc: 0.8903 - val_loss: 0.3848 - val_acc: 0.8737
Epoch 20/25
 - 2s - loss: 0.3010 - acc: 0.8889 - val_loss: 0.5121 - val_acc: 0.8449
Epoch 21/25
 - 2s - loss: 0.2979 - acc: 0.8923 - val_loss: 0.4287 - val_acc: 0.8558
Epoch 22/25
```

```
 - 2s - loss: 0.3039 - acc: 0.8987 - val_loss: 0.4496 - val_acc: 0.7346
Epoch 23/25
 - 2s - loss: 0.3044 - acc: 0.8864 - val_loss: 0.4049 - val_acc: 0.8635
Epoch 24/25
 - 2s - loss: 0.3064 - acc: 0.8901 - val_loss: 0.4089 - val_acc: 0.8417
Epoch 25/25
 - 2s - loss: 0.3041 - acc: 0.8921 - val_loss: 0.4358 - val_acc: 0.7827
Train accuracy 0.7814113597246127 Test accuracy: 0.7826923076923077
-------------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)            (None, 122, 28)           1792

conv1d_2 (Conv1D)            (None, 120, 24)           2040

dropout_1 (Dropout)          (None, 120, 24)           0

max_pooling1d_1 (MaxPooling1 (None, 24, 24)            0

flatten_1 (Flatten)          (None, 576)               0

dense_1 (Dense)              (None, 16)                9232

dense_2 (Dense)              (None, 3)                 51
===============================================================
Total params: 13,115
Trainable params: 13,115
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 1s - loss: 23.9156 - acc: 0.8291 - val_loss: 3.8605 - val_acc: 0.8186
Epoch 2/35
 - 1s - loss: 1.1680 - acc: 0.8665 - val_loss: 0.6067 - val_acc: 0.8506
Epoch 3/35
 - 1s - loss: 0.4252 - acc: 0.8758 - val_loss: 0.5267 - val_acc: 0.7923
Epoch 4/35
 - 1s - loss: 0.3600 - acc: 0.8881 - val_loss: 0.5056 - val_acc: 0.8147
Epoch 5/35
 - 1s - loss: 0.3511 - acc: 0.8835 - val_loss: 0.4290 - val_acc: 0.8603
Epoch 6/35
```

```
                - 1s - loss: 0.3290 - acc: 0.8916 - val_loss: 0.4222 - val_acc: 0.8551
        Epoch 7/35
                - 1s - loss: 0.3379 - acc: 0.8837 - val_loss: 0.3947 - val_acc: 0.8865
        Epoch 8/35
                - 1s - loss: 0.3325 - acc: 0.8935 - val_loss: 0.4351 - val_acc: 0.8494
        Epoch 9/35
                - 1s - loss: 0.3265 - acc: 0.8938 - val_loss: 0.4048 - val_acc: 0.8731
        Epoch 10/35
                - 1s - loss: 0.3162 - acc: 0.8943 - val_loss: 0.4260 - val_acc: 0.8679
        Epoch 11/35
                - 1s - loss: 0.3305 - acc: 0.8884 - val_loss: 0.4208 - val_acc: 0.8628
        Epoch 12/35
                - 1s - loss: 0.3184 - acc: 0.8972 - val_loss: 0.4141 - val_acc: 0.8801
        Epoch 13/35
                - 1s - loss: 0.3204 - acc: 0.8975 - val_loss: 0.4283 - val_acc: 0.8654
        Epoch 14/35
                - 1s - loss: 0.3052 - acc: 0.8987 - val_loss: 0.4516 - val_acc: 0.8506
        Epoch 15/35
                - 1s - loss: 0.3164 - acc: 0.8869 - val_loss: 0.4020 - val_acc: 0.8763
        Epoch 16/35
                - 1s - loss: 0.3203 - acc: 0.8953 - val_loss: 0.4029 - val_acc: 0.8673
        Epoch 17/35
                - 1s - loss: 0.3039 - acc: 0.8992 - val_loss: 0.3738 - val_acc: 0.8795
        Epoch 18/35
                - 1s - loss: 0.3145 - acc: 0.8967 - val_loss: 0.4002 - val_acc: 0.8859
        Epoch 19/35
                - 1s - loss: 0.3221 - acc: 0.8916 - val_loss: 0.3862 - val_acc: 0.8885
        Epoch 20/35
                - 1s - loss: 0.3100 - acc: 0.8965 - val_loss: 0.3804 - val_acc: 0.8994
        Epoch 21/35
                - 1s - loss: 0.2972 - acc: 0.9046 - val_loss: 0.3806 - val_acc: 0.8821
        Epoch 22/35
                - 1s - loss: 0.3132 - acc: 0.8960 - val_loss: 0.4109 - val_acc: 0.8596
        Epoch 23/35
                - 1s - loss: 0.3217 - acc: 0.8923 - val_loss: 0.4111 - val_acc: 0.8622
        Epoch 24/35
                - 1s - loss: 0.2969 - acc: 0.9009 - val_loss: 0.4113 - val_acc: 0.8487
        Epoch 25/35
                - 1s - loss: 0.3070 - acc: 0.8970 - val_loss: 0.4513 - val_acc: 0.8513
        Epoch 26/35
                - 1s - loss: 0.3163 - acc: 0.9002 - val_loss: 0.3926 - val_acc: 0.8795
        Epoch 27/35
                - 1s - loss: 0.2942 - acc: 0.9016 - val_loss: 0.4021 - val_acc: 0.8686
```

```
Epoch 28/35
 - 1s - loss: 0.3070 - acc: 0.8980 - val_loss: 0.4131 - val_acc: 0.8827
Epoch 29/35
 - 1s - loss: 0.3073 - acc: 0.9029 - val_loss: 0.3971 - val_acc: 0.8776
Epoch 30/35
 - 1s - loss: 0.3138 - acc: 0.8923 - val_loss: 0.3743 - val_acc: 0.8840
Epoch 31/35
 - 1s - loss: 0.3083 - acc: 0.8948 - val_loss: 0.3860 - val_acc: 0.8782
Epoch 32/35
 - 1s - loss: 0.2965 - acc: 0.8972 - val_loss: 0.3546 - val_acc: 0.8840
Epoch 33/35
 - 1s - loss: 0.3042 - acc: 0.9021 - val_loss: 0.4022 - val_acc: 0.8429
Epoch 34/35
 - 1s - loss: 0.2954 - acc: 0.9044 - val_loss: 0.4514 - val_acc: 0.8622
Epoch 35/35
 - 1s - loss: 0.3067 - acc: 0.9004 - val_loss: 0.3845 - val_acc: 0.8673
Train accuracy 0.9048438652569462 Test accuracy: 0.8673076923076923
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 118, 32)	4512
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 32)	0
flatten_1 (Flatten)	(None, 1888)	0
dense_1 (Dense)	(None, 32)	60448
dense_2 (Dense)	(None, 3)	99

```
Total params: 66,851
Trainable params: 66,851
Non-trainable params: 0

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 16.0176 - acc: 0.8249 - val_loss: 0.7809 - val_acc: 0.8141
```

```
Epoch 2/25
 - 1s - loss: 0.4720 - acc: 0.8758 - val_loss: 0.4422 - val_acc: 0.8615
Epoch 3/25
 - 2s - loss: 0.3647 - acc: 0.8891 - val_loss: 0.4111 - val_acc: 0.8641
Epoch 4/25
 - 1s - loss: 0.3533 - acc: 0.8938 - val_loss: 0.3677 - val_acc: 0.8756
Epoch 5/25
 - 1s - loss: 0.3401 - acc: 0.8943 - val_loss: 0.3692 - val_acc: 0.8750
Epoch 6/25
 - 1s - loss: 0.3359 - acc: 0.9002 - val_loss: 0.5727 - val_acc: 0.8224
Epoch 7/25
 - 2s - loss: 0.3265 - acc: 0.8989 - val_loss: 0.4125 - val_acc: 0.8628
Epoch 8/25
 - 2s - loss: 0.3303 - acc: 0.8977 - val_loss: 0.4286 - val_acc: 0.8596
Epoch 9/25
 - 1s - loss: 0.3141 - acc: 0.9044 - val_loss: 0.3662 - val_acc: 0.8744
Epoch 10/25
 - 1s - loss: 0.3268 - acc: 0.9019 - val_loss: 0.3558 - val_acc: 0.8795
Epoch 11/25
 - 1s - loss: 0.3288 - acc: 0.9002 - val_loss: 0.6492 - val_acc: 0.7333
Epoch 12/25
 - 1s - loss: 0.3296 - acc: 0.8997 - val_loss: 0.4738 - val_acc: 0.8327
Epoch 13/25
 - 1s - loss: 0.3307 - acc: 0.8923 - val_loss: 0.4284 - val_acc: 0.8410
Epoch 14/25
 - 1s - loss: 0.3202 - acc: 0.8960 - val_loss: 0.5643 - val_acc: 0.7314
Epoch 15/25
 - 1s - loss: 0.3228 - acc: 0.9019 - val_loss: 0.3655 - val_acc: 0.8788
Epoch 16/25
 - 1s - loss: 0.3093 - acc: 0.9085 - val_loss: 0.3907 - val_acc: 0.8744
Epoch 17/25
 - 1s - loss: 0.3215 - acc: 0.8948 - val_loss: 0.3702 - val_acc: 0.8756
Epoch 18/25
 - 1s - loss: 0.3045 - acc: 0.9041 - val_loss: 0.5465 - val_acc: 0.7372
Epoch 19/25
 - 1s - loss: 0.3056 - acc: 0.9002 - val_loss: 0.3581 - val_acc: 0.8776
Epoch 20/25
 - 1s - loss: 0.3108 - acc: 0.9090 - val_loss: 0.3644 - val_acc: 0.8712
Epoch 21/25
 - 1s - loss: 0.3172 - acc: 0.9039 - val_loss: 0.4481 - val_acc: 0.8641
Epoch 22/25
 - 1s - loss: 0.3293 - acc: 0.8994 - val_loss: 0.4676 - val_acc: 0.8135
Epoch 23/25
```

```
  - 1s - loss: 0.3113 - acc: 0.9026 - val_loss: 0.3363 - val_acc: 0.8776
Epoch 24/25
  - 1s - loss: 0.3100 - acc: 0.9009 - val_loss: 0.3531 - val_acc: 0.8885
Epoch 25/25
  - 2s - loss: 0.3045 - acc: 0.8980 - val_loss: 0.3790 - val_acc: 0.8641
Train accuracy 0.9080403245635603 Test accuracy: 0.8641025641025641
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 28)	784
conv1d_2 (Conv1D)	(None, 120, 32)	6304
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 32)	0
flatten_1 (Flatten)	(None, 1920)	0
dense_1 (Dense)	(None, 32)	61472
dense_2 (Dense)	(None, 3)	99

```
=================================================================
Total params: 68,659
Trainable params: 68,659
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
  - 2s - loss: 86.3377 - acc: 0.8168 - val_loss: 44.0305 - val_acc: 0.8660
Epoch 2/35
  - 1s - loss: 27.0937 - acc: 0.9024 - val_loss: 15.7847 - val_acc: 0.8891
Epoch 3/35
  - 1s - loss: 10.8588 - acc: 0.9026 - val_loss: 7.4043 - val_acc: 0.8763
Epoch 4/35
  - 1s - loss: 5.4188 - acc: 0.9051 - val_loss: 3.9739 - val_acc: 0.8788
Epoch 5/35
  - 1s - loss: 2.9383 - acc: 0.8992 - val_loss: 2.1930 - val_acc: 0.8878
Epoch 6/35
  - 1s - loss: 1.6034 - acc: 0.9107 - val_loss: 1.2794 - val_acc: 0.8712
Epoch 7/35
```

```
         - 1s - loss: 0.9471 - acc: 0.8994 - val_loss: 0.8565 - val_acc: 0.8558
Epoch 8/35
         - 1s - loss: 0.6268 - acc: 0.8938 - val_loss: 0.5847 - val_acc: 0.8865
Epoch 9/35
         - 1s - loss: 0.4310 - acc: 0.9083 - val_loss: 0.4934 - val_acc: 0.8558
Epoch 10/35
         - 1s - loss: 0.3590 - acc: 0.9031 - val_loss: 0.4320 - val_acc: 0.8635
Epoch 11/35
         - 1s - loss: 0.3276 - acc: 0.8972 - val_loss: 0.3907 - val_acc: 0.8859
Epoch 12/35
         - 1s - loss: 0.2996 - acc: 0.8985 - val_loss: 0.3847 - val_acc: 0.8788
Epoch 13/35
         - 1s - loss: 0.2978 - acc: 0.9034 - val_loss: 0.3639 - val_acc: 0.8859
Epoch 14/35
         - 1s - loss: 0.3013 - acc: 0.8955 - val_loss: 0.3825 - val_acc: 0.8744
Epoch 15/35
         - 1s - loss: 0.2962 - acc: 0.9036 - val_loss: 0.3716 - val_acc: 0.8821
Epoch 16/35
         - 1s - loss: 0.2872 - acc: 0.9078 - val_loss: 0.4039 - val_acc: 0.8365
Epoch 17/35
         - 1s - loss: 0.2907 - acc: 0.9009 - val_loss: 0.3589 - val_acc: 0.8731
Epoch 18/35
         - 1s - loss: 0.2962 - acc: 0.9021 - val_loss: 0.3527 - val_acc: 0.8827
Epoch 19/35
         - 1s - loss: 0.2813 - acc: 0.9007 - val_loss: 0.3443 - val_acc: 0.8885
Epoch 20/35
         - 1s - loss: 0.2724 - acc: 0.9095 - val_loss: 0.3571 - val_acc: 0.8801
Epoch 21/35
         - 1s - loss: 0.2761 - acc: 0.9083 - val_loss: 0.3620 - val_acc: 0.8667
Epoch 22/35
         - 1s - loss: 0.2889 - acc: 0.8992 - val_loss: 0.3343 - val_acc: 0.8801
Epoch 23/35
         - 1s - loss: 0.2766 - acc: 0.9039 - val_loss: 0.3460 - val_acc: 0.8788
Epoch 24/35
         - 1s - loss: 0.2737 - acc: 0.9053 - val_loss: 0.3255 - val_acc: 0.8897
Epoch 25/35
         - 1s - loss: 0.2640 - acc: 0.9056 - val_loss: 0.3261 - val_acc: 0.8795
Epoch 26/35
         - 1s - loss: 0.2682 - acc: 0.9026 - val_loss: 0.3226 - val_acc: 0.8872
Epoch 27/35
         - 1s - loss: 0.2683 - acc: 0.9044 - val_loss: 0.3427 - val_acc: 0.8833
Epoch 28/35
         - 1s - loss: 0.2812 - acc: 0.8999 - val_loss: 0.3541 - val_acc: 0.8718
```

```
Epoch 29/35
 - 1s - loss: 0.2761 - acc: 0.9073 - val_loss: 0.3367 - val_acc: 0.8763
Epoch 30/35
 - 1s - loss: 0.2676 - acc: 0.9016 - val_loss: 0.3325 - val_acc: 0.8859
Epoch 31/35
 - 1s - loss: 0.2525 - acc: 0.9093 - val_loss: 0.3221 - val_acc: 0.8846
Epoch 32/35
 - 1s - loss: 0.2583 - acc: 0.9075 - val_loss: 0.3200 - val_acc: 0.8910
Epoch 33/35
 - 1s - loss: 0.2627 - acc: 0.9073 - val_loss: 0.3138 - val_acc: 0.8878
Epoch 34/35
 - 1s - loss: 0.2744 - acc: 0.9053 - val_loss: 0.3702 - val_acc: 0.8647
Epoch 35/35
 - 1s - loss: 0.2573 - acc: 0.9127 - val_loss: 0.3277 - val_acc: 0.8885
Train accuracy 0.906073272682567 Test accuracy: 0.8884615384615384
----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 118, 24)	7080
dropout_1 (Dropout)	(None, 118, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 24)	0
flatten_1 (Flatten)	(None, 936)	0
dense_1 (Dense)	(None, 16)	14992
dense_2 (Dense)	(None, 3)	51

```
Total params: 24,055
Trainable params: 24,055
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 76.2702 - acc: 0.8353 - val_loss: 25.1869 - val_acc: 0.8821
Epoch 2/25
 - 1s - loss: 11.1232 - acc: 0.8938 - val_loss: 3.5524 - val_acc: 0.8731
```

```
Epoch 3/25
 - 1s - loss: 1.5264 - acc: 0.9004 - val_loss: 0.7478 - val_acc: 0.8571
Epoch 4/25
 - 1s - loss: 0.4610 - acc: 0.8876 - val_loss: 0.5229 - val_acc: 0.8359
Epoch 5/25
 - 1s - loss: 0.3451 - acc: 0.8933 - val_loss: 0.5281 - val_acc: 0.8487
Epoch 6/25
 - 1s - loss: 0.3233 - acc: 0.8992 - val_loss: 0.4392 - val_acc: 0.8788
Epoch 7/25
 - 1s - loss: 0.3491 - acc: 0.8908 - val_loss: 0.4258 - val_acc: 0.8673
Epoch 8/25
 - 1s - loss: 0.3435 - acc: 0.8938 - val_loss: 0.4569 - val_acc: 0.8667
Epoch 9/25
 - 1s - loss: 0.3111 - acc: 0.9024 - val_loss: 0.4586 - val_acc: 0.8558
Epoch 10/25
 - 1s - loss: 0.3085 - acc: 0.8999 - val_loss: 0.4345 - val_acc: 0.8635
Epoch 11/25
 - 1s - loss: 0.3390 - acc: 0.8881 - val_loss: 0.4639 - val_acc: 0.8712
Epoch 12/25
 - 1s - loss: 0.3388 - acc: 0.8916 - val_loss: 0.4224 - val_acc: 0.8583
Epoch 13/25
 - 1s - loss: 0.3059 - acc: 0.8987 - val_loss: 0.4016 - val_acc: 0.8769
Epoch 14/25
 - 1s - loss: 0.3137 - acc: 0.8985 - val_loss: 0.4283 - val_acc: 0.8622
Epoch 15/25
 - 1s - loss: 0.3042 - acc: 0.8948 - val_loss: 0.4284 - val_acc: 0.8686
Epoch 16/25
 - 1s - loss: 0.3252 - acc: 0.8908 - val_loss: 0.4174 - val_acc: 0.8654
Epoch 17/25
 - 1s - loss: 0.3023 - acc: 0.8982 - val_loss: 0.4539 - val_acc: 0.8571
Epoch 18/25
 - 1s - loss: 0.3046 - acc: 0.8972 - val_loss: 0.4322 - val_acc: 0.8494
Epoch 19/25
 - 1s - loss: 0.2990 - acc: 0.8992 - val_loss: 0.4050 - val_acc: 0.8667
Epoch 20/25
 - 1s - loss: 0.4272 - acc: 0.8886 - val_loss: 0.4348 - val_acc: 0.8596
Epoch 21/25
 - 1s - loss: 0.2832 - acc: 0.9071 - val_loss: 0.4148 - val_acc: 0.8641
Epoch 22/25
 - 1s - loss: 0.2867 - acc: 0.8994 - val_loss: 0.3897 - val_acc: 0.8635
Epoch 23/25
 - 1s - loss: 0.2933 - acc: 0.8957 - val_loss: 0.3932 - val_acc: 0.8699
Epoch 24/25
```

```
 - 1s - loss: 0.2849 - acc: 0.8962 - val_loss: 0.3948 - val_acc: 0.8712
Epoch 25/25
 - 1s - loss: 0.2988 - acc: 0.8989 - val_loss: 0.4211 - val_acc: 0.8571
Train accuracy 0.8952544873371036 Test accuracy: 0.857051282051282
------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 16)	1552
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 16)	0
flatten_1 (Flatten)	(None, 640)	0
dense_1 (Dense)	(None, 64)	41024
dense_2 (Dense)	(None, 3)	195

```
Total params: 44,243
Trainable params: 44,243
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 25.6302 - acc: 0.7937 - val_loss: 18.6629 - val_acc: 0.8628
Epoch 2/30
 - 1s - loss: 13.9066 - acc: 0.8906 - val_loss: 9.8837 - val_acc: 0.8596
Epoch 3/30
 - 1s - loss: 6.9876 - acc: 0.9034 - val_loss: 4.7720 - val_acc: 0.8558
Epoch 4/30
 - 1s - loss: 3.2449 - acc: 0.9134 - val_loss: 2.2974 - val_acc: 0.8455
Epoch 5/30
 - 1s - loss: 1.5296 - acc: 0.9115 - val_loss: 1.1637 - val_acc: 0.8724
Epoch 6/30
 - 1s - loss: 0.7631 - acc: 0.9095 - val_loss: 0.6714 - val_acc: 0.8577
Epoch 7/30
 - 1s - loss: 0.4716 - acc: 0.9112 - val_loss: 0.5300 - val_acc: 0.8718
Epoch 8/30
```

```
          - 1s - loss: 0.3585 - acc: 0.9166 - val_loss: 0.4886 - val_acc: 0.8237
Epoch 9/30
          - 1s - loss: 0.3228 - acc: 0.9132 - val_loss: 0.4153 - val_acc: 0.8494
Epoch 10/30
          - 1s - loss: 0.2976 - acc: 0.9107 - val_loss: 0.3792 - val_acc: 0.8641
Epoch 11/30
          - 1s - loss: 0.2760 - acc: 0.9137 - val_loss: 0.3542 - val_acc: 0.8679
Epoch 12/30
          - 1s - loss: 0.2679 - acc: 0.9130 - val_loss: 0.3626 - val_acc: 0.8756
Epoch 13/30
          - 1s - loss: 0.2593 - acc: 0.9147 - val_loss: 0.3330 - val_acc: 0.8795
Epoch 14/30
          - 1s - loss: 0.2492 - acc: 0.9191 - val_loss: 0.3726 - val_acc: 0.8782
Epoch 15/30
          - 1s - loss: 0.2504 - acc: 0.9171 - val_loss: 0.3283 - val_acc: 0.8833
Epoch 16/30
          - 1s - loss: 0.2389 - acc: 0.9184 - val_loss: 0.3301 - val_acc: 0.8782
Epoch 17/30
          - 1s - loss: 0.2367 - acc: 0.9179 - val_loss: 0.3467 - val_acc: 0.8679
Epoch 18/30
          - 1s - loss: 0.2352 - acc: 0.9201 - val_loss: 0.3066 - val_acc: 0.8801
Epoch 19/30
          - 1s - loss: 0.2336 - acc: 0.9164 - val_loss: 0.3047 - val_acc: 0.9013
Epoch 20/30
          - 1s - loss: 0.2273 - acc: 0.9228 - val_loss: 0.3292 - val_acc: 0.8782
Epoch 21/30
          - 1s - loss: 0.2213 - acc: 0.9253 - val_loss: 0.3360 - val_acc: 0.8673
Epoch 22/30
          - 1s - loss: 0.2222 - acc: 0.9211 - val_loss: 0.3458 - val_acc: 0.8872
Epoch 23/30
          - 1s - loss: 0.2229 - acc: 0.9223 - val_loss: 0.3284 - val_acc: 0.8987
Epoch 24/30
          - 1s - loss: 0.2226 - acc: 0.9243 - val_loss: 0.2973 - val_acc: 0.9019
Epoch 25/30
          - 1s - loss: 0.2188 - acc: 0.9243 - val_loss: 0.3558 - val_acc: 0.8750
Epoch 26/30
          - 1s - loss: 0.2164 - acc: 0.9211 - val_loss: 0.3237 - val_acc: 0.8987
Epoch 27/30
          - 1s - loss: 0.2121 - acc: 0.9262 - val_loss: 0.2964 - val_acc: 0.9019
Epoch 28/30
          - 1s - loss: 0.2118 - acc: 0.9309 - val_loss: 0.3226 - val_acc: 0.8987
Epoch 29/30
          - 1s - loss: 0.2134 - acc: 0.9275 - val_loss: 0.2957 - val_acc: 0.8962
```

```
Epoch 30/30
 - 1s - loss: 0.2082 - acc: 0.9297 - val_loss: 0.2846 - val_acc: 0.9096
Train accuracy 0.9092697319891813 Test accuracy: 0.9096153846153846
-----------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
_____
conv1d_2 (Conv1D)            (None, 122, 16)           1552
_____
dropout_1 (Dropout)          (None, 122, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0
_____
flatten_1 (Flatten)          (None, 976)               0
_____
dense_1 (Dense)              (None, 64)                62528
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 26.9325 - acc: 0.7986 - val_loss: 20.5459 - val_acc: 0.8654
Epoch 2/30
 - 1s - loss: 15.9832 - acc: 0.8896 - val_loss: 12.0087 - val_acc: 0.8724
Epoch 3/30
 - 1s - loss: 8.9774 - acc: 0.9075 - val_loss: 6.5144 - val_acc: 0.8686
Epoch 4/30
 - 1s - loss: 4.7182 - acc: 0.9157 - val_loss: 3.4371 - val_acc: 0.8519
Epoch 5/30
 - 1s - loss: 2.4324 - acc: 0.9098 - val_loss: 1.8308 - val_acc: 0.8724
Epoch 6/30
 - 1s - loss: 1.2698 - acc: 0.9139 - val_loss: 1.0284 - val_acc: 0.8660
Epoch 7/30
 - 1s - loss: 0.7299 - acc: 0.9137 - val_loss: 0.6770 - val_acc: 0.8692
Epoch 8/30
 - 1s - loss: 0.4692 - acc: 0.9171 - val_loss: 0.5751 - val_acc: 0.8250
```

```
Epoch 9/30
 - 1s - loss: 0.3765 - acc: 0.9132 - val_loss: 0.4409 - val_acc: 0.8545
Epoch 10/30
 - 1s - loss: 0.3309 - acc: 0.9134 - val_loss: 0.4002 - val_acc: 0.8679
Epoch 11/30
 - 1s - loss: 0.3022 - acc: 0.9103 - val_loss: 0.3713 - val_acc: 0.8635
Epoch 12/30
 - 1s - loss: 0.2864 - acc: 0.9132 - val_loss: 0.3842 - val_acc: 0.8769
Epoch 13/30
 - 1s - loss: 0.2743 - acc: 0.9125 - val_loss: 0.3538 - val_acc: 0.8724
Epoch 14/30
 - 1s - loss: 0.2603 - acc: 0.9203 - val_loss: 0.3699 - val_acc: 0.8827
Epoch 15/30
 - 1s - loss: 0.2608 - acc: 0.9176 - val_loss: 0.3417 - val_acc: 0.8827
Epoch 16/30
 - 1s - loss: 0.2490 - acc: 0.9164 - val_loss: 0.3383 - val_acc: 0.8712
Epoch 17/30
 - 1s - loss: 0.2449 - acc: 0.9206 - val_loss: 0.3435 - val_acc: 0.8705
Epoch 18/30
 - 1s - loss: 0.2418 - acc: 0.9208 - val_loss: 0.3078 - val_acc: 0.8821
Epoch 19/30
 - 1s - loss: 0.2417 - acc: 0.9176 - val_loss: 0.3162 - val_acc: 0.8942
Epoch 20/30
 - 1s - loss: 0.2359 - acc: 0.9235 - val_loss: 0.3239 - val_acc: 0.8776
Epoch 21/30
 - 1s - loss: 0.2297 - acc: 0.9235 - val_loss: 0.3464 - val_acc: 0.8615
Epoch 22/30
 - 1s - loss: 0.2261 - acc: 0.9225 - val_loss: 0.3048 - val_acc: 0.9000
Epoch 23/30
 - 1s - loss: 0.2260 - acc: 0.9262 - val_loss: 0.3162 - val_acc: 0.8853
Epoch 24/30
 - 1s - loss: 0.2275 - acc: 0.9235 - val_loss: 0.3175 - val_acc: 0.8981
Epoch 25/30
 - 1s - loss: 0.2227 - acc: 0.9240 - val_loss: 0.3650 - val_acc: 0.8705
Epoch 26/30
 - 1s - loss: 0.2217 - acc: 0.9216 - val_loss: 0.3231 - val_acc: 0.9026
Epoch 27/30
 - 1s - loss: 0.2160 - acc: 0.9248 - val_loss: 0.2907 - val_acc: 0.8917
Epoch 28/30
 - 1s - loss: 0.2146 - acc: 0.9309 - val_loss: 0.3170 - val_acc: 0.9026
Epoch 29/30
 - 1s - loss: 0.2160 - acc: 0.9302 - val_loss: 0.2847 - val_acc: 0.9006
Epoch 30/30
```

```
 - 1s - loss: 0.2108 - acc: 0.9284 - val_loss: 0.2914 - val_acc: 0.9109
Train accuracy 0.9146791246619129 Test accuracy: 0.9108974358974359
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 16)	1552
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 64)	62528
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 10.6708 - acc: 0.8375 - val_loss: 3.0306 - val_acc: 0.8936
Epoch 2/30
 - 1s - loss: 1.3031 - acc: 0.8940 - val_loss: 0.8003 - val_acc: 0.8692
Epoch 3/30
 - 1s - loss: 0.4745 - acc: 0.9021 - val_loss: 0.4832 - val_acc: 0.8654
Epoch 4/30
 - 1s - loss: 0.3943 - acc: 0.9071 - val_loss: 0.4872 - val_acc: 0.8372
Epoch 5/30
 - 1s - loss: 0.3386 - acc: 0.9117 - val_loss: 0.6474 - val_acc: 0.8481
Epoch 6/30
 - 1s - loss: 0.3360 - acc: 0.9120 - val_loss: 0.3573 - val_acc: 0.8840
Epoch 7/30
 - 1s - loss: 0.2948 - acc: 0.9218 - val_loss: 0.4944 - val_acc: 0.8590
Epoch 8/30
 - 1s - loss: 0.2882 - acc: 0.9257 - val_loss: 0.8616 - val_acc: 0.8109
Epoch 9/30
```

```
        - 1s - loss: 0.2941 - acc: 0.9221 - val_loss: 0.3259 - val_acc: 0.8859
Epoch 10/30
        - 1s - loss: 0.2511 - acc: 0.9304 - val_loss: 0.3186 - val_acc: 0.9058
Epoch 11/30
        - 1s - loss: 0.3248 - acc: 0.9260 - val_loss: 0.3478 - val_acc: 0.8846
Epoch 12/30
        - 1s - loss: 0.2423 - acc: 0.9260 - val_loss: 0.2804 - val_acc: 0.9212
Epoch 13/30
        - 1s - loss: 0.2329 - acc: 0.9341 - val_loss: 0.3019 - val_acc: 0.8904
Epoch 14/30
        - 1s - loss: 0.2314 - acc: 0.9388 - val_loss: 0.2531 - val_acc: 0.9314
Epoch 15/30
        - 1s - loss: 0.2395 - acc: 0.9339 - val_loss: 0.2778 - val_acc: 0.8981
Epoch 16/30
        - 1s - loss: 0.1990 - acc: 0.9434 - val_loss: 0.3221 - val_acc: 0.8872
Epoch 17/30
        - 1s - loss: 0.2038 - acc: 0.9437 - val_loss: 0.2670 - val_acc: 0.9000
Epoch 18/30
        - 1s - loss: 0.2313 - acc: 0.9378 - val_loss: 0.2377 - val_acc: 0.9115
Epoch 19/30
        - 1s - loss: 0.2157 - acc: 0.9366 - val_loss: 0.2415 - val_acc: 0.9192
Epoch 20/30
        - 1s - loss: 0.1927 - acc: 0.9479 - val_loss: 0.2540 - val_acc: 0.9019
Epoch 21/30
        - 1s - loss: 0.1921 - acc: 0.9442 - val_loss: 0.3710 - val_acc: 0.8827
Epoch 22/30
        - 1s - loss: 0.1744 - acc: 0.9503 - val_loss: 0.2931 - val_acc: 0.9103
Epoch 23/30
        - 1s - loss: 0.2202 - acc: 0.9405 - val_loss: 0.2419 - val_acc: 0.9103
Epoch 24/30
        - 1s - loss: 0.1932 - acc: 0.9442 - val_loss: 0.2433 - val_acc: 0.9096
Epoch 25/30
        - 1s - loss: 0.1796 - acc: 0.9481 - val_loss: 0.2784 - val_acc: 0.9013
Epoch 26/30
        - 1s - loss: 0.1815 - acc: 0.9466 - val_loss: 0.2110 - val_acc: 0.9481
Epoch 27/30
        - 1s - loss: 0.2025 - acc: 0.9471 - val_loss: 0.2576 - val_acc: 0.9077
Epoch 28/30
        - 1s - loss: 0.1613 - acc: 0.9548 - val_loss: 0.2180 - val_acc: 0.9333
Epoch 29/30
        - 1s - loss: 0.1916 - acc: 0.9548 - val_loss: 0.2340 - val_acc: 0.9256
Epoch 30/30
        - 1s - loss: 0.1729 - acc: 0.9560 - val_loss: 0.2294 - val_acc: 0.9385
```

```
Train accuracy 0.9586919104991394 Test accuracy: 0.9384615384615385
----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
_____
conv1d_2 (Conv1D)            (None, 122, 16)           1552
_____
dropout_1 (Dropout)          (None, 122, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0
_____
flatten_1 (Flatten)          (None, 976)               0
_____
dense_1 (Dense)              (None, 64)                62528
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 15.4856 - acc: 0.8316 - val_loss: 4.1580 - val_acc: 0.8814
Epoch 2/30
 - 1s - loss: 1.7032 - acc: 0.8930 - val_loss: 0.7813 - val_acc: 0.8846
Epoch 3/30
 - 1s - loss: 0.6480 - acc: 0.8908 - val_loss: 0.6089 - val_acc: 0.8628
Epoch 4/30
 - 1s - loss: 0.4856 - acc: 0.9073 - val_loss: 0.5497 - val_acc: 0.8436
Epoch 5/30
 - 1s - loss: 0.3912 - acc: 0.9098 - val_loss: 0.5123 - val_acc: 0.8391
Epoch 6/30
 - 1s - loss: 0.3610 - acc: 0.9122 - val_loss: 0.3813 - val_acc: 0.8846
Epoch 7/30
 - 1s - loss: 0.3283 - acc: 0.9144 - val_loss: 0.4082 - val_acc: 0.8654
Epoch 8/30
 - 1s - loss: 0.2958 - acc: 0.9206 - val_loss: 0.3969 - val_acc: 0.8679
Epoch 9/30
 - 1s - loss: 0.2882 - acc: 0.9159 - val_loss: 0.3565 - val_acc: 0.8699
```

```
Epoch 10/30
 - 1s - loss: 0.2762 - acc: 0.9176 - val_loss: 0.3432 - val_acc: 0.8840
Epoch 11/30
 - 1s - loss: 0.2701 - acc: 0.9176 - val_loss: 0.3623 - val_acc: 0.8936
Epoch 12/30
 - 1s - loss: 0.2543 - acc: 0.9233 - val_loss: 0.3398 - val_acc: 0.8891
Epoch 13/30
 - 1s - loss: 0.2592 - acc: 0.9196 - val_loss: 0.3358 - val_acc: 0.8808
Epoch 14/30
 - 1s - loss: 0.2605 - acc: 0.9233 - val_loss: 0.3106 - val_acc: 0.9032
Epoch 15/30
 - 1s - loss: 0.2418 - acc: 0.9267 - val_loss: 0.3132 - val_acc: 0.8878
Epoch 16/30
 - 1s - loss: 0.2415 - acc: 0.9255 - val_loss: 0.2845 - val_acc: 0.8942
Epoch 17/30
 - 1s - loss: 0.2342 - acc: 0.9275 - val_loss: 0.3099 - val_acc: 0.8801
Epoch 18/30
 - 1s - loss: 0.2347 - acc: 0.9265 - val_loss: 0.2961 - val_acc: 0.8904
Epoch 19/30
 - 1s - loss: 0.2391 - acc: 0.9225 - val_loss: 0.2872 - val_acc: 0.8994
Epoch 20/30
 - 1s - loss: 0.2343 - acc: 0.9255 - val_loss: 0.2909 - val_acc: 0.8949
Epoch 21/30
 - 1s - loss: 0.2407 - acc: 0.9238 - val_loss: 0.3913 - val_acc: 0.8558
Epoch 22/30
 - 1s - loss: 0.2164 - acc: 0.9304 - val_loss: 0.3842 - val_acc: 0.8788
Epoch 23/30
 - 1s - loss: 0.2176 - acc: 0.9297 - val_loss: 0.2916 - val_acc: 0.9090
Epoch 24/30
 - 1s - loss: 0.2304 - acc: 0.9257 - val_loss: 0.2637 - val_acc: 0.8962
Epoch 25/30
 - 1s - loss: 0.2160 - acc: 0.9329 - val_loss: 0.2817 - val_acc: 0.8917
Epoch 26/30
 - 1s - loss: 0.2132 - acc: 0.9297 - val_loss: 0.2627 - val_acc: 0.9160
Epoch 27/30
 - 1s - loss: 0.2087 - acc: 0.9378 - val_loss: 0.3105 - val_acc: 0.8795
Epoch 28/30
 - 1s - loss: 0.2089 - acc: 0.9368 - val_loss: 0.2812 - val_acc: 0.9128
Epoch 29/30
 - 1s - loss: 0.2083 - acc: 0.9353 - val_loss: 0.2541 - val_acc: 0.9090
Epoch 30/30
 - 1s - loss: 0.1995 - acc: 0.9375 - val_loss: 0.2903 - val_acc: 0.9109
Train accuracy 0.9286943693139906 Test accuracy: 0.9108974358974359
```

```
-------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
_____
conv1d_2 (Conv1D)            (None, 122, 16)           1552
_____
dropout_1 (Dropout)          (None, 122, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0
_____
flatten_1 (Flatten)          (None, 976)               0
_____
dense_1 (Dense)              (None, 64)                62528
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 23.4762 - acc: 0.8028 - val_loss: 7.8031 - val_acc: 0.8885
Epoch 2/30
 - 1s - loss: 3.2596 - acc: 0.8741 - val_loss: 1.0084 - val_acc: 0.8673
Epoch 3/30
 - 1s - loss: 0.5528 - acc: 0.8842 - val_loss: 0.5528 - val_acc: 0.7846
Epoch 4/30
 - 1s - loss: 0.3728 - acc: 0.8889 - val_loss: 0.5339 - val_acc: 0.7859
Epoch 5/30
 - 1s - loss: 0.3396 - acc: 0.8948 - val_loss: 0.4318 - val_acc: 0.8359
Epoch 6/30
 - 1s - loss: 0.3194 - acc: 0.8908 - val_loss: 0.4361 - val_acc: 0.8314
Epoch 7/30
 - 1s - loss: 0.3280 - acc: 0.8862 - val_loss: 0.3402 - val_acc: 0.8872
Epoch 8/30
 - 1s - loss: 0.3071 - acc: 0.8930 - val_loss: 0.4096 - val_acc: 0.8340
Epoch 9/30
 - 1s - loss: 0.3025 - acc: 0.8965 - val_loss: 0.3430 - val_acc: 0.8878
Epoch 10/30
```

```
              - 1s - loss: 0.2948 - acc: 0.8953 - val_loss: 0.3679 - val_acc: 0.8782
         Epoch 11/30
              - 1s - loss: 0.3049 - acc: 0.8928 - val_loss: 0.3593 - val_acc: 0.8686
         Epoch 12/30
              - 1s - loss: 0.2853 - acc: 0.8977 - val_loss: 0.3362 - val_acc: 0.8712
         Epoch 13/30
              - 1s - loss: 0.2850 - acc: 0.9029 - val_loss: 0.3386 - val_acc: 0.8840
         Epoch 14/30
              - 1s - loss: 0.2796 - acc: 0.9036 - val_loss: 0.3825 - val_acc: 0.8699
         Epoch 15/30
              - 1s - loss: 0.2865 - acc: 0.8943 - val_loss: 0.4078 - val_acc: 0.8455
         Epoch 16/30
              - 1s - loss: 0.2806 - acc: 0.8970 - val_loss: 0.3435 - val_acc: 0.8801
         Epoch 17/30
              - 1s - loss: 0.2751 - acc: 0.9048 - val_loss: 0.3711 - val_acc: 0.8564
         Epoch 18/30
              - 1s - loss: 0.2817 - acc: 0.8982 - val_loss: 0.3223 - val_acc: 0.8782
         Epoch 19/30
              - 1s - loss: 0.2767 - acc: 0.8962 - val_loss: 0.3392 - val_acc: 0.8750
         Epoch 20/30
              - 1s - loss: 0.2871 - acc: 0.8911 - val_loss: 0.3364 - val_acc: 0.8769
         Epoch 21/30
              - 1s - loss: 0.2780 - acc: 0.8987 - val_loss: 0.3378 - val_acc: 0.8731
         Epoch 22/30
              - 1s - loss: 0.2683 - acc: 0.8960 - val_loss: 0.3401 - val_acc: 0.8635
         Epoch 23/30
              - 1s - loss: 0.2733 - acc: 0.8957 - val_loss: 0.3293 - val_acc: 0.8763
         Epoch 24/30
              - 1s - loss: 0.2777 - acc: 0.8962 - val_loss: 0.3370 - val_acc: 0.8724
         Epoch 25/30
              - 1s - loss: 0.2783 - acc: 0.8967 - val_loss: 0.3866 - val_acc: 0.8577
         Epoch 26/30
              - 1s - loss: 0.2764 - acc: 0.8982 - val_loss: 0.3259 - val_acc: 0.8776
         Epoch 27/30
              - 1s - loss: 0.2567 - acc: 0.9048 - val_loss: 0.3186 - val_acc: 0.8846
         Epoch 28/30
              - 1s - loss: 0.2729 - acc: 0.8997 - val_loss: 0.3371 - val_acc: 0.8788
         Epoch 29/30
              - 1s - loss: 0.2717 - acc: 0.9031 - val_loss: 0.3460 - val_acc: 0.8712
         Epoch 30/30
              - 1s - loss: 0.2828 - acc: 0.9002 - val_loss: 0.3589 - val_acc: 0.8724
         Train accuracy 0.8753380870420457 Test accuracy: 0.8724358974358974
         -------------------------------------------------------------------------------
```

```
Layer (type)                  Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)             (None, 124, 32)           1472

conv1d_2 (Conv1D)             (None, 122, 24)           2328

dropout_1 (Dropout)           (None, 122, 24)           0

max_pooling1d_1 (MaxPooling1  (None, 61, 24)            0

flatten_1 (Flatten)           (None, 1464)              0

dense_1 (Dense)               (None, 64)                93760

dense_2 (Dense)               (None, 3)                 195
=================================================================
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 79.4652 - acc: 0.8190 - val_loss: 51.5287 - val_acc: 0.8808
Epoch 2/30
 - 1s - loss: 34.1855 - acc: 0.9036 - val_loss: 20.0307 - val_acc: 0.8596
Epoch 3/30
 - 1s - loss: 11.9922 - acc: 0.9031 - val_loss: 6.1111 - val_acc: 0.8429
Epoch 4/30
 - 1s - loss: 3.2231 - acc: 0.8967 - val_loss: 1.5264 - val_acc: 0.8276
Epoch 5/30
 - 1s - loss: 0.7694 - acc: 0.8933 - val_loss: 0.6135 - val_acc: 0.8487
Epoch 6/30
 - 1s - loss: 0.3817 - acc: 0.8918 - val_loss: 0.4667 - val_acc: 0.8603
Epoch 7/30
 - 1s - loss: 0.3356 - acc: 0.8950 - val_loss: 0.4181 - val_acc: 0.8603
Epoch 8/30
 - 1s - loss: 0.3126 - acc: 0.8957 - val_loss: 0.4520 - val_acc: 0.8237
Epoch 9/30
 - 1s - loss: 0.3068 - acc: 0.9012 - val_loss: 0.3998 - val_acc: 0.8615
Epoch 10/30
 - 1s - loss: 0.3018 - acc: 0.8953 - val_loss: 0.3765 - val_acc: 0.8808
```

```
Epoch 11/30
 - 1s - loss: 0.2875 - acc: 0.9002 - val_loss: 0.4068 - val_acc: 0.8474
Epoch 12/30
 - 1s - loss: 0.2836 - acc: 0.8997 - val_loss: 0.3538 - val_acc: 0.8603
Epoch 13/30
 - 1s - loss: 0.2825 - acc: 0.9026 - val_loss: 0.3350 - val_acc: 0.8795
Epoch 14/30
 - 1s - loss: 0.2729 - acc: 0.9058 - val_loss: 0.3877 - val_acc: 0.8750
Epoch 15/30
 - 1s - loss: 0.2775 - acc: 0.9048 - val_loss: 0.4551 - val_acc: 0.8417
Epoch 16/30
 - 1s - loss: 0.2723 - acc: 0.9029 - val_loss: 0.3352 - val_acc: 0.8756
Epoch 17/30
 - 1s - loss: 0.2640 - acc: 0.9122 - val_loss: 0.3509 - val_acc: 0.8647
Epoch 18/30
 - 1s - loss: 0.2693 - acc: 0.9078 - val_loss: 0.3204 - val_acc: 0.8821
Epoch 19/30
 - 1s - loss: 0.2697 - acc: 0.9009 - val_loss: 0.3268 - val_acc: 0.8923
Epoch 20/30
 - 1s - loss: 0.2670 - acc: 0.9071 - val_loss: 0.4416 - val_acc: 0.8359
Epoch 21/30
 - 1s - loss: 0.2595 - acc: 0.9098 - val_loss: 0.3762 - val_acc: 0.8583
Epoch 22/30
 - 1s - loss: 0.2645 - acc: 0.9004 - val_loss: 0.3243 - val_acc: 0.8833
Epoch 23/30
 - 1s - loss: 0.2690 - acc: 0.8999 - val_loss: 0.3198 - val_acc: 0.8872
Epoch 24/30
 - 1s - loss: 0.2661 - acc: 0.9088 - val_loss: 0.3728 - val_acc: 0.8724
Epoch 25/30
 - 1s - loss: 0.2615 - acc: 0.9061 - val_loss: 0.3471 - val_acc: 0.8724
Epoch 26/30
 - 1s - loss: 0.2621 - acc: 0.9068 - val_loss: 0.3437 - val_acc: 0.8872
Epoch 27/30
 - 1s - loss: 0.2598 - acc: 0.9053 - val_loss: 0.3159 - val_acc: 0.8731
Epoch 28/30
 - 1s - loss: 0.2641 - acc: 0.9073 - val_loss: 0.3220 - val_acc: 0.8929
Epoch 29/30
 - 1s - loss: 0.2564 - acc: 0.9107 - val_loss: 0.3258 - val_acc: 0.8910
Epoch 30/30
 - 1s - loss: 0.2665 - acc: 0.9112 - val_loss: 0.3483 - val_acc: 0.8731
Train accuracy 0.8856651094172608 Test accuracy: 0.8730769230769231
--------------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)               (None, 124, 32)            1472

conv1d_2 (Conv1D)               (None, 122, 24)            2328

dropout_1 (Dropout)             (None, 122, 24)            0

max_pooling1d_1 (MaxPooling1    (None, 61, 24)             0

flatten_1 (Flatten)             (None, 1464)               0

dense_1 (Dense)                 (None, 64)                 93760

dense_2 (Dense)                 (None, 3)                  195
=================================================================
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 61.2443 - acc: 0.8232 - val_loss: 23.7625 - val_acc: 0.8686
Epoch 2/30
 - 1s - loss: 10.2820 - acc: 0.8776 - val_loss: 2.6804 - val_acc: 0.8641
Epoch 3/30
 - 1s - loss: 1.0548 - acc: 0.8719 - val_loss: 0.6479 - val_acc: 0.7840
Epoch 4/30
 - 1s - loss: 0.4146 - acc: 0.8766 - val_loss: 0.5441 - val_acc: 0.8186
Epoch 5/30
 - 1s - loss: 0.3523 - acc: 0.8911 - val_loss: 0.5060 - val_acc: 0.8410
Epoch 6/30
 - 1s - loss: 0.3390 - acc: 0.8901 - val_loss: 0.4509 - val_acc: 0.8551
Epoch 7/30
 - 1s - loss: 0.3308 - acc: 0.8916 - val_loss: 0.4191 - val_acc: 0.8641
Epoch 8/30
 - 1s - loss: 0.3229 - acc: 0.8881 - val_loss: 0.4539 - val_acc: 0.8179
Epoch 9/30
 - 1s - loss: 0.3193 - acc: 0.8935 - val_loss: 0.4919 - val_acc: 0.8385
Epoch 10/30
 - 1s - loss: 0.3183 - acc: 0.8896 - val_loss: 0.4255 - val_acc: 0.8673
Epoch 11/30
```

```
           - 1s - loss: 0.3095 - acc: 0.8898 - val_loss: 0.4030 - val_acc: 0.8506
        Epoch 12/30
           - 1s - loss: 0.3103 - acc: 0.8901 - val_loss: 0.3712 - val_acc: 0.8641
        Epoch 13/30
           - 1s - loss: 0.3004 - acc: 0.8960 - val_loss: 0.3456 - val_acc: 0.8737
        Epoch 14/30
           - 1s - loss: 0.3141 - acc: 0.8933 - val_loss: 0.4700 - val_acc: 0.8494
        Epoch 15/30
           - 1s - loss: 0.3094 - acc: 0.8957 - val_loss: 0.3662 - val_acc: 0.8782
        Epoch 16/30
           - 1s - loss: 0.3056 - acc: 0.8898 - val_loss: 0.3510 - val_acc: 0.8769
        Epoch 17/30
           - 1s - loss: 0.2934 - acc: 0.8975 - val_loss: 0.3409 - val_acc: 0.8718
        Epoch 18/30
           - 1s - loss: 0.3041 - acc: 0.8938 - val_loss: 0.3968 - val_acc: 0.8551
        Epoch 19/30
           - 1s - loss: 0.2965 - acc: 0.8925 - val_loss: 0.3705 - val_acc: 0.8654
        Epoch 20/30
           - 1s - loss: 0.3006 - acc: 0.8906 - val_loss: 0.3530 - val_acc: 0.8750
        Epoch 21/30
           - 1s - loss: 0.2923 - acc: 0.8997 - val_loss: 0.3560 - val_acc: 0.8699
        Epoch 22/30
           - 1s - loss: 0.2953 - acc: 0.8953 - val_loss: 0.3739 - val_acc: 0.8635
        Epoch 23/30
           - 1s - loss: 0.2996 - acc: 0.8891 - val_loss: 0.3872 - val_acc: 0.8609
        Epoch 24/30
           - 1s - loss: 0.2901 - acc: 0.8928 - val_loss: 0.4060 - val_acc: 0.8449
        Epoch 25/30
           - 1s - loss: 0.2986 - acc: 0.8908 - val_loss: 0.3861 - val_acc: 0.8615
        Epoch 26/30
           - 1s - loss: 0.2980 - acc: 0.8950 - val_loss: 0.3556 - val_acc: 0.8795
        Epoch 27/30
           - 1s - loss: 0.2881 - acc: 0.8957 - val_loss: 0.3256 - val_acc: 0.8801
        Epoch 28/30
           - 1s - loss: 0.2954 - acc: 0.8948 - val_loss: 0.3600 - val_acc: 0.8724
        Epoch 29/30
           - 1s - loss: 0.2936 - acc: 0.8977 - val_loss: 0.3445 - val_acc: 0.8769
        Epoch 30/30
           - 1s - loss: 0.2940 - acc: 0.8955 - val_loss: 0.3589 - val_acc: 0.8782
        Train accuracy 0.880009835259405 Test accuracy: 0.8782051282051282
        --------------------------------------------------------------------------------

        _____
        Layer (type)                 Output Shape              Param #
```

```
================================================================
conv1d_1 (Conv1D)              (None, 124, 32)          1472
_____
conv1d_2 (Conv1D)              (None, 122, 16)          1552
_____
dropout_1 (Dropout)            (None, 122, 16)          0
_____
max_pooling1d_1 (MaxPooling1   (None, 61, 16)           0
_____
flatten_1 (Flatten)            (None, 976)              0
_____
dense_1 (Dense)                (None, 64)               62528
_____
dense_2 (Dense)                (None, 3)                195
================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 15.0350 - acc: 0.8075 - val_loss: 3.2371 - val_acc: 0.8449
Epoch 2/30
 - 1s - loss: 1.1831 - acc: 0.8694 - val_loss: 0.5183 - val_acc: 0.8609
Epoch 3/30
 - 1s - loss: 0.4007 - acc: 0.8766 - val_loss: 0.5115 - val_acc: 0.7949
Epoch 4/30
 - 1s - loss: 0.3665 - acc: 0.8864 - val_loss: 0.4254 - val_acc: 0.8359
Epoch 5/30
 - 1s - loss: 0.3494 - acc: 0.8803 - val_loss: 0.4174 - val_acc: 0.8724
Epoch 6/30
 - 1s - loss: 0.3498 - acc: 0.8898 - val_loss: 0.3842 - val_acc: 0.8615
Epoch 7/30
 - 1s - loss: 0.3331 - acc: 0.8906 - val_loss: 0.4642 - val_acc: 0.8647
Epoch 8/30
 - 1s - loss: 0.3107 - acc: 0.8943 - val_loss: 0.3988 - val_acc: 0.8417
Epoch 9/30
 - 1s - loss: 0.3098 - acc: 0.8987 - val_loss: 0.4624 - val_acc: 0.8417
Epoch 10/30
 - 1s - loss: 0.3091 - acc: 0.8906 - val_loss: 0.7163 - val_acc: 0.7821
Epoch 11/30
 - 1s - loss: 0.3221 - acc: 0.8913 - val_loss: 0.3589 - val_acc: 0.8737
```

```
Epoch 12/30
 - 1s - loss: 0.2937 - acc: 0.8975 - val_loss: 0.3452 - val_acc: 0.8782
Epoch 13/30
 - 1s - loss: 0.3028 - acc: 0.8997 - val_loss: 0.3415 - val_acc: 0.8814
Epoch 14/30
 - 1s - loss: 0.2918 - acc: 0.9019 - val_loss: 0.4030 - val_acc: 0.8635
Epoch 15/30
 - 1s - loss: 0.2998 - acc: 0.8977 - val_loss: 0.3434 - val_acc: 0.8731
Epoch 16/30
 - 1s - loss: 0.3080 - acc: 0.8962 - val_loss: 0.3744 - val_acc: 0.8776
Epoch 17/30
 - 1s - loss: 0.2883 - acc: 0.9041 - val_loss: 0.3440 - val_acc: 0.8737
Epoch 18/30
 - 1s - loss: 0.2903 - acc: 0.9007 - val_loss: 0.5757 - val_acc: 0.8635
Epoch 19/30
 - 1s - loss: 0.3157 - acc: 0.8962 - val_loss: 0.3680 - val_acc: 0.8724
Epoch 20/30
 - 1s - loss: 0.2900 - acc: 0.9004 - val_loss: 0.3570 - val_acc: 0.8731
Epoch 21/30
 - 1s - loss: 0.2965 - acc: 0.9031 - val_loss: 0.3450 - val_acc: 0.8801
Epoch 22/30
 - 1s - loss: 0.2949 - acc: 0.9031 - val_loss: 0.3578 - val_acc: 0.8833
Epoch 23/30
 - 1s - loss: 0.2877 - acc: 0.9044 - val_loss: 0.3655 - val_acc: 0.8756
Epoch 24/30
 - 1s - loss: 0.2933 - acc: 0.9016 - val_loss: 0.3481 - val_acc: 0.8859
Epoch 25/30
 - 1s - loss: 0.2786 - acc: 0.9021 - val_loss: 0.3282 - val_acc: 0.8744
Epoch 26/30
 - 1s - loss: 0.2932 - acc: 0.9061 - val_loss: 0.3638 - val_acc: 0.8814
Epoch 27/30
 - 1s - loss: 0.2989 - acc: 0.8992 - val_loss: 0.3777 - val_acc: 0.8821
Epoch 28/30
 - 1s - loss: 0.2799 - acc: 0.9073 - val_loss: 0.3279 - val_acc: 0.8968
Epoch 29/30
 - 1s - loss: 0.2758 - acc: 0.9100 - val_loss: 0.3359 - val_acc: 0.8827
Epoch 30/30
 - 1s - loss: 0.2939 - acc: 0.9021 - val_loss: 0.3142 - val_acc: 0.8878
Train accuracy 0.9203343988197689 Test accuracy: 0.8878205128205128
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 16)	1552
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 64)	62528
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 53.2061 - acc: 0.7927 - val_loss: 19.2166 - val_acc: 0.8776
Epoch 2/30
 - 1s - loss: 7.6087 - acc: 0.8687 - val_loss: 1.4357 - val_acc: 0.8718
Epoch 3/30
 - 1s - loss: 0.6387 - acc: 0.8687 - val_loss: 0.5616 - val_acc: 0.7846
Epoch 4/30
 - 1s - loss: 0.3894 - acc: 0.8815 - val_loss: 0.5348 - val_acc: 0.7808
Epoch 5/30
 - 1s - loss: 0.3512 - acc: 0.8857 - val_loss: 0.4411 - val_acc: 0.8436
Epoch 6/30
 - 1s - loss: 0.3315 - acc: 0.8891 - val_loss: 0.4119 - val_acc: 0.8506
Epoch 7/30
 - 1s - loss: 0.3304 - acc: 0.8869 - val_loss: 0.3660 - val_acc: 0.8853
Epoch 8/30
 - 1s - loss: 0.3259 - acc: 0.8933 - val_loss: 0.4755 - val_acc: 0.8045
Epoch 9/30
 - 1s - loss: 0.3267 - acc: 0.8916 - val_loss: 0.3950 - val_acc: 0.8583
Epoch 10/30
 - 1s - loss: 0.3213 - acc: 0.8874 - val_loss: 0.3607 - val_acc: 0.8724
Epoch 11/30
 - 1s - loss: 0.3154 - acc: 0.8901 - val_loss: 0.4196 - val_acc: 0.8513
Epoch 12/30
```

```
          - 1s - loss: 0.3189 - acc: 0.8886 - val_loss: 0.4089 - val_acc: 0.8545
         Epoch 13/30
          - 1s - loss: 0.3138 - acc: 0.8913 - val_loss: 0.3721 - val_acc: 0.8769
         Epoch 14/30
          - 1s - loss: 0.3051 - acc: 0.8970 - val_loss: 0.6546 - val_acc: 0.7577
         Epoch 15/30
          - 1s - loss: 0.3136 - acc: 0.8871 - val_loss: 0.4367 - val_acc: 0.8372
         Epoch 16/30
          - 1s - loss: 0.3245 - acc: 0.8857 - val_loss: 0.3434 - val_acc: 0.8724
         Epoch 17/30
          - 1s - loss: 0.2984 - acc: 0.8975 - val_loss: 0.3368 - val_acc: 0.8731
         Epoch 18/30
          - 1s - loss: 0.3282 - acc: 0.8866 - val_loss: 0.4201 - val_acc: 0.8558
         Epoch 19/30
          - 1s - loss: 0.3111 - acc: 0.8891 - val_loss: 0.3868 - val_acc: 0.8622
         Epoch 20/30
          - 1s - loss: 0.3042 - acc: 0.8935 - val_loss: 0.9469 - val_acc: 0.6705
         Epoch 21/30
          - 1s - loss: 0.3134 - acc: 0.8859 - val_loss: 0.3585 - val_acc: 0.8667
         Epoch 22/30
          - 1s - loss: 0.2963 - acc: 0.8965 - val_loss: 0.3386 - val_acc: 0.8808
         Epoch 23/30
          - 1s - loss: 0.3086 - acc: 0.8898 - val_loss: 0.3380 - val_acc: 0.8808
         Epoch 24/30
          - 1s - loss: 0.3120 - acc: 0.8916 - val_loss: 0.3947 - val_acc: 0.8622
         Epoch 25/30
          - 1s - loss: 0.3002 - acc: 0.8908 - val_loss: 0.4136 - val_acc: 0.8538
         Epoch 26/30
          - 1s - loss: 0.2991 - acc: 0.8965 - val_loss: 0.3758 - val_acc: 0.8744
         Epoch 27/30
          - 1s - loss: 0.2892 - acc: 0.8977 - val_loss: 0.3328 - val_acc: 0.8795
         Epoch 28/30
          - 1s - loss: 0.3078 - acc: 0.8943 - val_loss: 0.3520 - val_acc: 0.8756
         Epoch 29/30
          - 1s - loss: 0.3021 - acc: 0.9002 - val_loss: 0.3631 - val_acc: 0.8718
         Epoch 30/30
          - 1s - loss: 0.3060 - acc: 0.8894 - val_loss: 0.4888 - val_acc: 0.8391
         Train accuracy 0.843865256946152 Test accuracy: 0.8391025641025641
         ---------------------------------------------------------------------------

         _____
         Layer (type)                 Output Shape              Param #
         =================================================================
         conv1d_1 (Conv1D)            (None, 124, 32)           1472
```

```
conv1d_2 (Conv1D)              (None, 122, 24)              2328
_____
dropout_1 (Dropout)            (None, 122, 24)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 61, 24)               0
_____
flatten_1 (Flatten)            (None, 1464)                 0
_____
dense_1 (Dense)                (None, 64)                   93760
_____
dense_2 (Dense)                (None, 3)                    195
===============================================================
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 14.9010 - acc: 0.8439 - val_loss: 1.7914 - val_acc: 0.8442
Epoch 2/30
 - 1s - loss: 0.9005 - acc: 0.8776 - val_loss: 0.6297 - val_acc: 0.8833
Epoch 3/30
 - 1s - loss: 0.4880 - acc: 0.8970 - val_loss: 0.5680 - val_acc: 0.8442
Epoch 4/30
 - 1s - loss: 0.4149 - acc: 0.9009 - val_loss: 0.4602 - val_acc: 0.8494
Epoch 5/30
 - 1s - loss: 0.3439 - acc: 0.8999 - val_loss: 0.3831 - val_acc: 0.8744
Epoch 6/30
 - 1s - loss: 0.3072 - acc: 0.9083 - val_loss: 0.3455 - val_acc: 0.8891
Epoch 7/30
 - 1s - loss: 0.3105 - acc: 0.9041 - val_loss: 0.3369 - val_acc: 0.8929
Epoch 8/30
 - 1s - loss: 0.3173 - acc: 0.9068 - val_loss: 0.5060 - val_acc: 0.8237
Epoch 9/30
 - 1s - loss: 0.3005 - acc: 0.9105 - val_loss: 0.3260 - val_acc: 0.8910
Epoch 10/30
 - 1s - loss: 0.3013 - acc: 0.9073 - val_loss: 0.3821 - val_acc: 0.8673
Epoch 11/30
 - 1s - loss: 0.2934 - acc: 0.9056 - val_loss: 0.3504 - val_acc: 0.8731
Epoch 12/30
 - 1s - loss: 0.2800 - acc: 0.9090 - val_loss: 0.3297 - val_acc: 0.8936
```

```
Epoch 13/30
 - 1s - loss: 0.2861 - acc: 0.9122 - val_loss: 0.3351 - val_acc: 0.8840
Epoch 14/30
 - 1s - loss: 0.2918 - acc: 0.9147 - val_loss: 0.3388 - val_acc: 0.8897
Epoch 15/30
 - 1s - loss: 0.2746 - acc: 0.9100 - val_loss: 0.3878 - val_acc: 0.8647
Epoch 16/30
 - 1s - loss: 0.2795 - acc: 0.9115 - val_loss: 0.3558 - val_acc: 0.8776
Epoch 17/30
 - 1s - loss: 0.2522 - acc: 0.9196 - val_loss: 0.3607 - val_acc: 0.8615
Epoch 18/30
 - 1s - loss: 0.2591 - acc: 0.9162 - val_loss: 0.3016 - val_acc: 0.8917
Epoch 19/30
 - 1s - loss: 0.2802 - acc: 0.9056 - val_loss: 0.3431 - val_acc: 0.8744
Epoch 20/30
 - 1s - loss: 0.2516 - acc: 0.9196 - val_loss: 1.5613 - val_acc: 0.6301
Epoch 21/30
 - 1s - loss: 0.2797 - acc: 0.9164 - val_loss: 0.3422 - val_acc: 0.8712
Epoch 22/30
 - 1s - loss: 0.2568 - acc: 0.9127 - val_loss: 0.3241 - val_acc: 0.8808
Epoch 23/30
 - 1s - loss: 0.2501 - acc: 0.9191 - val_loss: 0.2901 - val_acc: 0.9045
Epoch 24/30
 - 1s - loss: 0.2590 - acc: 0.9179 - val_loss: 0.3032 - val_acc: 0.9096
Epoch 25/30
 - 1s - loss: 0.2605 - acc: 0.9230 - val_loss: 0.6357 - val_acc: 0.8237
Epoch 26/30
 - 1s - loss: 0.2657 - acc: 0.9164 - val_loss: 0.2888 - val_acc: 0.9109
Epoch 27/30
 - 1s - loss: 0.2391 - acc: 0.9248 - val_loss: 0.4405 - val_acc: 0.8801
Epoch 28/30
 - 1s - loss: 0.2524 - acc: 0.9248 - val_loss: 0.2829 - val_acc: 0.9006
Epoch 29/30
 - 1s - loss: 0.2635 - acc: 0.9201 - val_loss: 0.2846 - val_acc: 0.9058
Epoch 30/30
 - 1s - loss: 0.2428 - acc: 0.9233 - val_loss: 0.3520 - val_acc: 0.8942
Train accuracy 0.8979591836734694 Test accuracy: 0.8942307692307693
---------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
_____
```

```
conv1d_2 (Conv1D)              (None, 122, 24)              2328
_____
dropout_1 (Dropout)            (None, 122, 24)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 24, 24)               0
_____
flatten_1 (Flatten)            (None, 576)                  0
_____
dense_1 (Dense)                (None, 64)                   36928
_____
dense_2 (Dense)                (None, 3)                    195
=================================================================
Total params: 40,923
Trainable params: 40,923
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 71.0170 - acc: 0.8212 - val_loss: 50.0453 - val_acc: 0.8590
Epoch 2/30
 - 1s - loss: 35.7718 - acc: 0.8985 - val_loss: 23.6875 - val_acc: 0.8526
Epoch 3/30
 - 1s - loss: 15.7852 - acc: 0.9039 - val_loss: 9.6487 - val_acc: 0.8474
Epoch 4/30
 - 1s - loss: 5.9161 - acc: 0.9098 - val_loss: 3.4132 - val_acc: 0.8429
Epoch 5/30
 - 1s - loss: 1.9134 - acc: 0.8997 - val_loss: 1.1500 - val_acc: 0.8654
Epoch 6/30
 - 1s - loss: 0.6184 - acc: 0.8982 - val_loss: 0.5992 - val_acc: 0.8583
Epoch 7/30
 - 1s - loss: 0.3711 - acc: 0.8960 - val_loss: 0.4878 - val_acc: 0.8635
Epoch 8/30
 - 1s - loss: 0.3242 - acc: 0.8965 - val_loss: 0.4754 - val_acc: 0.8365
Epoch 9/30
 - 1s - loss: 0.3117 - acc: 0.9046 - val_loss: 0.4711 - val_acc: 0.8647
Epoch 10/30
 - 1s - loss: 0.3015 - acc: 0.9002 - val_loss: 0.4409 - val_acc: 0.8628
Epoch 11/30
 - 1s - loss: 0.2860 - acc: 0.9009 - val_loss: 0.4500 - val_acc: 0.8686
Epoch 12/30
 - 1s - loss: 0.2817 - acc: 0.9004 - val_loss: 0.4095 - val_acc: 0.8712
Epoch 13/30
```

```
 - 1s - loss: 0.2776 - acc: 0.9061 - val_loss: 0.3941 - val_acc: 0.8660
Epoch 14/30
 - 1s - loss: 0.2705 - acc: 0.9056 - val_loss: 0.5141 - val_acc: 0.8340
Epoch 15/30
 - 1s - loss: 0.2737 - acc: 0.9048 - val_loss: 0.4842 - val_acc: 0.8436
Epoch 16/30
 - 1s - loss: 0.2699 - acc: 0.9012 - val_loss: 0.3894 - val_acc: 0.8788
Epoch 17/30
 - 1s - loss: 0.2655 - acc: 0.9063 - val_loss: 0.3820 - val_acc: 0.8660
Epoch 18/30
 - 1s - loss: 0.2620 - acc: 0.9044 - val_loss: 0.3878 - val_acc: 0.8821
Epoch 19/30
 - 1s - loss: 0.2657 - acc: 0.9007 - val_loss: 0.3938 - val_acc: 0.8737
Epoch 20/30
 - 1s - loss: 0.2639 - acc: 0.9021 - val_loss: 0.4405 - val_acc: 0.8635
Epoch 21/30
 - 1s - loss: 0.2583 - acc: 0.9085 - val_loss: 0.3702 - val_acc: 0.8788
Epoch 22/30
 - 1s - loss: 0.2612 - acc: 0.8997 - val_loss: 0.3859 - val_acc: 0.8763
Epoch 23/30
 - 1s - loss: 0.2679 - acc: 0.9021 - val_loss: 0.3955 - val_acc: 0.8673
Epoch 24/30
 - 1s - loss: 0.2617 - acc: 0.9031 - val_loss: 0.3930 - val_acc: 0.8744
Epoch 25/30
 - 1s - loss: 0.2614 - acc: 0.9009 - val_loss: 0.3939 - val_acc: 0.8468
Epoch 26/30
 - 1s - loss: 0.2618 - acc: 0.9031 - val_loss: 0.3727 - val_acc: 0.8801
Epoch 27/30
 - 1s - loss: 0.2537 - acc: 0.9053 - val_loss: 0.3554 - val_acc: 0.8782
Epoch 28/30
 - 1s - loss: 0.2592 - acc: 0.9014 - val_loss: 0.3716 - val_acc: 0.8821
Epoch 29/30
 - 1s - loss: 0.2524 - acc: 0.9103 - val_loss: 0.3843 - val_acc: 0.8795
Epoch 30/30
 - 1s - loss: 0.2638 - acc: 0.9053 - val_loss: 0.3758 - val_acc: 0.8654
Train accuracy 0.8805015982296533 Test accuracy: 0.8653846153846154
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552

```
_____
dropout_1 (Dropout)            (None, 120, 16)             0
_____
max_pooling1d_1 (MaxPooling1   (None, 60, 16)              0
_____
flatten_1 (Flatten)            (None, 960)                 0
_____
dense_1 (Dense)                (None, 64)                  61504
_____
dense_2 (Dense)                (None, 3)                   195
============================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 20.1676 - acc: 0.8195 - val_loss: 12.1608 - val_acc: 0.8814
Epoch 2/30
 - 1s - loss: 7.5587 - acc: 0.9075 - val_loss: 4.0569 - val_acc: 0.8885
Epoch 3/30
 - 1s - loss: 2.2772 - acc: 0.9147 - val_loss: 1.2692 - val_acc: 0.8410
Epoch 4/30
 - 1s - loss: 0.7602 - acc: 0.9137 - val_loss: 0.6731 - val_acc: 0.8558
Epoch 5/30
 - 1s - loss: 0.4574 - acc: 0.9142 - val_loss: 0.4755 - val_acc: 0.8788
Epoch 6/30
 - 1s - loss: 0.3703 - acc: 0.9132 - val_loss: 0.3895 - val_acc: 0.8795
Epoch 7/30
 - 1s - loss: 0.3171 - acc: 0.9159 - val_loss: 0.4396 - val_acc: 0.8833
Epoch 8/30
 - 1s - loss: 0.2942 - acc: 0.9218 - val_loss: 0.3892 - val_acc: 0.8756
Epoch 9/30
 - 1s - loss: 0.2816 - acc: 0.9225 - val_loss: 0.3432 - val_acc: 0.8782
Epoch 10/30
 - 1s - loss: 0.2678 - acc: 0.9201 - val_loss: 0.3595 - val_acc: 0.8750
Epoch 11/30
 - 1s - loss: 0.2477 - acc: 0.9233 - val_loss: 0.3044 - val_acc: 0.8801
Epoch 12/30
 - 1s - loss: 0.2514 - acc: 0.9243 - val_loss: 0.3149 - val_acc: 0.8897
Epoch 13/30
 - 1s - loss: 0.2375 - acc: 0.9284 - val_loss: 0.3314 - val_acc: 0.8904
```

```
Epoch 14/30
 - 1s - loss: 0.2284 - acc: 0.9324 - val_loss: 0.3440 - val_acc: 0.8788
Epoch 15/30
 - 1s - loss: 0.2318 - acc: 0.9297 - val_loss: 0.3010 - val_acc: 0.8904
Epoch 16/30
 - 1s - loss: 0.2394 - acc: 0.9314 - val_loss: 0.2788 - val_acc: 0.8942
Epoch 17/30
 - 1s - loss: 0.2280 - acc: 0.9299 - val_loss: 0.3001 - val_acc: 0.8859
Epoch 18/30
 - 1s - loss: 0.2112 - acc: 0.9324 - val_loss: 0.3149 - val_acc: 0.8923
Epoch 19/30
 - 1s - loss: 0.2209 - acc: 0.9287 - val_loss: 0.2559 - val_acc: 0.9282
Epoch 20/30
 - 1s - loss: 0.2130 - acc: 0.9302 - val_loss: 0.2776 - val_acc: 0.8942
Epoch 21/30
 - 1s - loss: 0.2069 - acc: 0.9356 - val_loss: 0.2749 - val_acc: 0.9109
Epoch 22/30
 - 1s - loss: 0.2061 - acc: 0.9356 - val_loss: 0.2785 - val_acc: 0.8968
Epoch 23/30
 - 1s - loss: 0.2095 - acc: 0.9343 - val_loss: 0.2510 - val_acc: 0.9250
Epoch 24/30
 - 1s - loss: 0.2068 - acc: 0.9343 - val_loss: 0.2533 - val_acc: 0.9192
Epoch 25/30
 - 1s - loss: 0.2019 - acc: 0.9361 - val_loss: 0.2791 - val_acc: 0.8865
Epoch 26/30
 - 1s - loss: 0.1959 - acc: 0.9368 - val_loss: 0.2559 - val_acc: 0.9263
Epoch 27/30
 - 1s - loss: 0.1983 - acc: 0.9366 - val_loss: 0.2942 - val_acc: 0.8846
Epoch 28/30
 - 1s - loss: 0.1954 - acc: 0.9420 - val_loss: 0.2291 - val_acc: 0.9282
Epoch 29/30
 - 1s - loss: 0.2069 - acc: 0.9400 - val_loss: 0.2365 - val_acc: 0.9276
Epoch 30/30
 - 1s - loss: 0.1905 - acc: 0.9400 - val_loss: 0.2774 - val_acc: 0.9186
Train accuracy 0.929186132284239 Test accuracy: 0.9185897435897435
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552

```
dropout_1 (Dropout)              (None, 120, 16)              0
_____
max_pooling1d_1 (MaxPooling1 (None, 60, 16)               0
_____
flatten_1 (Flatten)              (None, 960)                  0
_____
dense_1 (Dense)                  (None, 16)                   15376
_____
dense_2 (Dense)                  (None, 3)                    51
=================================================================
Total params: 19,027
Trainable params: 19,027
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 15.7528 - acc: 0.8264 - val_loss: 7.2308 - val_acc: 0.8872
Epoch 2/30
 - 1s - loss: 3.5738 - acc: 0.9026 - val_loss: 1.3650 - val_acc: 0.8776
Epoch 3/30
 - 1s - loss: 0.7648 - acc: 0.9036 - val_loss: 0.6155 - val_acc: 0.8269
Epoch 4/30
 - 1s - loss: 0.4270 - acc: 0.9068 - val_loss: 0.4895 - val_acc: 0.8353
Epoch 5/30
 - 1s - loss: 0.3540 - acc: 0.9073 - val_loss: 0.4180 - val_acc: 0.8878
Epoch 6/30
 - 1s - loss: 0.3276 - acc: 0.9085 - val_loss: 0.3443 - val_acc: 0.8904
Epoch 7/30
 - 1s - loss: 0.3088 - acc: 0.9103 - val_loss: 0.4154 - val_acc: 0.8782
Epoch 8/30
 - 1s - loss: 0.2805 - acc: 0.9191 - val_loss: 0.4772 - val_acc: 0.8340
Epoch 9/30
 - 1s - loss: 0.2973 - acc: 0.9103 - val_loss: 0.3851 - val_acc: 0.8654
Epoch 10/30
 - 1s - loss: 0.2680 - acc: 0.9149 - val_loss: 0.3100 - val_acc: 0.8865
Epoch 11/30
 - 1s - loss: 0.2537 - acc: 0.9142 - val_loss: 0.3697 - val_acc: 0.8692
Epoch 12/30
 - 1s - loss: 0.2649 - acc: 0.9152 - val_loss: 0.3314 - val_acc: 0.8929
Epoch 13/30
 - 1s - loss: 0.2539 - acc: 0.9208 - val_loss: 0.4494 - val_acc: 0.8654
Epoch 14/30
```

```
        - 1s - loss: 0.2456 - acc: 0.9233 - val_loss: 0.4232 - val_acc: 0.8532
       Epoch 15/30
        - 1s - loss: 0.2437 - acc: 0.9162 - val_loss: 0.3855 - val_acc: 0.8756
       Epoch 16/30
        - 1s - loss: 0.2313 - acc: 0.9257 - val_loss: 0.3500 - val_acc: 0.8731
       Epoch 17/30
        - 1s - loss: 0.2329 - acc: 0.9250 - val_loss: 0.3903 - val_acc: 0.8692
       Epoch 18/30
        - 1s - loss: 0.2281 - acc: 0.9270 - val_loss: 0.3893 - val_acc: 0.9045
       Epoch 19/30
        - 1s - loss: 0.2453 - acc: 0.9179 - val_loss: 0.3011 - val_acc: 0.9135
       Epoch 20/30
        - 1s - loss: 0.2280 - acc: 0.9265 - val_loss: 0.3024 - val_acc: 0.8878
       Epoch 21/30
        - 1s - loss: 0.2312 - acc: 0.9270 - val_loss: 0.4253 - val_acc: 0.8776
       Epoch 22/30
        - 1s - loss: 0.2238 - acc: 0.9260 - val_loss: 0.3246 - val_acc: 0.9096
       Epoch 23/30
        - 1s - loss: 0.2304 - acc: 0.9260 - val_loss: 0.2906 - val_acc: 0.9122
       Epoch 24/30
        - 1s - loss: 0.2246 - acc: 0.9275 - val_loss: 0.3034 - val_acc: 0.9096
       Epoch 25/30
        - 1s - loss: 0.2180 - acc: 0.9284 - val_loss: 0.3963 - val_acc: 0.8673
       Epoch 26/30
        - 1s - loss: 0.2218 - acc: 0.9277 - val_loss: 0.3037 - val_acc: 0.9045
       Epoch 27/30
        - 1s - loss: 0.2208 - acc: 0.9289 - val_loss: 0.3251 - val_acc: 0.8891
       Epoch 28/30
        - 1s - loss: 0.2164 - acc: 0.9336 - val_loss: 0.2786 - val_acc: 0.9179
       Epoch 29/30
        - 1s - loss: 0.2096 - acc: 0.9302 - val_loss: 0.2692 - val_acc: 0.9115
       Epoch 30/30
        - 1s - loss: 0.2201 - acc: 0.9309 - val_loss: 0.3849 - val_acc: 0.8756
       Train accuracy 0.9242685025817556 Test accuracy: 0.8756410256410256
       -----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
=======================	===================	=========
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0

```
_____
max_pooling1d_1 (MaxPooling1 (None, 60, 16)            0
_____
flatten_1 (Flatten)          (None, 960)               0
_____
dense_1 (Dense)              (None, 64)                61504
_____
dense_2 (Dense)              (None, 3)                 195
========================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 23.6532 - acc: 0.8190 - val_loss: 12.1490 - val_acc: 0.8718
Epoch 2/30
 - 1s - loss: 6.5479 - acc: 0.9002 - val_loss: 2.7941 - val_acc: 0.8808
Epoch 3/30
 - 1s - loss: 1.4933 - acc: 0.9048 - val_loss: 0.9421 - val_acc: 0.8410
Epoch 4/30
 - 1s - loss: 0.6547 - acc: 0.9127 - val_loss: 0.7080 - val_acc: 0.8340
Epoch 5/30
 - 1s - loss: 0.4958 - acc: 0.9110 - val_loss: 0.5537 - val_acc: 0.8609
Epoch 6/30
 - 1s - loss: 0.4110 - acc: 0.9144 - val_loss: 0.5045 - val_acc: 0.8750
Epoch 7/30
 - 1s - loss: 0.3609 - acc: 0.9134 - val_loss: 0.4677 - val_acc: 0.8712
Epoch 8/30
 - 1s - loss: 0.3214 - acc: 0.9253 - val_loss: 0.5251 - val_acc: 0.8526
Epoch 9/30
 - 1s - loss: 0.3031 - acc: 0.9253 - val_loss: 0.3474 - val_acc: 0.8974
Epoch 10/30
 - 1s - loss: 0.3106 - acc: 0.9230 - val_loss: 0.4111 - val_acc: 0.8782
Epoch 11/30
 - 1s - loss: 0.2623 - acc: 0.9329 - val_loss: 0.3150 - val_acc: 0.8968
Epoch 12/30
 - 1s - loss: 0.2667 - acc: 0.9265 - val_loss: 0.3016 - val_acc: 0.9237
Epoch 13/30
 - 1s - loss: 0.2551 - acc: 0.9331 - val_loss: 0.3220 - val_acc: 0.8955
Epoch 14/30
 - 1s - loss: 0.2450 - acc: 0.9390 - val_loss: 0.3132 - val_acc: 0.9263
```

```
Epoch 15/30
 - 1s - loss: 0.2371 - acc: 0.9378 - val_loss: 0.3328 - val_acc: 0.8878
Epoch 16/30
 - 1s - loss: 0.2316 - acc: 0.9358 - val_loss: 0.3208 - val_acc: 0.8865
Epoch 17/30
 - 1s - loss: 0.2305 - acc: 0.9366 - val_loss: 0.2932 - val_acc: 0.8929
Epoch 18/30
 - 1s - loss: 0.2145 - acc: 0.9393 - val_loss: 0.2637 - val_acc: 0.9103
Epoch 19/30
 - 1s - loss: 0.2192 - acc: 0.9316 - val_loss: 0.2600 - val_acc: 0.9365
Epoch 20/30
 - 1s - loss: 0.2156 - acc: 0.9407 - val_loss: 0.5189 - val_acc: 0.7872
Epoch 21/30
 - 1s - loss: 0.2113 - acc: 0.9398 - val_loss: 0.2431 - val_acc: 0.9269
Epoch 22/30
 - 1s - loss: 0.2003 - acc: 0.9427 - val_loss: 0.2712 - val_acc: 0.8968
Epoch 23/30
 - 1s - loss: 0.2031 - acc: 0.9403 - val_loss: 0.2327 - val_acc: 0.9359
Epoch 24/30
 - 1s - loss: 0.2010 - acc: 0.9420 - val_loss: 0.2344 - val_acc: 0.9385
Epoch 25/30
 - 1s - loss: 0.1952 - acc: 0.9430 - val_loss: 0.2654 - val_acc: 0.8968
Epoch 26/30
 - 1s - loss: 0.1947 - acc: 0.9439 - val_loss: 0.2209 - val_acc: 0.9436
Epoch 27/30
 - 1s - loss: 0.1870 - acc: 0.9427 - val_loss: 0.2639 - val_acc: 0.8974
Epoch 28/30
 - 1s - loss: 0.2050 - acc: 0.9452 - val_loss: 0.2256 - val_acc: 0.9423
Epoch 29/30
 - 1s - loss: 0.1926 - acc: 0.9454 - val_loss: 0.2427 - val_acc: 0.9308
Epoch 30/30
 - 1s - loss: 0.1882 - acc: 0.9457 - val_loss: 0.2380 - val_acc: 0.9372
Train accuracy 0.9402507991148267 Test accuracy: 0.9371794871794872
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0

```
max_pooling1d_1 (MaxPooling1 (None, 60, 16)              0
_____

flatten_1 (Flatten)          (None, 960)                 0
_____

dense_1 (Dense)              (None, 64)                  61504
_____

dense_2 (Dense)              (None, 3)                   195
================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0

_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 17.9677 - acc: 0.8284 - val_loss: 4.9731 - val_acc: 0.8000
Epoch 2/30
 - 1s - loss: 1.9262 - acc: 0.8835 - val_loss: 0.7557 - val_acc: 0.8763
Epoch 3/30
 - 1s - loss: 0.6134 - acc: 0.8955 - val_loss: 0.8107 - val_acc: 0.8385
Epoch 4/30
 - 1s - loss: 0.4918 - acc: 0.9024 - val_loss: 0.4840 - val_acc: 0.8660
Epoch 5/30
 - 1s - loss: 0.3834 - acc: 0.9048 - val_loss: 0.4472 - val_acc: 0.8724
Epoch 6/30
 - 1s - loss: 0.3802 - acc: 0.9009 - val_loss: 0.3854 - val_acc: 0.8686
Epoch 7/30
 - 1s - loss: 0.3115 - acc: 0.9090 - val_loss: 0.3631 - val_acc: 0.8859
Epoch 8/30
 - 1s - loss: 0.2908 - acc: 0.9152 - val_loss: 0.3974 - val_acc: 0.8756
Epoch 9/30
 - 1s - loss: 0.2969 - acc: 0.9144 - val_loss: 0.3832 - val_acc: 0.8699
Epoch 10/30
 - 1s - loss: 0.2744 - acc: 0.9201 - val_loss: 0.3076 - val_acc: 0.9006
Epoch 11/30
 - 1s - loss: 0.2970 - acc: 0.9149 - val_loss: 0.3276 - val_acc: 0.8808
Epoch 12/30
 - 1s - loss: 0.2914 - acc: 0.9152 - val_loss: 0.3533 - val_acc: 0.8974
Epoch 13/30
 - 1s - loss: 0.2475 - acc: 0.9211 - val_loss: 0.3058 - val_acc: 0.8929
Epoch 14/30
 - 1s - loss: 0.2497 - acc: 0.9245 - val_loss: 0.2987 - val_acc: 0.9173
Epoch 15/30
```

```
 - 1s - loss: 0.2369 - acc: 0.9265 - val_loss: 0.3861 - val_acc: 0.8795
Epoch 16/30
 - 1s - loss: 0.2329 - acc: 0.9272 - val_loss: 0.2732 - val_acc: 0.9135
Epoch 17/30
 - 1s - loss: 0.2306 - acc: 0.9262 - val_loss: 0.2879 - val_acc: 0.8981
Epoch 18/30
 - 1s - loss: 0.2359 - acc: 0.9265 - val_loss: 0.2749 - val_acc: 0.9019
Epoch 19/30
 - 1s - loss: 0.2264 - acc: 0.9235 - val_loss: 0.2562 - val_acc: 0.9237
Epoch 20/30
 - 1s - loss: 0.2224 - acc: 0.9321 - val_loss: 0.2663 - val_acc: 0.8981
Epoch 21/30
 - 1s - loss: 0.2072 - acc: 0.9378 - val_loss: 0.2707 - val_acc: 0.9090
Epoch 22/30
 - 1s - loss: 0.2216 - acc: 0.9312 - val_loss: 0.3145 - val_acc: 0.9109
Epoch 23/30
 - 1s - loss: 0.2101 - acc: 0.9393 - val_loss: 0.2662 - val_acc: 0.9135
Epoch 24/30
 - 1s - loss: 0.2123 - acc: 0.9358 - val_loss: 0.2668 - val_acc: 0.9199
Epoch 25/30
 - 1s - loss: 0.2111 - acc: 0.9351 - val_loss: 0.2757 - val_acc: 0.9013
Epoch 26/30
 - 1s - loss: 0.2172 - acc: 0.9378 - val_loss: 0.2605 - val_acc: 0.9276
Epoch 27/30
 - 1s - loss: 0.1982 - acc: 0.9358 - val_loss: 0.2438 - val_acc: 0.9346
Epoch 28/30
 - 1s - loss: 0.2131 - acc: 0.9412 - val_loss: 0.2485 - val_acc: 0.9244
Epoch 29/30
 - 1s - loss: 0.1959 - acc: 0.9410 - val_loss: 0.2885 - val_acc: 0.8891
Epoch 30/30
 - 1s - loss: 0.1971 - acc: 0.9388 - val_loss: 0.3031 - val_acc: 0.9250
Train accuracy 0.9343496434718466 Test accuracy: 0.925
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0

```
flatten_1 (Flatten)          (None, 384)              0
_____
dense_1 (Dense)              (None, 64)               24640
_____
dense_2 (Dense)              (None, 3)                195
=================================================================
Total params: 28,435
Trainable params: 28,435
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 17.8459 - acc: 0.8124 - val_loss: 3.8668 - val_acc: 0.8308
Epoch 2/30
 - 1s - loss: 1.2830 - acc: 0.8798 - val_loss: 0.5506 - val_acc: 0.8609
Epoch 3/30
 - 1s - loss: 0.3792 - acc: 0.8876 - val_loss: 0.5167 - val_acc: 0.8173
Epoch 4/30
 - 1s - loss: 0.3521 - acc: 0.8938 - val_loss: 0.4659 - val_acc: 0.8147
Epoch 5/30
 - 1s - loss: 0.3245 - acc: 0.8921 - val_loss: 0.4412 - val_acc: 0.8462
Epoch 6/30
 - 1s - loss: 0.3144 - acc: 0.8913 - val_loss: 0.3906 - val_acc: 0.8699
Epoch 7/30
 - 1s - loss: 0.3093 - acc: 0.8908 - val_loss: 0.3858 - val_acc: 0.8731
Epoch 8/30
 - 1s - loss: 0.3049 - acc: 0.8987 - val_loss: 0.4253 - val_acc: 0.8417
Epoch 9/30
 - 1s - loss: 0.2944 - acc: 0.9009 - val_loss: 0.3703 - val_acc: 0.8686
Epoch 10/30
 - 1s - loss: 0.2955 - acc: 0.8965 - val_loss: 0.5077 - val_acc: 0.8308
Epoch 11/30
 - 1s - loss: 0.2904 - acc: 0.8953 - val_loss: 0.3701 - val_acc: 0.8795
Epoch 12/30
 - 1s - loss: 0.2981 - acc: 0.8975 - val_loss: 0.3461 - val_acc: 0.8808
Epoch 13/30
 - 1s - loss: 0.2790 - acc: 0.9061 - val_loss: 0.3267 - val_acc: 0.8769
Epoch 14/30
 - 1s - loss: 0.2726 - acc: 0.9002 - val_loss: 0.4684 - val_acc: 0.8224
Epoch 15/30
 - 1s - loss: 0.2821 - acc: 0.8972 - val_loss: 0.4553 - val_acc: 0.8051
```

```
Epoch 16/30
 - 1s - loss: 0.2821 - acc: 0.8962 - val_loss: 0.3361 - val_acc: 0.8795
Epoch 17/30
 - 1s - loss: 0.2796 - acc: 0.9014 - val_loss: 0.3614 - val_acc: 0.8571
Epoch 18/30
 - 1s - loss: 0.2751 - acc: 0.8997 - val_loss: 0.3240 - val_acc: 0.8846
Epoch 19/30
 - 1s - loss: 0.2799 - acc: 0.8982 - val_loss: 0.3558 - val_acc: 0.8827
Epoch 20/30
 - 1s - loss: 0.2748 - acc: 0.9036 - val_loss: 0.3383 - val_acc: 0.8821
Epoch 21/30
 - 1s - loss: 0.2636 - acc: 0.9048 - val_loss: 0.3341 - val_acc: 0.8731
Epoch 22/30
 - 1s - loss: 0.2685 - acc: 0.8992 - val_loss: 0.3233 - val_acc: 0.8833
Epoch 23/30
 - 1s - loss: 0.2688 - acc: 0.8950 - val_loss: 0.3434 - val_acc: 0.8859
Epoch 24/30
 - 1s - loss: 0.2663 - acc: 0.9048 - val_loss: 0.3605 - val_acc: 0.8654
Epoch 25/30
 - 1s - loss: 0.2678 - acc: 0.8987 - val_loss: 0.3372 - val_acc: 0.8660
Epoch 26/30
 - 1s - loss: 0.2662 - acc: 0.9036 - val_loss: 0.4112 - val_acc: 0.8724
Epoch 27/30
 - 1s - loss: 0.2597 - acc: 0.9029 - val_loss: 0.3379 - val_acc: 0.8885
Epoch 28/30
 - 1s - loss: 0.2614 - acc: 0.9031 - val_loss: 0.3741 - val_acc: 0.8353
Epoch 29/30
 - 1s - loss: 0.2709 - acc: 0.9012 - val_loss: 0.3549 - val_acc: 0.8769
Epoch 30/30
 - 1s - loss: 0.2654 - acc: 0.9046 - val_loss: 0.3947 - val_acc: 0.8250
Train accuracy 0.8003442340791739 Test accuracy: 0.825
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 16)	3600
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 58, 16)	0

```
flatten_1 (Flatten)          (None, 928)              0
_____
dense_1 (Dense)              (None, 64)               59456
_____
dense_2 (Dense)              (None, 3)                195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 84.7366 - acc: 0.7930 - val_loss: 42.7749 - val_acc: 0.8506
Epoch 2/30
 - 1s - loss: 23.4535 - acc: 0.8576 - val_loss: 9.8637 - val_acc: 0.8686
Epoch 3/30
 - 1s - loss: 4.4119 - acc: 0.8692 - val_loss: 1.2871 - val_acc: 0.8199
Epoch 4/30
 - 1s - loss: 0.5961 - acc: 0.8803 - val_loss: 0.5557 - val_acc: 0.7885
Epoch 5/30
 - 1s - loss: 0.3853 - acc: 0.8810 - val_loss: 0.4862 - val_acc: 0.8417
Epoch 6/30
 - 1s - loss: 0.3467 - acc: 0.8844 - val_loss: 0.4178 - val_acc: 0.8577
Epoch 7/30
 - 1s - loss: 0.3497 - acc: 0.8862 - val_loss: 0.4084 - val_acc: 0.8622
Epoch 8/30
 - 1s - loss: 0.3115 - acc: 0.8945 - val_loss: 0.4429 - val_acc: 0.8205
Epoch 9/30
 - 1s - loss: 0.3175 - acc: 0.8940 - val_loss: 0.3595 - val_acc: 0.8705
Epoch 10/30
 - 1s - loss: 0.3286 - acc: 0.8889 - val_loss: 0.4158 - val_acc: 0.8577
Epoch 11/30
 - 1s - loss: 0.3150 - acc: 0.8898 - val_loss: 0.4255 - val_acc: 0.8577
Epoch 12/30
 - 1s - loss: 0.3062 - acc: 0.8955 - val_loss: 0.3926 - val_acc: 0.8692
Epoch 13/30
 - 1s - loss: 0.3172 - acc: 0.8955 - val_loss: 0.3504 - val_acc: 0.8814
Epoch 14/30
 - 1s - loss: 0.2966 - acc: 0.9019 - val_loss: 0.4086 - val_acc: 0.8487
Epoch 15/30
 - 1s - loss: 0.3066 - acc: 0.8957 - val_loss: 0.3661 - val_acc: 0.8731
Epoch 16/30
```

```
        - 1s - loss: 0.2995 - acc: 0.8948 - val_loss: 0.3637 - val_acc: 0.8718
Epoch 17/30
        - 1s - loss: 0.3005 - acc: 0.8989 - val_loss: 0.3617 - val_acc: 0.8705
Epoch 18/30
        - 1s - loss: 0.3027 - acc: 0.8950 - val_loss: 0.3962 - val_acc: 0.8641
Epoch 19/30
        - 1s - loss: 0.3043 - acc: 0.8913 - val_loss: 0.3537 - val_acc: 0.8853
Epoch 20/30
        - 1s - loss: 0.3044 - acc: 0.8906 - val_loss: 0.3772 - val_acc: 0.8628
Epoch 21/30
        - 1s - loss: 0.2901 - acc: 0.9002 - val_loss: 0.3615 - val_acc: 0.8654
Epoch 22/30
        - 1s - loss: 0.3358 - acc: 0.8849 - val_loss: 0.3795 - val_acc: 0.8603
Epoch 23/30
        - 1s - loss: 0.2889 - acc: 0.8935 - val_loss: 0.3484 - val_acc: 0.8724
Epoch 24/30
        - 1s - loss: 0.2957 - acc: 0.8911 - val_loss: 0.3619 - val_acc: 0.8686
Epoch 25/30
        - 1s - loss: 0.3077 - acc: 0.8921 - val_loss: 0.3853 - val_acc: 0.8494
Epoch 26/30
        - 1s - loss: 0.2974 - acc: 0.8894 - val_loss: 0.3773 - val_acc: 0.8756
Epoch 27/30
        - 1s - loss: 0.2942 - acc: 0.8933 - val_loss: 0.3383 - val_acc: 0.8840
Epoch 28/30
        - 1s - loss: 0.2997 - acc: 0.8908 - val_loss: 0.3629 - val_acc: 0.8705
Epoch 29/30
        - 1s - loss: 0.2872 - acc: 0.8967 - val_loss: 0.3476 - val_acc: 0.8808
Epoch 30/30
        - 1s - loss: 0.2902 - acc: 0.8977 - val_loss: 0.3635 - val_acc: 0.8744
Train accuracy 0.8905827391197443 Test accuracy: 0.8743589743589744
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0

```
_____
dense_1 (Dense)                  (None, 16)                15376
_____
dense_2 (Dense)                  (None, 3)                 51
================================================================
Total params: 19,027
Trainable params: 19,027
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 47.2555 - acc: 0.8021 - val_loss: 18.8068 - val_acc: 0.8590
Epoch 2/30
 - 1s - loss: 7.9943 - acc: 0.8650 - val_loss: 1.9137 - val_acc: 0.8340
Epoch 3/30
 - 1s - loss: 0.7499 - acc: 0.8726 - val_loss: 0.5727 - val_acc: 0.7814
Epoch 4/30
 - 1s - loss: 0.3950 - acc: 0.8778 - val_loss: 0.4976 - val_acc: 0.8160
Epoch 5/30
 - 1s - loss: 0.3736 - acc: 0.8815 - val_loss: 0.4252 - val_acc: 0.8564
Epoch 6/30
 - 1s - loss: 0.3552 - acc: 0.8852 - val_loss: 0.4247 - val_acc: 0.8513
Epoch 7/30
 - 1s - loss: 0.3425 - acc: 0.8862 - val_loss: 0.4039 - val_acc: 0.8564
Epoch 8/30
 - 1s - loss: 0.3454 - acc: 0.8857 - val_loss: 0.4762 - val_acc: 0.8096
Epoch 9/30
 - 1s - loss: 0.3303 - acc: 0.8935 - val_loss: 0.3795 - val_acc: 0.8750
Epoch 10/30
 - 1s - loss: 0.3361 - acc: 0.8830 - val_loss: 0.3767 - val_acc: 0.8724
Epoch 11/30
 - 1s - loss: 0.3188 - acc: 0.8913 - val_loss: 0.4124 - val_acc: 0.8577
Epoch 12/30
 - 1s - loss: 0.3225 - acc: 0.8901 - val_loss: 0.4381 - val_acc: 0.8295
Epoch 13/30
 - 1s - loss: 0.3047 - acc: 0.8992 - val_loss: 0.3577 - val_acc: 0.8776
Epoch 14/30
 - 1s - loss: 0.3039 - acc: 0.8992 - val_loss: 0.4024 - val_acc: 0.8673
Epoch 15/30
 - 1s - loss: 0.3097 - acc: 0.8923 - val_loss: 0.4158 - val_acc: 0.8647
Epoch 16/30
 - 1s - loss: 0.3122 - acc: 0.8901 - val_loss: 0.3546 - val_acc: 0.8737
```

```
Epoch 17/30
 - 1s - loss: 0.2961 - acc: 0.8980 - val_loss: 0.3481 - val_acc: 0.8737
Epoch 18/30
 - 1s - loss: 0.3007 - acc: 0.8962 - val_loss: 0.3696 - val_acc: 0.8686
Epoch 19/30
 - 1s - loss: 0.2945 - acc: 0.8935 - val_loss: 0.3453 - val_acc: 0.8673
Epoch 20/30
 - 1s - loss: 0.3083 - acc: 0.8921 - val_loss: 0.4327 - val_acc: 0.8340
Epoch 21/30
 - 1s - loss: 0.2870 - acc: 0.8982 - val_loss: 0.3653 - val_acc: 0.8532
Epoch 22/30
 - 1s - loss: 0.3026 - acc: 0.8925 - val_loss: 0.3633 - val_acc: 0.8628
Epoch 23/30
 - 1s - loss: 0.3036 - acc: 0.8874 - val_loss: 0.3669 - val_acc: 0.8705
Epoch 24/30
 - 1s - loss: 0.2981 - acc: 0.8916 - val_loss: 0.3592 - val_acc: 0.8744
Epoch 25/30
 - 1s - loss: 0.2924 - acc: 0.8923 - val_loss: 0.3675 - val_acc: 0.8603
Epoch 26/30
 - 1s - loss: 0.2917 - acc: 0.8957 - val_loss: 0.3520 - val_acc: 0.8692
Epoch 27/30
 - 1s - loss: 0.2958 - acc: 0.8913 - val_loss: 0.3254 - val_acc: 0.8814
Epoch 28/30
 - 1s - loss: 0.2950 - acc: 0.8913 - val_loss: 0.3569 - val_acc: 0.8795
Epoch 29/30
 - 1s - loss: 0.2906 - acc: 0.8960 - val_loss: 0.3488 - val_acc: 0.8776
Epoch 30/30
 - 1s - loss: 0.2932 - acc: 0.8960 - val_loss: 0.4023 - val_acc: 0.8647
Train accuracy 0.8748463240717974 Test accuracy: 0.8647435897435898
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 118, 32)	5152
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 32)	0
flatten_1 (Flatten)	(None, 1888)	0

```
dense_1 (Dense)                 (None, 64)                  120896
_____
dense_2 (Dense)                 (None, 3)                   195
=================================================================
Total params: 128,291
Trainable params: 128,291
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 3s - loss: 31.2619 - acc: 0.8407 - val_loss: 1.3416 - val_acc: 0.8353
Epoch 2/30
 - 3s - loss: 0.5084 - acc: 0.8896 - val_loss: 0.4401 - val_acc: 0.8737
Epoch 3/30
 - 3s - loss: 0.3682 - acc: 0.8894 - val_loss: 0.4127 - val_acc: 0.8538
Epoch 4/30
 - 3s - loss: 0.3994 - acc: 0.8793 - val_loss: 0.4589 - val_acc: 0.8397
Epoch 5/30
 - 3s - loss: 0.3363 - acc: 0.8898 - val_loss: 0.3903 - val_acc: 0.8603
Epoch 6/30
 - 3s - loss: 0.3162 - acc: 0.8948 - val_loss: 0.3801 - val_acc: 0.8712
Epoch 7/30
 - 3s - loss: 0.3273 - acc: 0.8938 - val_loss: 0.3757 - val_acc: 0.8750
Epoch 8/30
 - 3s - loss: 0.3455 - acc: 0.8906 - val_loss: 0.4143 - val_acc: 0.8526
Epoch 9/30
 - 2s - loss: 0.3089 - acc: 0.8970 - val_loss: 0.4480 - val_acc: 0.8564
Epoch 10/30
 - 3s - loss: 0.3374 - acc: 0.8945 - val_loss: 0.3678 - val_acc: 0.8750
Epoch 11/30
 - 3s - loss: 0.3495 - acc: 0.8847 - val_loss: 0.4096 - val_acc: 0.8551
Epoch 12/30
 - 3s - loss: 0.3420 - acc: 0.8864 - val_loss: 0.3727 - val_acc: 0.8583
Epoch 13/30
 - 3s - loss: 0.3146 - acc: 0.8953 - val_loss: 0.3920 - val_acc: 0.8455
Epoch 14/30
 - 3s - loss: 0.3005 - acc: 0.8943 - val_loss: 0.3884 - val_acc: 0.8712
Epoch 15/30
 - 3s - loss: 0.3320 - acc: 0.8903 - val_loss: 0.3868 - val_acc: 0.8750
Epoch 16/30
 - 3s - loss: 0.3299 - acc: 0.8891 - val_loss: 0.4659 - val_acc: 0.8487
Epoch 17/30
```

```
      - 3s - loss: 0.3278 - acc: 0.8908 - val_loss: 0.3562 - val_acc: 0.8615
Epoch 18/30
      - 3s - loss: 0.3117 - acc: 0.8894 - val_loss: 0.3813 - val_acc: 0.8635
Epoch 19/30
      - 3s - loss: 0.3649 - acc: 0.8906 - val_loss: 0.3806 - val_acc: 0.8647
Epoch 20/30
      - 2s - loss: 0.2972 - acc: 0.9014 - val_loss: 0.3349 - val_acc: 0.8679
Epoch 21/30
      - 2s - loss: 0.2960 - acc: 0.8992 - val_loss: 0.4548 - val_acc: 0.8545
Epoch 22/30
      - 3s - loss: 0.3177 - acc: 0.8940 - val_loss: 0.3551 - val_acc: 0.8756
Epoch 23/30
      - 3s - loss: 0.3020 - acc: 0.8982 - val_loss: 0.3545 - val_acc: 0.8705
Epoch 24/30
      - 3s - loss: 0.3236 - acc: 0.8894 - val_loss: 0.3881 - val_acc: 0.8538
Epoch 25/30
      - 3s - loss: 0.3175 - acc: 0.8923 - val_loss: 0.3685 - val_acc: 0.8609
Epoch 26/30
      - 3s - loss: 0.2944 - acc: 0.8960 - val_loss: 0.3484 - val_acc: 0.8846
Epoch 27/30
      - 3s - loss: 0.3039 - acc: 0.9004 - val_loss: 0.3771 - val_acc: 0.8647
Epoch 28/30
      - 2s - loss: 0.2982 - acc: 0.8908 - val_loss: 0.3398 - val_acc: 0.8763
Epoch 29/30
      - 3s - loss: 0.3031 - acc: 0.9039 - val_loss: 0.3862 - val_acc: 0.8622
Epoch 30/30
      - 3s - loss: 0.3145 - acc: 0.8908 - val_loss: 0.3743 - val_acc: 0.8756
Train accuracy 0.8908286206048684 Test accuracy: 0.8756410256410256
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 28)           1792
_____
conv1d_2 (Conv1D)            (None, 120, 16)           1360
_____
dropout_1 (Dropout)          (None, 120, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 16)            0
_____
flatten_1 (Flatten)          (None, 640)               0
_____
dense_1 (Dense)              (None, 64)                41024
```

```
_____
dense_2 (Dense)              (None, 3)                   195
===========================================================
Total params: 44,371
Trainable params: 44,371
Non-trainable params: 0

_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 1s - loss: 37.5219 - acc: 0.8058 - val_loss: 6.0895 - val_acc: 0.8282
Epoch 2/30
 - 1s - loss: 1.5991 - acc: 0.8591 - val_loss: 0.5299 - val_acc: 0.8500
Epoch 3/30
 - 1s - loss: 0.4068 - acc: 0.8694 - val_loss: 0.5146 - val_acc: 0.7897
Epoch 4/30
 - 1s - loss: 0.3839 - acc: 0.8790 - val_loss: 0.5348 - val_acc: 0.7718
Epoch 5/30
 - 1s - loss: 0.3788 - acc: 0.8771 - val_loss: 0.4374 - val_acc: 0.8532
Epoch 6/30
 - 1s - loss: 0.3648 - acc: 0.8798 - val_loss: 0.4019 - val_acc: 0.8673
Epoch 7/30
 - 1s - loss: 0.3708 - acc: 0.8793 - val_loss: 0.4038 - val_acc: 0.8660
Epoch 8/30
 - 1s - loss: 0.3642 - acc: 0.8817 - val_loss: 0.4298 - val_acc: 0.8308
Epoch 9/30
 - 1s - loss: 0.3577 - acc: 0.8866 - val_loss: 0.4517 - val_acc: 0.8551
Epoch 10/30
 - 1s - loss: 0.3499 - acc: 0.8803 - val_loss: 0.4122 - val_acc: 0.8654
Epoch 11/30
 - 1s - loss: 0.3456 - acc: 0.8817 - val_loss: 0.3822 - val_acc: 0.8686
Epoch 12/30
 - 1s - loss: 0.3466 - acc: 0.8859 - val_loss: 0.4333 - val_acc: 0.8603
Epoch 13/30
 - 1s - loss: 0.3602 - acc: 0.8884 - val_loss: 0.3722 - val_acc: 0.8776
Epoch 14/30
 - 1s - loss: 0.3546 - acc: 0.8889 - val_loss: 0.4182 - val_acc: 0.8647
Epoch 15/30
 - 1s - loss: 0.3597 - acc: 0.8832 - val_loss: 0.4108 - val_acc: 0.8667
Epoch 16/30
 - 1s - loss: 0.3537 - acc: 0.8837 - val_loss: 0.3782 - val_acc: 0.8679
Epoch 17/30
 - 1s - loss: 0.3388 - acc: 0.8881 - val_loss: 0.4218 - val_acc: 0.8538
```

```
Epoch 18/30
 - 1s - loss: 0.3423 - acc: 0.8849 - val_loss: 0.3913 - val_acc: 0.8641
Epoch 19/30
 - 1s - loss: 0.3439 - acc: 0.8869 - val_loss: 0.4014 - val_acc: 0.8462
Epoch 20/30
 - 1s - loss: 0.3388 - acc: 0.8898 - val_loss: 0.4162 - val_acc: 0.8609
Epoch 21/30
 - 1s - loss: 0.3417 - acc: 0.8830 - val_loss: 0.3876 - val_acc: 0.8635
Epoch 22/30
 - 1s - loss: 0.3364 - acc: 0.8889 - val_loss: 0.4116 - val_acc: 0.8532
Epoch 23/30
 - 1s - loss: 0.3505 - acc: 0.8803 - val_loss: 0.3980 - val_acc: 0.8795
Epoch 24/30
 - 1s - loss: 0.3393 - acc: 0.8886 - val_loss: 0.4690 - val_acc: 0.8526
Epoch 25/30
 - 1s - loss: 0.3443 - acc: 0.8874 - val_loss: 0.7069 - val_acc: 0.7808
Epoch 26/30
 - 1s - loss: 0.3397 - acc: 0.8827 - val_loss: 0.3804 - val_acc: 0.8718
Epoch 27/30
 - 1s - loss: 0.3309 - acc: 0.8866 - val_loss: 0.3633 - val_acc: 0.8731
Epoch 28/30
 - 1s - loss: 0.3408 - acc: 0.8815 - val_loss: 0.3893 - val_acc: 0.8718
Epoch 29/30
 - 1s - loss: 0.3454 - acc: 0.8849 - val_loss: 0.3933 - val_acc: 0.8712
Epoch 30/30
 - 1s - loss: 0.3296 - acc: 0.8884 - val_loss: 0.4333 - val_acc: 0.8199
Train accuracy 0.810671256454389 Test accuracy: 0.8198717948717948
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 16)	3600
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 16)	0
flatten_1 (Flatten)	(None, 368)	0
dense_1 (Dense)	(None, 16)	5904

```
dense_2 (Dense)                    (None, 3)                      51
=================================================================
Total params: 11,603
Trainable params: 11,603
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 9.1968 - acc: 0.8358 - val_loss: 0.5610 - val_acc: 0.8346
Epoch 2/25
 - 1s - loss: 0.3637 - acc: 0.8776 - val_loss: 0.4332 - val_acc: 0.8667
Epoch 3/25
 - 1s - loss: 0.3234 - acc: 0.8906 - val_loss: 0.4245 - val_acc: 0.8487
Epoch 4/25
 - 1s - loss: 0.3092 - acc: 0.8933 - val_loss: 0.4070 - val_acc: 0.8647
Epoch 5/25
 - 1s - loss: 0.3163 - acc: 0.8913 - val_loss: 0.3815 - val_acc: 0.8686
Epoch 6/25
 - 1s - loss: 0.3106 - acc: 0.8889 - val_loss: 0.4453 - val_acc: 0.8263
Epoch 7/25
 - 1s - loss: 0.3013 - acc: 0.8930 - val_loss: 0.3769 - val_acc: 0.8686
Epoch 8/25
 - 1s - loss: 0.2998 - acc: 0.8911 - val_loss: 0.4105 - val_acc: 0.8551
Epoch 9/25
 - 1s - loss: 0.2979 - acc: 0.8965 - val_loss: 0.3796 - val_acc: 0.8641
Epoch 10/25
 - 1s - loss: 0.2994 - acc: 0.8925 - val_loss: 0.3739 - val_acc: 0.8769
Epoch 11/25
 - 1s - loss: 0.2913 - acc: 0.8972 - val_loss: 0.4680 - val_acc: 0.7205
Epoch 12/25
 - 1s - loss: 0.2990 - acc: 0.8891 - val_loss: 0.3748 - val_acc: 0.8635
Epoch 13/25
 - 1s - loss: 0.2983 - acc: 0.8889 - val_loss: 0.3914 - val_acc: 0.8532
Epoch 14/25
 - 1s - loss: 0.2916 - acc: 0.8923 - val_loss: 0.4211 - val_acc: 0.8397
Epoch 15/25
 - 1s - loss: 0.2918 - acc: 0.8953 - val_loss: 0.3818 - val_acc: 0.8712
Epoch 16/25
 - 1s - loss: 0.2870 - acc: 0.8989 - val_loss: 0.3556 - val_acc: 0.8769
Epoch 17/25
 - 1s - loss: 0.3022 - acc: 0.8903 - val_loss: 0.3353 - val_acc: 0.8788
Epoch 18/25
```

```
 - 1s - loss: 0.3002 - acc: 0.8923 - val_loss: 0.3581 - val_acc: 0.8904
Epoch 19/25
 - 1s - loss: 0.2860 - acc: 0.8957 - val_loss: 0.3559 - val_acc: 0.8808
Epoch 20/25
 - 1s - loss: 0.2895 - acc: 0.8918 - val_loss: 0.3646 - val_acc: 0.8840
Epoch 21/25
 - 1s - loss: 0.2913 - acc: 0.8960 - val_loss: 0.3476 - val_acc: 0.8686
Epoch 22/25
 - 1s - loss: 0.2909 - acc: 0.8940 - val_loss: 0.5283 - val_acc: 0.7115
Epoch 23/25
 - 1s - loss: 0.2910 - acc: 0.8898 - val_loss: 0.3805 - val_acc: 0.8532
Epoch 24/25
 - 1s - loss: 0.2918 - acc: 0.8918 - val_loss: 0.3489 - val_acc: 0.8917
Epoch 25/25
 - 1s - loss: 0.3073 - acc: 0.8901 - val_loss: 0.3616 - val_acc: 0.8808
Train accuracy 0.922055569215638 Test accuracy: 0.8807692307692307
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 124, 32)	4064
dropout_1 (Dropout)	(None, 124, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 62, 32)	0
flatten_1 (Flatten)	(None, 1984)	0
dense_1 (Dense)	(None, 64)	127040
dense_2 (Dense)	(None, 3)	195

```
Total params: 132,475
Trainable params: 132,475
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 165.0868 - acc: 0.8176 - val_loss: 81.4208 - val_acc: 0.8949
Epoch 2/30
```

```
         - 1s - loss: 45.3164 - acc: 0.8633 - val_loss: 19.8192 - val_acc: 0.8494
Epoch 3/30
         - 1s - loss: 8.9950 - acc: 0.8741 - val_loss: 2.3976 - val_acc: 0.8019
Epoch 4/30
         - 1s - loss: 0.8805 - acc: 0.8655 - val_loss: 0.6133 - val_acc: 0.7750
Epoch 5/30
         - 1s - loss: 0.4447 - acc: 0.8689 - val_loss: 0.5137 - val_acc: 0.8468
Epoch 6/30
         - 1s - loss: 0.3929 - acc: 0.8744 - val_loss: 0.4423 - val_acc: 0.8519
Epoch 7/30
         - 1s - loss: 0.3894 - acc: 0.8741 - val_loss: 0.4184 - val_acc: 0.8647
Epoch 8/30
         - 1s - loss: 0.3629 - acc: 0.8776 - val_loss: 0.4746 - val_acc: 0.8038
Epoch 9/30
         - 1s - loss: 0.3510 - acc: 0.8857 - val_loss: 0.4199 - val_acc: 0.8628
Epoch 10/30
         - 1s - loss: 0.3483 - acc: 0.8825 - val_loss: 0.3896 - val_acc: 0.8756
Epoch 11/30
         - 1s - loss: 0.3456 - acc: 0.8884 - val_loss: 0.3756 - val_acc: 0.8705
Epoch 12/30
         - 1s - loss: 0.3390 - acc: 0.8835 - val_loss: 0.3951 - val_acc: 0.8590
Epoch 13/30
         - 1s - loss: 0.3351 - acc: 0.8869 - val_loss: 0.3753 - val_acc: 0.8788
Epoch 14/30
         - 1s - loss: 0.3365 - acc: 0.8886 - val_loss: 0.5048 - val_acc: 0.7859
Epoch 15/30
         - 1s - loss: 0.3350 - acc: 0.8871 - val_loss: 0.4946 - val_acc: 0.8167
Epoch 16/30
         - 1s - loss: 0.3482 - acc: 0.8839 - val_loss: 0.3830 - val_acc: 0.8737
Epoch 17/30
         - 1s - loss: 0.3368 - acc: 0.8894 - val_loss: 0.3686 - val_acc: 0.8699
Epoch 18/30
         - 1s - loss: 0.3393 - acc: 0.8898 - val_loss: 0.4460 - val_acc: 0.8583
Epoch 19/30
         - 1s - loss: 0.3433 - acc: 0.8839 - val_loss: 0.3731 - val_acc: 0.8692
Epoch 20/30
         - 1s - loss: 0.3335 - acc: 0.8911 - val_loss: 0.7182 - val_acc: 0.7109
Epoch 21/30
         - 1s - loss: 0.3484 - acc: 0.8879 - val_loss: 0.4030 - val_acc: 0.8532
Epoch 22/30
         - 1s - loss: 0.3109 - acc: 0.8972 - val_loss: 0.4523 - val_acc: 0.8308
Epoch 23/30
         - 1s - loss: 0.3313 - acc: 0.8847 - val_loss: 0.3923 - val_acc: 0.8705
```

```
Epoch 24/30
 - 1s - loss: 0.3326 - acc: 0.8894 - val_loss: 0.3858 - val_acc: 0.8788
Epoch 25/30
 - 1s - loss: 0.3331 - acc: 0.8862 - val_loss: 0.4117 - val_acc: 0.8340
Epoch 26/30
 - 1s - loss: 0.3336 - acc: 0.8898 - val_loss: 0.3775 - val_acc: 0.8686
Epoch 27/30
 - 1s - loss: 0.3235 - acc: 0.8901 - val_loss: 0.3681 - val_acc: 0.8667
Epoch 28/30
 - 1s - loss: 0.3275 - acc: 0.8879 - val_loss: 0.3869 - val_acc: 0.8769
Epoch 29/30
 - 1s - loss: 0.3204 - acc: 0.8953 - val_loss: 0.3764 - val_acc: 0.8744
Epoch 30/30
 - 1s - loss: 0.3325 - acc: 0.8879 - val_loss: 0.4088 - val_acc: 0.8487
Train accuracy 0.8519793459552496 Test accuracy: 0.8487179487179487
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 118, 16)	2576
dropout_1 (Dropout)	(None, 118, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 16)	0
flatten_1 (Flatten)	(None, 944)	0
dense_1 (Dense)	(None, 64)	60480
dense_2 (Dense)	(None, 3)	195

```
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 3s - loss: 8.3180 - acc: 0.8667 - val_loss: 0.6862 - val_acc: 0.8494
Epoch 2/30
 - 2s - loss: 0.4286 - acc: 0.8911 - val_loss: 0.3810 - val_acc: 0.8731
```

```
Epoch 3/30
 - 2s - loss: 0.3195 - acc: 0.8975 - val_loss: 0.4216 - val_acc: 0.8455
Epoch 4/30
 - 2s - loss: 0.4222 - acc: 0.8790 - val_loss: 0.4983 - val_acc: 0.8654
Epoch 5/30
 - 2s - loss: 0.3265 - acc: 0.8955 - val_loss: 0.3516 - val_acc: 0.8763
Epoch 6/30
 - 2s - loss: 0.3251 - acc: 0.8948 - val_loss: 0.4026 - val_acc: 0.8654
Epoch 7/30
 - 2s - loss: 0.3175 - acc: 0.8960 - val_loss: 0.4091 - val_acc: 0.8667
Epoch 8/30
 - 2s - loss: 0.3519 - acc: 0.8970 - val_loss: 0.4375 - val_acc: 0.8494
Epoch 9/30
 - 2s - loss: 0.2967 - acc: 0.8994 - val_loss: 0.3840 - val_acc: 0.8506
Epoch 10/30
 - 2s - loss: 0.2863 - acc: 0.9029 - val_loss: 0.3923 - val_acc: 0.8654
Epoch 11/30
 - 2s - loss: 0.3219 - acc: 0.8891 - val_loss: 0.3826 - val_acc: 0.8686
Epoch 12/30
 - 2s - loss: 0.3614 - acc: 0.8771 - val_loss: 0.4203 - val_acc: 0.8776
Epoch 13/30
 - 2s - loss: 0.3215 - acc: 0.8960 - val_loss: 0.3496 - val_acc: 0.8692
Epoch 14/30
 - 2s - loss: 0.2738 - acc: 0.9063 - val_loss: 0.3514 - val_acc: 0.8840
Epoch 15/30
 - 2s - loss: 0.2927 - acc: 0.8999 - val_loss: 0.3686 - val_acc: 0.8788
Epoch 16/30
 - 2s - loss: 0.3115 - acc: 0.8955 - val_loss: 0.4002 - val_acc: 0.8577
Epoch 17/30
 - 2s - loss: 0.2939 - acc: 0.8955 - val_loss: 0.3275 - val_acc: 0.8699
Epoch 18/30
 - 2s - loss: 0.2762 - acc: 0.8992 - val_loss: 0.3786 - val_acc: 0.8647
Epoch 19/30
 - 2s - loss: 0.3176 - acc: 0.8918 - val_loss: 0.3370 - val_acc: 0.8750
Epoch 20/30
 - 2s - loss: 0.3053 - acc: 0.8994 - val_loss: 0.3311 - val_acc: 0.8737
Epoch 21/30
 - 2s - loss: 0.2800 - acc: 0.9036 - val_loss: 0.4189 - val_acc: 0.8468
Epoch 22/30
 - 2s - loss: 0.2930 - acc: 0.8977 - val_loss: 0.3453 - val_acc: 0.8769
Epoch 23/30
 - 2s - loss: 0.3177 - acc: 0.8911 - val_loss: 0.3951 - val_acc: 0.8609
Epoch 24/30
```

```
 - 2s - loss: 0.2832 - acc: 0.8999 - val_loss: 0.3927 - val_acc: 0.8571
Epoch 25/30
 - 2s - loss: 0.2933 - acc: 0.8943 - val_loss: 0.4962 - val_acc: 0.8545
Epoch 26/30
 - 2s - loss: 0.2869 - acc: 0.9026 - val_loss: 0.3804 - val_acc: 0.8667
Epoch 27/30
 - 2s - loss: 0.2709 - acc: 0.9044 - val_loss: 0.4343 - val_acc: 0.8282
Epoch 28/30
 - 2s - loss: 0.2958 - acc: 0.8925 - val_loss: 0.3463 - val_acc: 0.8756
Epoch 29/30
 - 2s - loss: 0.2594 - acc: 0.9066 - val_loss: 0.3151 - val_acc: 0.8821
Epoch 30/30
 - 2s - loss: 0.3010 - acc: 0.8982 - val_loss: 0.3233 - val_acc: 0.8795
Train accuracy 0.9014015244652077 Test accuracy: 0.8794871794871795
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 124, 16)	2032
dropout_1 (Dropout)	(None, 124, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 41, 16)	0
flatten_1 (Flatten)	(None, 656)	0
dense_1 (Dense)	(None, 16)	10512
dense_2 (Dense)	(None, 3)	51

```
Total params: 13,771
Trainable params: 13,771
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 8.6805 - acc: 0.8294 - val_loss: 0.5643 - val_acc: 0.8173
Epoch 2/30
 - 1s - loss: 0.4044 - acc: 0.8729 - val_loss: 0.4557 - val_acc: 0.8590
Epoch 3/30
```

```
                 - 1s - loss: 0.3709 - acc: 0.8780 - val_loss: 0.4844 - val_acc: 0.8071
          Epoch 4/30
                 - 1s - loss: 0.3483 - acc: 0.8852 - val_loss: 0.4062 - val_acc: 0.8699
          Epoch 5/30
                 - 1s - loss: 0.3464 - acc: 0.8832 - val_loss: 0.3996 - val_acc: 0.8673
          Epoch 6/30
                 - 1s - loss: 0.3338 - acc: 0.8862 - val_loss: 0.4489 - val_acc: 0.8186
          Epoch 7/30
                 - 1s - loss: 0.3212 - acc: 0.8884 - val_loss: 0.3982 - val_acc: 0.8526
          Epoch 8/30
                 - 1s - loss: 0.3190 - acc: 0.8925 - val_loss: 0.4333 - val_acc: 0.8269
          Epoch 9/30
                 - 1s - loss: 0.3245 - acc: 0.8908 - val_loss: 0.3881 - val_acc: 0.8731
          Epoch 10/30
                 - 1s - loss: 0.3188 - acc: 0.8820 - val_loss: 0.3849 - val_acc: 0.8744
          Epoch 11/30
                 - 1s - loss: 0.3142 - acc: 0.8972 - val_loss: 0.4716 - val_acc: 0.7269
          Epoch 12/30
                 - 1s - loss: 0.3376 - acc: 0.8805 - val_loss: 0.4590 - val_acc: 0.8353
          Epoch 13/30
                 - 1s - loss: 0.3175 - acc: 0.8923 - val_loss: 0.3824 - val_acc: 0.8577
          Epoch 14/30
                 - 1s - loss: 0.3162 - acc: 0.8913 - val_loss: 0.3845 - val_acc: 0.8750
          Epoch 15/30
                 - 1s - loss: 0.3156 - acc: 0.8916 - val_loss: 0.3673 - val_acc: 0.8776
          Epoch 16/30
                 - 1s - loss: 0.3131 - acc: 0.8906 - val_loss: 0.3620 - val_acc: 0.8885
          Epoch 17/30
                 - 1s - loss: 0.3250 - acc: 0.8874 - val_loss: 0.4495 - val_acc: 0.8551
          Epoch 18/30
                 - 1s - loss: 0.3234 - acc: 0.8918 - val_loss: 0.4664 - val_acc: 0.8519
          Epoch 19/30
                 - 1s - loss: 0.3174 - acc: 0.8916 - val_loss: 0.4767 - val_acc: 0.8481
          Epoch 20/30
                 - 1s - loss: 0.3136 - acc: 0.8918 - val_loss: 0.4061 - val_acc: 0.8224
          Epoch 21/30
                 - 1s - loss: 0.3109 - acc: 0.8928 - val_loss: 0.4937 - val_acc: 0.8532
          Epoch 22/30
                 - 1s - loss: 0.3147 - acc: 0.8918 - val_loss: 0.5302 - val_acc: 0.6987
          Epoch 23/30
                 - 1s - loss: 0.3165 - acc: 0.8874 - val_loss: 0.4137 - val_acc: 0.8647
          Epoch 24/30
                 - 1s - loss: 0.3046 - acc: 0.8992 - val_loss: 0.3572 - val_acc: 0.8827
```

```
Epoch 25/30
 - 1s - loss: 0.3267 - acc: 0.8884 - val_loss: 0.4078 - val_acc: 0.8327
Epoch 26/30
 - 1s - loss: 0.3068 - acc: 0.8994 - val_loss: 0.4278 - val_acc: 0.8192
Epoch 27/30
 - 1s - loss: 0.3229 - acc: 0.8928 - val_loss: 0.3839 - val_acc: 0.8763
Epoch 28/30
 - 1s - loss: 0.3228 - acc: 0.8906 - val_loss: 0.4514 - val_acc: 0.7404
Epoch 29/30
 - 1s - loss: 0.3060 - acc: 0.8989 - val_loss: 0.5171 - val_acc: 0.8372
Epoch 30/30
 - 1s - loss: 0.3182 - acc: 0.8957 - val_loss: 0.3570 - val_acc: 0.8891
Train accuracy 0.9043521022866978 Test accuracy: 0.889102564102564
-------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 28)           1792

_____
conv1d_2 (Conv1D)            (None, 116, 32)           6304

_____
dropout_1 (Dropout)          (None, 116, 32)           0

_____
max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0

_____
flatten_1 (Flatten)          (None, 736)               0

_____
dense_1 (Dense)              (None, 64)                47168

_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 55,459
Trainable params: 55,459
Non-trainable params: 0

_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 63.6339 - acc: 0.8274 - val_loss: 16.1166 - val_acc: 0.8782
Epoch 2/25
 - 1s - loss: 6.7424 - acc: 0.8970 - val_loss: 2.3685 - val_acc: 0.8667
Epoch 3/25
 - 1s - loss: 1.1357 - acc: 0.8957 - val_loss: 0.7379 - val_acc: 0.8564
```

```
Epoch 4/25
 - 1s - loss: 0.4183 - acc: 0.8960 - val_loss: 0.5041 - val_acc: 0.8628
Epoch 5/25
 - 1s - loss: 0.3472 - acc: 0.8896 - val_loss: 0.5217 - val_acc: 0.8577
Epoch 6/25
 - 1s - loss: 0.3191 - acc: 0.8987 - val_loss: 0.5115 - val_acc: 0.8545
Epoch 7/25
 - 1s - loss: 0.4000 - acc: 0.8825 - val_loss: 0.5036 - val_acc: 0.8705
Epoch 8/25
 - 1s - loss: 0.3369 - acc: 0.8928 - val_loss: 0.4741 - val_acc: 0.8641
Epoch 9/25
 - 1s - loss: 0.2923 - acc: 0.9036 - val_loss: 0.4394 - val_acc: 0.8577
Epoch 10/25
 - 1s - loss: 0.2873 - acc: 0.9002 - val_loss: 0.4306 - val_acc: 0.8679
Epoch 11/25
 - 1s - loss: 0.3046 - acc: 0.8992 - val_loss: 0.5108 - val_acc: 0.8417
Epoch 12/25
 - 1s - loss: 0.2926 - acc: 0.8972 - val_loss: 0.4162 - val_acc: 0.8756
Epoch 13/25
 - 1s - loss: 0.3039 - acc: 0.8999 - val_loss: 0.4025 - val_acc: 0.8724
Epoch 14/25
 - 1s - loss: 0.3172 - acc: 0.8943 - val_loss: 0.4524 - val_acc: 0.8603
Epoch 15/25
 - 1s - loss: 0.3318 - acc: 0.8955 - val_loss: 0.4818 - val_acc: 0.8481
Epoch 16/25
 - 1s - loss: 0.2905 - acc: 0.9021 - val_loss: 0.4544 - val_acc: 0.8564
Epoch 17/25
 - 1s - loss: 0.3010 - acc: 0.8935 - val_loss: 0.3925 - val_acc: 0.8865
Epoch 18/25
 - 1s - loss: 0.3145 - acc: 0.8933 - val_loss: 0.3998 - val_acc: 0.8782
Epoch 19/25
 - 1s - loss: 0.2974 - acc: 0.8962 - val_loss: 0.4349 - val_acc: 0.8462
Epoch 20/25
 - 1s - loss: 0.2906 - acc: 0.8972 - val_loss: 0.4846 - val_acc: 0.8519
Epoch 21/25
 - 1s - loss: 0.2916 - acc: 0.9004 - val_loss: 0.4728 - val_acc: 0.8481
Epoch 22/25
 - 1s - loss: 0.2927 - acc: 0.8921 - val_loss: 0.3978 - val_acc: 0.8615
Epoch 23/25
 - 1s - loss: 0.3087 - acc: 0.8925 - val_loss: 0.4777 - val_acc: 0.8404
Epoch 24/25
 - 1s - loss: 0.3316 - acc: 0.8948 - val_loss: 0.4213 - val_acc: 0.8699
Epoch 25/25
```

```
  - 1s - loss: 0.2797 - acc: 0.9016 - val_loss: 0.4171 - val_acc: 0.8609
Train accuracy 0.907548561593312 Test accuracy: 0.860897435897436
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 122, 16)	2576
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 32)	31264
dense_2 (Dense)	(None, 3)	99

```
Total params: 34,835
Trainable params: 34,835
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 4s - loss: 55.1424 - acc: 0.8817 - val_loss: 14.8734 - val_acc: 0.8692
Epoch 2/35
 - 3s - loss: 4.2249 - acc: 0.8953 - val_loss: 0.5487 - val_acc: 0.8474
Epoch 3/35
 - 3s - loss: 0.3591 - acc: 0.8938 - val_loss: 0.4563 - val_acc: 0.8378
Epoch 4/35
 - 3s - loss: 0.3078 - acc: 0.8987 - val_loss: 0.3586 - val_acc: 0.8641
Epoch 5/35
 - 3s - loss: 0.2979 - acc: 0.9007 - val_loss: 0.3391 - val_acc: 0.8737
Epoch 6/35
 - 3s - loss: 0.2972 - acc: 0.8955 - val_loss: 0.4411 - val_acc: 0.8205
Epoch 7/35
 - 3s - loss: 0.2888 - acc: 0.9034 - val_loss: 0.3595 - val_acc: 0.8647
Epoch 8/35
 - 3s - loss: 0.2833 - acc: 0.9034 - val_loss: 0.3719 - val_acc: 0.8494
Epoch 9/35
```

```
       - 3s - loss: 0.2788 - acc: 0.9036 - val_loss: 0.3091 - val_acc: 0.8788
Epoch 10/35
       - 3s - loss: 0.2761 - acc: 0.9048 - val_loss: 0.3024 - val_acc: 0.8987
Epoch 11/35
       - 3s - loss: 0.2720 - acc: 0.9098 - val_loss: 0.3705 - val_acc: 0.8538
Epoch 12/35
       - 3s - loss: 0.2730 - acc: 0.9012 - val_loss: 0.3583 - val_acc: 0.8615
Epoch 13/35
       - 3s - loss: 0.2709 - acc: 0.9063 - val_loss: 0.3644 - val_acc: 0.8590
Epoch 14/35
       - 3s - loss: 0.2604 - acc: 0.9100 - val_loss: 0.3079 - val_acc: 0.8929
Epoch 15/35
       - 3s - loss: 0.2616 - acc: 0.9105 - val_loss: 0.2956 - val_acc: 0.8936
Epoch 16/35
       - 3s - loss: 0.2576 - acc: 0.9152 - val_loss: 0.2938 - val_acc: 0.9006
Epoch 17/35
       - 3s - loss: 0.2685 - acc: 0.9068 - val_loss: 0.3065 - val_acc: 0.8942
Epoch 18/35
       - 3s - loss: 0.2590 - acc: 0.9093 - val_loss: 0.3730 - val_acc: 0.8519
Epoch 19/35
       - 3s - loss: 0.2598 - acc: 0.9090 - val_loss: 0.3153 - val_acc: 0.8897
Epoch 20/35
       - 3s - loss: 0.2581 - acc: 0.9085 - val_loss: 0.2898 - val_acc: 0.9013
Epoch 21/35
       - 3s - loss: 0.2576 - acc: 0.9115 - val_loss: 0.3318 - val_acc: 0.8821
Epoch 22/35
       - 3s - loss: 0.2560 - acc: 0.9166 - val_loss: 0.3311 - val_acc: 0.8853
Epoch 23/35
       - 3s - loss: 0.2657 - acc: 0.9083 - val_loss: 0.3493 - val_acc: 0.8776
Epoch 24/35
       - 3s - loss: 0.2596 - acc: 0.9125 - val_loss: 0.3102 - val_acc: 0.8853
Epoch 25/35
       - 3s - loss: 0.2629 - acc: 0.9098 - val_loss: 0.2958 - val_acc: 0.8929
Epoch 26/35
       - 3s - loss: 0.2562 - acc: 0.9112 - val_loss: 0.2846 - val_acc: 0.9045
Epoch 27/35
       - 3s - loss: 0.2648 - acc: 0.9132 - val_loss: 0.3138 - val_acc: 0.8840
Epoch 28/35
       - 3s - loss: 0.2617 - acc: 0.9134 - val_loss: 0.3143 - val_acc: 0.8962
Epoch 29/35
       - 3s - loss: 0.2577 - acc: 0.9152 - val_loss: 0.2909 - val_acc: 0.8955
Epoch 30/35
       - 3s - loss: 0.2512 - acc: 0.9149 - val_loss: 0.3047 - val_acc: 0.8840
```

```
Epoch 31/35
 - 3s - loss: 0.2613 - acc: 0.9134 - val_loss: 0.3741 - val_acc: 0.8705
Epoch 32/35
 - 3s - loss: 0.2681 - acc: 0.9132 - val_loss: 0.3910 - val_acc: 0.8724
Epoch 33/35
 - 3s - loss: 0.2539 - acc: 0.9134 - val_loss: 0.2869 - val_acc: 0.9103
Epoch 34/35
 - 3s - loss: 0.2797 - acc: 0.9093 - val_loss: 0.3479 - val_acc: 0.8769
Epoch 35/35
 - 3s - loss: 0.2608 - acc: 0.9120 - val_loss: 0.2993 - val_acc: 0.9000
Train accuracy 0.8986968281288419 Test accuracy: 0.9
--------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 42)           1932
_____
conv1d_2 (Conv1D)            (None, 122, 16)           2032
_____
dropout_1 (Dropout)          (None, 122, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0
_____
flatten_1 (Flatten)          (None, 976)               0
_____
dense_1 (Dense)              (None, 64)                62528
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 66,687
Trainable params: 66,687
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 23.9586 - acc: 0.8119 - val_loss: 0.5178 - val_acc: 0.8077
Epoch 2/30
 - 1s - loss: 0.5181 - acc: 0.8444 - val_loss: 0.5187 - val_acc: 0.8064
Epoch 3/30
 - 1s - loss: 0.4157 - acc: 0.8734 - val_loss: 0.4548 - val_acc: 0.8410
Epoch 4/30
 - 1s - loss: 0.4211 - acc: 0.8709 - val_loss: 0.4661 - val_acc: 0.8378
```

```
Epoch 5/30
 - 1s - loss: 0.4151 - acc: 0.8756 - val_loss: 0.6996 - val_acc: 0.7808
Epoch 6/30
 - 1s - loss: 0.4072 - acc: 0.8793 - val_loss: 0.5690 - val_acc: 0.7987
Epoch 7/30
 - 1s - loss: 0.4019 - acc: 0.8704 - val_loss: 0.4100 - val_acc: 0.8442
Epoch 8/30
 - 1s - loss: 0.3855 - acc: 0.8716 - val_loss: 0.5002 - val_acc: 0.8000
Epoch 9/30
 - 1s - loss: 0.3865 - acc: 0.8783 - val_loss: 0.4032 - val_acc: 0.8628
Epoch 10/30
 - 1s - loss: 0.4131 - acc: 0.8682 - val_loss: 0.4255 - val_acc: 0.8583
Epoch 11/30
 - 1s - loss: 0.3847 - acc: 0.8790 - val_loss: 1.0428 - val_acc: 0.6571
Epoch 12/30
 - 1s - loss: 0.3843 - acc: 0.8739 - val_loss: 0.4681 - val_acc: 0.8051
Epoch 13/30
 - 1s - loss: 0.3946 - acc: 0.8702 - val_loss: 0.5023 - val_acc: 0.7987
Epoch 14/30
 - 1s - loss: 0.3939 - acc: 0.8771 - val_loss: 0.8017 - val_acc: 0.6776
Epoch 15/30
 - 1s - loss: 0.3794 - acc: 0.8793 - val_loss: 0.3920 - val_acc: 0.8737
Epoch 16/30
 - 1s - loss: 0.4092 - acc: 0.8748 - val_loss: 0.4107 - val_acc: 0.8603
Epoch 17/30
 - 1s - loss: 0.3793 - acc: 0.8780 - val_loss: 0.5499 - val_acc: 0.8474
Epoch 18/30
 - 1s - loss: 0.3720 - acc: 0.8790 - val_loss: 0.9118 - val_acc: 0.6686
Epoch 19/30
 - 1s - loss: 0.3839 - acc: 0.8768 - val_loss: 0.4188 - val_acc: 0.8628
Epoch 20/30
 - 1s - loss: 0.3948 - acc: 0.8842 - val_loss: 0.6932 - val_acc: 0.8635
Epoch 21/30
 - 1s - loss: 0.3808 - acc: 0.8854 - val_loss: 0.3894 - val_acc: 0.8724
Epoch 22/30
 - 1s - loss: 0.3846 - acc: 0.8778 - val_loss: 0.8336 - val_acc: 0.6545
Epoch 23/30
 - 1s - loss: 0.3756 - acc: 0.8788 - val_loss: 0.3876 - val_acc: 0.8750
Epoch 24/30
 - 1s - loss: 0.3718 - acc: 0.8783 - val_loss: 0.7235 - val_acc: 0.8455
Epoch 25/30
 - 1s - loss: 0.3762 - acc: 0.8798 - val_loss: 0.4360 - val_acc: 0.8423
Epoch 26/30
```

```
 - 1s - loss: 0.3968 - acc: 0.8800 - val_loss: 0.4368 - val_acc: 0.8731
Epoch 27/30
 - 1s - loss: 0.3681 - acc: 0.8812 - val_loss: 0.4681 - val_acc: 0.8545
Epoch 28/30
 - 1s - loss: 0.3733 - acc: 0.8800 - val_loss: 0.5176 - val_acc: 0.8045
Epoch 29/30
 - 1s - loss: 0.3742 - acc: 0.8822 - val_loss: 0.4207 - val_acc: 0.8635
Epoch 30/30
 - 1s - loss: 0.3657 - acc: 0.8803 - val_loss: 0.4086 - val_acc: 0.8692
Train accuracy 0.8718957462503073 Test accuracy: 0.8692307692307693
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 120, 16)	1360
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 16)	0
flatten_1 (Flatten)	(None, 640)	0
dense_1 (Dense)	(None, 32)	20512
dense_2 (Dense)	(None, 3)	99

```
Total params: 23,763
Trainable params: 23,763
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 98.3156 - acc: 0.7974 - val_loss: 42.2039 - val_acc: 0.8301
Epoch 2/35
 - 1s - loss: 21.1776 - acc: 0.8871 - val_loss: 8.1589 - val_acc: 0.8545
Epoch 3/35
 - 1s - loss: 3.8611 - acc: 0.8950 - val_loss: 1.5964 - val_acc: 0.8500
Epoch 4/35
 - 1s - loss: 0.8289 - acc: 0.8950 - val_loss: 0.6180 - val_acc: 0.8462
Epoch 5/35
```

```
         - 1s - loss: 0.4261 - acc: 0.8862 - val_loss: 0.5087 - val_acc: 0.8545
Epoch 6/35
         - 1s - loss: 0.3534 - acc: 0.8989 - val_loss: 0.5660 - val_acc: 0.8263
Epoch 7/35
         - 1s - loss: 0.3833 - acc: 0.8790 - val_loss: 0.4810 - val_acc: 0.8577
Epoch 8/35
         - 1s - loss: 0.3347 - acc: 0.8977 - val_loss: 0.4576 - val_acc: 0.8564
Epoch 9/35
         - 1s - loss: 0.3355 - acc: 0.8950 - val_loss: 0.4594 - val_acc: 0.8494
Epoch 10/35
         - 1s - loss: 0.3316 - acc: 0.8948 - val_loss: 0.4596 - val_acc: 0.8372
Epoch 11/35
         - 1s - loss: 0.3310 - acc: 0.8935 - val_loss: 0.4394 - val_acc: 0.8615
Epoch 12/35
         - 1s - loss: 0.3300 - acc: 0.8950 - val_loss: 0.4053 - val_acc: 0.8667
Epoch 13/35
         - 1s - loss: 0.3185 - acc: 0.8950 - val_loss: 0.3896 - val_acc: 0.8705
Epoch 14/35
         - 1s - loss: 0.3240 - acc: 0.8901 - val_loss: 0.4030 - val_acc: 0.8641
Epoch 15/35
         - 1s - loss: 0.3173 - acc: 0.8977 - val_loss: 0.4054 - val_acc: 0.8769
Epoch 16/35
         - 1s - loss: 0.3096 - acc: 0.8977 - val_loss: 0.4072 - val_acc: 0.8417
Epoch 17/35
         - 1s - loss: 0.3152 - acc: 0.8921 - val_loss: 0.3654 - val_acc: 0.8827
Epoch 18/35
         - 1s - loss: 0.3102 - acc: 0.8889 - val_loss: 0.3850 - val_acc: 0.8705
Epoch 19/35
         - 1s - loss: 0.3164 - acc: 0.8940 - val_loss: 0.3874 - val_acc: 0.8635
Epoch 20/35
         - 1s - loss: 0.3066 - acc: 0.8970 - val_loss: 0.4197 - val_acc: 0.8577
Epoch 21/35
         - 1s - loss: 0.2999 - acc: 0.8975 - val_loss: 0.3920 - val_acc: 0.8526
Epoch 22/35
         - 1s - loss: 0.3004 - acc: 0.8957 - val_loss: 0.3654 - val_acc: 0.8692
Epoch 23/35
         - 1s - loss: 0.3008 - acc: 0.8930 - val_loss: 0.3902 - val_acc: 0.8538
Epoch 24/35
         - 1s - loss: 0.3063 - acc: 0.8933 - val_loss: 0.3859 - val_acc: 0.8788
Epoch 25/35
         - 1s - loss: 0.3007 - acc: 0.8933 - val_loss: 0.3675 - val_acc: 0.8814
Epoch 26/35
         - 1s - loss: 0.2960 - acc: 0.8975 - val_loss: 0.3598 - val_acc: 0.8814
```

```
Epoch 27/35
 - 1s - loss: 0.2765 - acc: 0.9063 - val_loss: 0.4239 - val_acc: 0.8231
Epoch 28/35
 - 1s - loss: 0.3148 - acc: 0.8901 - val_loss: 0.3735 - val_acc: 0.8795
Epoch 29/35
 - 1s - loss: 0.3054 - acc: 0.8989 - val_loss: 0.3616 - val_acc: 0.8814
Epoch 30/35
 - 1s - loss: 0.3029 - acc: 0.8911 - val_loss: 0.3685 - val_acc: 0.8718
Epoch 31/35
 - 1s - loss: 0.2825 - acc: 0.9029 - val_loss: 0.3763 - val_acc: 0.8628
Epoch 32/35
 - 1s - loss: 0.2918 - acc: 0.8982 - val_loss: 0.3556 - val_acc: 0.8776
Epoch 33/35
 - 1s - loss: 0.3010 - acc: 0.8967 - val_loss: 0.4036 - val_acc: 0.8558
Epoch 34/35
 - 1s - loss: 0.3350 - acc: 0.8844 - val_loss: 0.3819 - val_acc: 0.8737
Epoch 35/35
 - 1s - loss: 0.2853 - acc: 0.8982 - val_loss: 0.3580 - val_acc: 0.8628
Train accuracy 0.890090976149496 Test accuracy: 0.8628205128205129
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 32)	7200
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 16)	11792
dense_2 (Dense)	(None, 3)	51

```
Total params: 20,515
Trainable params: 20,515
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
```

```
Epoch 1/25
 - 2s - loss: 28.3069 - acc: 0.7991 - val_loss: 7.1424 - val_acc: 0.8686
Epoch 2/25
 - 1s - loss: 2.7912 - acc: 0.8628 - val_loss: 0.9277 - val_acc: 0.8487
Epoch 3/25
 - 1s - loss: 0.4968 - acc: 0.8721 - val_loss: 0.6212 - val_acc: 0.7910
Epoch 4/25
 - 1s - loss: 0.3805 - acc: 0.8849 - val_loss: 0.5867 - val_acc: 0.8032
Epoch 5/25
 - 1s - loss: 0.3498 - acc: 0.8884 - val_loss: 0.5896 - val_acc: 0.8327
Epoch 6/25
 - 1s - loss: 0.3464 - acc: 0.8862 - val_loss: 0.4605 - val_acc: 0.8538
Epoch 7/25
 - 1s - loss: 0.3276 - acc: 0.8918 - val_loss: 0.4513 - val_acc: 0.8628
Epoch 8/25
 - 1s - loss: 0.3158 - acc: 0.8977 - val_loss: 0.4758 - val_acc: 0.8186
Epoch 9/25
 - 1s - loss: 0.3112 - acc: 0.8955 - val_loss: 0.4620 - val_acc: 0.8603
Epoch 10/25
 - 1s - loss: 0.3190 - acc: 0.8935 - val_loss: 0.4491 - val_acc: 0.8756
Epoch 11/25
 - 1s - loss: 0.3127 - acc: 0.8945 - val_loss: 0.4407 - val_acc: 0.8654
Epoch 12/25
 - 1s - loss: 0.3101 - acc: 0.8913 - val_loss: 0.4230 - val_acc: 0.8731
Epoch 13/25
 - 1s - loss: 0.3117 - acc: 0.8994 - val_loss: 0.4087 - val_acc: 0.8865
Epoch 14/25
 - 1s - loss: 0.3024 - acc: 0.8994 - val_loss: 0.5393 - val_acc: 0.8429
Epoch 15/25
 - 1s - loss: 0.3179 - acc: 0.8886 - val_loss: 0.4468 - val_acc: 0.8731
Epoch 16/25
 - 1s - loss: 0.3022 - acc: 0.8948 - val_loss: 0.4177 - val_acc: 0.8795
Epoch 17/25
 - 1s - loss: 0.3229 - acc: 0.8945 - val_loss: 0.4456 - val_acc: 0.8538
Epoch 18/25
 - 1s - loss: 0.3034 - acc: 0.8972 - val_loss: 0.3996 - val_acc: 0.8724
Epoch 19/25
 - 1s - loss: 0.3020 - acc: 0.8955 - val_loss: 0.4095 - val_acc: 0.8795
Epoch 20/25
 - 1s - loss: 0.3028 - acc: 0.8948 - val_loss: 0.7896 - val_acc: 0.6282
Epoch 21/25
 - 1s - loss: 0.3024 - acc: 0.8960 - val_loss: 0.4102 - val_acc: 0.8686
Epoch 22/25
```

```
 - 1s - loss: 0.2996 - acc: 0.8957 - val_loss: 0.4019 - val_acc: 0.8814
Epoch 23/25
 - 1s - loss: 0.2980 - acc: 0.8903 - val_loss: 0.4219 - val_acc: 0.8718
Epoch 24/25
 - 1s - loss: 0.2947 - acc: 0.8980 - val_loss: 0.4129 - val_acc: 0.8654
Epoch 25/25
 - 1s - loss: 0.2977 - acc: 0.8953 - val_loss: 0.5524 - val_acc: 0.8391
Train accuracy 0.8573887386279813 Test accuracy: 0.8391025641025641
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 122, 16)	3376
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 64)	62528
dense_2 (Dense)	(None, 3)	195

```
Total params: 67,275
Trainable params: 67,275
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 52.5465 - acc: 0.8552 - val_loss: 0.6564 - val_acc: 0.8090
Epoch 2/30
 - 2s - loss: 0.4335 - acc: 0.8640 - val_loss: 0.4309 - val_acc: 0.8564
Epoch 3/30
 - 2s - loss: 0.3753 - acc: 0.8741 - val_loss: 0.4580 - val_acc: 0.8276
Epoch 4/30
 - 2s - loss: 0.3516 - acc: 0.8832 - val_loss: 0.3662 - val_acc: 0.8718
Epoch 5/30
 - 2s - loss: 0.3548 - acc: 0.8756 - val_loss: 0.3697 - val_acc: 0.8615
Epoch 6/30
```

```
         - 2s - loss: 0.3460 - acc: 0.8798 - val_loss: 0.4409 - val_acc: 0.8103
Epoch 7/30
         - 2s - loss: 0.3392 - acc: 0.8847 - val_loss: 0.3772 - val_acc: 0.8692
Epoch 8/30
         - 2s - loss: 0.3387 - acc: 0.8859 - val_loss: 0.5056 - val_acc: 0.8321
Epoch 9/30
         - 2s - loss: 0.3362 - acc: 0.8830 - val_loss: 0.4326 - val_acc: 0.8519
Epoch 10/30
         - 2s - loss: 0.3456 - acc: 0.8807 - val_loss: 0.3775 - val_acc: 0.8769
Epoch 11/30
         - 2s - loss: 0.3418 - acc: 0.8913 - val_loss: 0.6412 - val_acc: 0.6962
Epoch 12/30
         - 2s - loss: 0.3384 - acc: 0.8847 - val_loss: 0.3659 - val_acc: 0.8622
Epoch 13/30
         - 2s - loss: 0.3363 - acc: 0.8822 - val_loss: 0.4465 - val_acc: 0.8397
Epoch 14/30
         - 2s - loss: 0.3300 - acc: 0.8876 - val_loss: 0.5270 - val_acc: 0.7417
Epoch 15/30
         - 2s - loss: 0.3244 - acc: 0.8906 - val_loss: 0.3348 - val_acc: 0.8737
Epoch 16/30
         - 2s - loss: 0.3306 - acc: 0.8884 - val_loss: 0.3609 - val_acc: 0.8782
Epoch 17/30
         - 2s - loss: 0.3214 - acc: 0.8884 - val_loss: 0.5083 - val_acc: 0.8545
Epoch 18/30
         - 2s - loss: 0.3165 - acc: 0.8898 - val_loss: 0.5304 - val_acc: 0.8596
Epoch 19/30
         - 2s - loss: 0.3221 - acc: 0.8908 - val_loss: 0.4412 - val_acc: 0.8679
Epoch 20/30
         - 2s - loss: 0.3177 - acc: 0.8930 - val_loss: 0.3984 - val_acc: 0.8667
Epoch 21/30
         - 2s - loss: 0.3084 - acc: 0.8879 - val_loss: 0.5146 - val_acc: 0.8481
Epoch 22/30
         - 2s - loss: 0.3205 - acc: 0.8876 - val_loss: 0.5759 - val_acc: 0.8199
Epoch 23/30
         - 2s - loss: 0.3208 - acc: 0.8898 - val_loss: 0.3520 - val_acc: 0.8731
Epoch 24/30
         - 2s - loss: 0.3187 - acc: 0.8871 - val_loss: 0.3750 - val_acc: 0.8692
Epoch 25/30
         - 2s - loss: 0.3104 - acc: 0.8889 - val_loss: 0.3379 - val_acc: 0.8904
Epoch 26/30
         - 2s - loss: 0.3168 - acc: 0.8950 - val_loss: 0.3811 - val_acc: 0.8724
Epoch 27/30
         - 2s - loss: 0.3353 - acc: 0.8879 - val_loss: 0.3406 - val_acc: 0.8718
```

```
Epoch 28/30
 - 2s - loss: 0.3238 - acc: 0.8930 - val_loss: 0.4613 - val_acc: 0.8224
Epoch 29/30
 - 2s - loss: 0.3173 - acc: 0.8935 - val_loss: 0.3759 - val_acc: 0.8718
Epoch 30/30
 - 2s - loss: 0.3249 - acc: 0.8935 - val_loss: 0.3380 - val_acc: 0.8827
Train accuracy 0.9141873616916646 Test accuracy: 0.8826923076923077
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 120, 16)	1360
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 32)	30752
dense_2 (Dense)	(None, 3)	99

```
Total params: 34,003
Trainable params: 34,003
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 45.8780 - acc: 0.8321 - val_loss: 2.4164 - val_acc: 0.8545
Epoch 2/35
 - 1s - loss: 0.7405 - acc: 0.8780 - val_loss: 0.4873 - val_acc: 0.8500
Epoch 3/35
 - 1s - loss: 0.4056 - acc: 0.8748 - val_loss: 0.4593 - val_acc: 0.8538
Epoch 4/35
 - 1s - loss: 0.4136 - acc: 0.8613 - val_loss: 0.4638 - val_acc: 0.8455
Epoch 5/35
 - 1s - loss: 0.3844 - acc: 0.8817 - val_loss: 0.4388 - val_acc: 0.8564
Epoch 6/35
 - 1s - loss: 0.3396 - acc: 0.8891 - val_loss: 0.3843 - val_acc: 0.8705
```

```
Epoch 7/35
 - 1s - loss: 0.3619 - acc: 0.8849 - val_loss: 0.4112 - val_acc: 0.8782
Epoch 8/35
 - 1s - loss: 0.3953 - acc: 0.8805 - val_loss: 0.4559 - val_acc: 0.8353
Epoch 9/35
 - 1s - loss: 0.4188 - acc: 0.8849 - val_loss: 0.3881 - val_acc: 0.8660
Epoch 10/35
 - 1s - loss: 0.3376 - acc: 0.8906 - val_loss: 0.3924 - val_acc: 0.8660
Epoch 11/35
 - 1s - loss: 0.3819 - acc: 0.8748 - val_loss: 0.4235 - val_acc: 0.8532
Epoch 12/35
 - 1s - loss: 0.3517 - acc: 0.8822 - val_loss: 0.4019 - val_acc: 0.8654
Epoch 13/35
 - 1s - loss: 0.3412 - acc: 0.8857 - val_loss: 0.3997 - val_acc: 0.8577
Epoch 14/35
 - 1s - loss: 0.3434 - acc: 0.8876 - val_loss: 0.4417 - val_acc: 0.8282
Epoch 15/35
 - 1s - loss: 0.3508 - acc: 0.8756 - val_loss: 0.3992 - val_acc: 0.8660
Epoch 16/35
 - 1s - loss: 0.3615 - acc: 0.8891 - val_loss: 0.4111 - val_acc: 0.8397
Epoch 17/35
 - 1s - loss: 0.3576 - acc: 0.8898 - val_loss: 0.4121 - val_acc: 0.8615
Epoch 18/35
 - 1s - loss: 0.3539 - acc: 0.8768 - val_loss: 0.4246 - val_acc: 0.8436
Epoch 19/35
 - 1s - loss: 0.3425 - acc: 0.8839 - val_loss: 0.4360 - val_acc: 0.8365
Epoch 20/35
 - 1s - loss: 0.3288 - acc: 0.8921 - val_loss: 0.4256 - val_acc: 0.8526
Epoch 21/35
 - 1s - loss: 0.3389 - acc: 0.8854 - val_loss: 0.3892 - val_acc: 0.8667
Epoch 22/35
 - 1s - loss: 0.3450 - acc: 0.8871 - val_loss: 0.3797 - val_acc: 0.8622
Epoch 23/35
 - 1s - loss: 0.5197 - acc: 0.8301 - val_loss: 0.4272 - val_acc: 0.8692
Epoch 24/35
 - 1s - loss: 0.3337 - acc: 0.8812 - val_loss: 0.3985 - val_acc: 0.8603
Epoch 25/35
 - 1s - loss: 0.3279 - acc: 0.8962 - val_loss: 0.3604 - val_acc: 0.8603
Epoch 26/35
 - 1s - loss: 0.3440 - acc: 0.8857 - val_loss: 0.4227 - val_acc: 0.8365
Epoch 27/35
 - 1s - loss: 0.3158 - acc: 0.8967 - val_loss: 0.3776 - val_acc: 0.8731
Epoch 28/35
```

```
 - 1s - loss: 0.3277 - acc: 0.8894 - val_loss: 0.4105 - val_acc: 0.8692
Epoch 29/35
 - 1s - loss: 0.3337 - acc: 0.8906 - val_loss: 0.5340 - val_acc: 0.7955
Epoch 30/35
 - 1s - loss: 0.3752 - acc: 0.8660 - val_loss: 0.3709 - val_acc: 0.8782
Epoch 31/35
 - 1s - loss: 0.3132 - acc: 0.8901 - val_loss: 0.4068 - val_acc: 0.8596
Epoch 32/35
 - 1s - loss: 0.3069 - acc: 0.8953 - val_loss: 0.3925 - val_acc: 0.8609
Epoch 33/35
 - 1s - loss: 0.3195 - acc: 0.8871 - val_loss: 0.3845 - val_acc: 0.8615
Epoch 34/35
 - 1s - loss: 0.3372 - acc: 0.8854 - val_loss: 0.4420 - val_acc: 0.8391
Epoch 35/35
 - 1s - loss: 0.3808 - acc: 0.8832 - val_loss: 0.3866 - val_acc: 0.8551
Train accuracy 0.8812392426850258 Test accuracy: 0.8551282051282051
--------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
_____
conv1d_2 (Conv1D)            (None, 122, 32)           3104
_____
dropout_1 (Dropout)          (None, 122, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 32)            0
_____
flatten_1 (Flatten)          (None, 1280)              0
_____
dense_1 (Dense)              (None, 64)                81984
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 86,755
Trainable params: 86,755
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 46.6903 - acc: 0.8291 - val_loss: 21.6544 - val_acc: 0.8667
Epoch 2/25
```

```
         - 1s - loss: 10.5558 - acc: 0.8982 - val_loss: 3.5127 - val_acc: 0.8814
Epoch 3/25
         - 1s - loss: 1.6898 - acc: 0.8923 - val_loss: 0.9691 - val_acc: 0.8359
Epoch 4/25
         - 2s - loss: 0.6299 - acc: 0.9026 - val_loss: 0.6433 - val_acc: 0.8301
Epoch 5/25
         - 1s - loss: 0.4345 - acc: 0.9007 - val_loss: 0.5532 - val_acc: 0.8583
Epoch 6/25
         - 1s - loss: 0.3595 - acc: 0.9056 - val_loss: 0.4813 - val_acc: 0.8609
Epoch 7/25
         - 1s - loss: 0.3353 - acc: 0.8987 - val_loss: 0.4140 - val_acc: 0.8769
Epoch 8/25
         - 1s - loss: 0.2969 - acc: 0.9127 - val_loss: 0.4302 - val_acc: 0.8321
Epoch 9/25
         - 1s - loss: 0.2823 - acc: 0.9125 - val_loss: 0.3604 - val_acc: 0.8782
Epoch 10/25
         - 1s - loss: 0.2867 - acc: 0.9071 - val_loss: 0.3587 - val_acc: 0.8654
Epoch 11/25
         - 1s - loss: 0.2623 - acc: 0.9139 - val_loss: 0.3386 - val_acc: 0.8846
Epoch 12/25
         - 1s - loss: 0.2689 - acc: 0.9083 - val_loss: 0.3312 - val_acc: 0.8878
Epoch 13/25
         - 1s - loss: 0.2604 - acc: 0.9169 - val_loss: 0.3235 - val_acc: 0.8936
Epoch 14/25
         - 1s - loss: 0.2529 - acc: 0.9176 - val_loss: 0.3551 - val_acc: 0.8859
Epoch 15/25
         - 1s - loss: 0.2555 - acc: 0.9191 - val_loss: 0.3550 - val_acc: 0.8628
Epoch 16/25
         - 1s - loss: 0.2528 - acc: 0.9162 - val_loss: 0.3100 - val_acc: 0.8942
Epoch 17/25
         - 1s - loss: 0.2545 - acc: 0.9166 - val_loss: 0.3230 - val_acc: 0.8833
Epoch 18/25
         - 1s - loss: 0.2442 - acc: 0.9164 - val_loss: 0.3139 - val_acc: 0.8737
Epoch 19/25
         - 1s - loss: 0.2471 - acc: 0.9115 - val_loss: 0.2999 - val_acc: 0.9000
Epoch 20/25
         - 1s - loss: 0.2447 - acc: 0.9221 - val_loss: 0.5081 - val_acc: 0.7987
Epoch 21/25
         - 1s - loss: 0.2362 - acc: 0.9260 - val_loss: 0.3236 - val_acc: 0.8795
Epoch 22/25
         - 2s - loss: 0.2391 - acc: 0.9181 - val_loss: 0.3770 - val_acc: 0.8628
Epoch 23/25
         - 1s - loss: 0.2270 - acc: 0.9257 - val_loss: 0.2971 - val_acc: 0.8949
```

```
Epoch 24/25
 - 1s - loss: 0.2394 - acc: 0.9198 - val_loss: 0.2972 - val_acc: 0.9128
Epoch 25/25
 - 1s - loss: 0.2455 - acc: 0.9208 - val_loss: 0.3122 - val_acc: 0.8859
Train accuracy 0.9245143840668798 Test accuracy: 0.8858974358974359
-----------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)            (None, 116, 16)           3600
_____
dropout_1 (Dropout)          (None, 116, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 58, 16)            0
_____
flatten_1 (Flatten)          (None, 928)               0
_____
dense_1 (Dense)              (None, 64)                59456
_____
dense_2 (Dense)              (None, 3)                 195
===============================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 4s - loss: 4.2722 - acc: 0.8439 - val_loss: 0.4968 - val_acc: 0.8397
Epoch 2/30
 - 3s - loss: 0.4019 - acc: 0.8805 - val_loss: 0.4921 - val_acc: 0.8449
Epoch 3/30
 - 3s - loss: 0.3703 - acc: 0.8822 - val_loss: 0.5092 - val_acc: 0.8256
Epoch 4/30
 - 3s - loss: 0.3571 - acc: 0.8911 - val_loss: 0.3577 - val_acc: 0.8647
Epoch 5/30
 - 3s - loss: 0.3494 - acc: 0.8918 - val_loss: 0.4539 - val_acc: 0.8506
Epoch 6/30
 - 3s - loss: 0.3295 - acc: 0.8911 - val_loss: 0.5556 - val_acc: 0.8385
Epoch 7/30
 - 3s - loss: 0.3057 - acc: 0.8896 - val_loss: 0.3597 - val_acc: 0.8468
```

```
Epoch 8/30
 - 3s - loss: 0.3543 - acc: 0.8847 - val_loss: 0.4036 - val_acc: 0.8385
Epoch 9/30
 - 3s - loss: 0.3250 - acc: 0.8854 - val_loss: 0.5840 - val_acc: 0.8538
Epoch 10/30
 - 3s - loss: 0.3429 - acc: 0.8857 - val_loss: 0.5319 - val_acc: 0.8628
Epoch 11/30
 - 3s - loss: 0.3379 - acc: 0.8903 - val_loss: 0.4500 - val_acc: 0.7462
Epoch 12/30
 - 3s - loss: 0.3100 - acc: 0.8886 - val_loss: 0.3369 - val_acc: 0.8660
Epoch 13/30
 - 3s - loss: 0.3230 - acc: 0.8876 - val_loss: 0.3687 - val_acc: 0.8558
Epoch 14/30
 - 3s - loss: 0.3439 - acc: 0.8896 - val_loss: 0.4574 - val_acc: 0.7705
Epoch 15/30
 - 3s - loss: 0.3081 - acc: 0.8935 - val_loss: 0.3982 - val_acc: 0.8590
Epoch 16/30
 - 3s - loss: 0.3398 - acc: 0.8908 - val_loss: 0.3592 - val_acc: 0.8833
Epoch 17/30
 - 3s - loss: 0.3165 - acc: 0.8923 - val_loss: 0.6060 - val_acc: 0.8545
Epoch 18/30
 - 3s - loss: 0.3094 - acc: 0.8955 - val_loss: 0.6460 - val_acc: 0.8506
Epoch 19/30
 - 3s - loss: 0.3141 - acc: 0.8948 - val_loss: 0.3548 - val_acc: 0.8814
Epoch 20/30
 - 3s - loss: 0.3229 - acc: 0.8916 - val_loss: 0.4887 - val_acc: 0.8558
Epoch 21/30
 - 3s - loss: 0.3283 - acc: 0.8940 - val_loss: 0.5115 - val_acc: 0.8590
Epoch 22/30
 - 3s - loss: 0.3070 - acc: 0.8891 - val_loss: 0.6118 - val_acc: 0.6878
Epoch 23/30
 - 3s - loss: 0.3187 - acc: 0.8896 - val_loss: 0.3359 - val_acc: 0.8679
Epoch 24/30
 - 3s - loss: 0.3231 - acc: 0.8940 - val_loss: 0.6078 - val_acc: 0.8603
Epoch 25/30
 - 3s - loss: 0.3373 - acc: 0.8871 - val_loss: 0.3849 - val_acc: 0.8667
Epoch 26/30
 - 3s - loss: 0.3189 - acc: 0.8876 - val_loss: 0.5632 - val_acc: 0.8449
Epoch 27/30
 - 3s - loss: 0.3333 - acc: 0.8906 - val_loss: 0.5917 - val_acc: 0.8564
Epoch 28/30
 - 3s - loss: 0.3210 - acc: 0.8913 - val_loss: 0.4286 - val_acc: 0.8462
Epoch 29/30
```

```
 - 3s - loss: 0.3077 - acc: 0.8957 - val_loss: 0.3517 - val_acc: 0.8724
Epoch 30/30
 - 3s - loss: 0.3057 - acc: 0.8985 - val_loss: 0.5813 - val_acc: 0.8628
Train accuracy 0.9112367838701746 Test accuracy: 0.8628205128205129
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 122, 16)	3376
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0
dense_1 (Dense)	(None, 32)	12320
dense_2 (Dense)	(None, 3)	99

```
=================================================================
Total params: 16,971
Trainable params: 16,971
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 41.7235 - acc: 0.8483 - val_loss: 13.4304 - val_acc: 0.8673
Epoch 2/35
 - 1s - loss: 5.7498 - acc: 0.9014 - val_loss: 1.9041 - val_acc: 0.8538
Epoch 3/35
 - 1s - loss: 0.8308 - acc: 0.8987 - val_loss: 0.5992 - val_acc: 0.8654
Epoch 4/35
 - 1s - loss: 0.3762 - acc: 0.8975 - val_loss: 0.4779 - val_acc: 0.8526
Epoch 5/35
 - 1s - loss: 0.3388 - acc: 0.8908 - val_loss: 0.4659 - val_acc: 0.8583
Epoch 6/35
 - 1s - loss: 0.3239 - acc: 0.8953 - val_loss: 0.7361 - val_acc: 0.6974
Epoch 7/35
 - 1s - loss: 0.3957 - acc: 0.8839 - val_loss: 0.5072 - val_acc: 0.8474
Epoch 8/35
```

```
          - 1s - loss: 0.3332 - acc: 0.8930 - val_loss: 0.4585 - val_acc: 0.8782
Epoch 9/35
          - 1s - loss: 0.3091 - acc: 0.9036 - val_loss: 0.4323 - val_acc: 0.8692
Epoch 10/35
          - 1s - loss: 0.3091 - acc: 0.8999 - val_loss: 0.4502 - val_acc: 0.8590
Epoch 11/35
          - 1s - loss: 0.3146 - acc: 0.9007 - val_loss: 0.4536 - val_acc: 0.8801
Epoch 12/35
          - 1s - loss: 0.3014 - acc: 0.8975 - val_loss: 0.4331 - val_acc: 0.8667
Epoch 13/35
          - 1s - loss: 0.2938 - acc: 0.9073 - val_loss: 0.3960 - val_acc: 0.8846
Epoch 14/35
          - 1s - loss: 0.2842 - acc: 0.9029 - val_loss: 0.4344 - val_acc: 0.8609
Epoch 15/35
          - 1s - loss: 0.2899 - acc: 0.9021 - val_loss: 0.4369 - val_acc: 0.8628
Epoch 16/35
          - 1s - loss: 0.3358 - acc: 0.8980 - val_loss: 0.4143 - val_acc: 0.8679
Epoch 17/35
          - 1s - loss: 0.3120 - acc: 0.8925 - val_loss: 0.3912 - val_acc: 0.8731
Epoch 18/35
          - 1s - loss: 0.3092 - acc: 0.8987 - val_loss: 0.4243 - val_acc: 0.8776
Epoch 19/35
          - 1s - loss: 0.2864 - acc: 0.9007 - val_loss: 0.4309 - val_acc: 0.8654
Epoch 20/35
          - 1s - loss: 0.2886 - acc: 0.9090 - val_loss: 0.4394 - val_acc: 0.8763
Epoch 21/35
          - 1s - loss: 0.2754 - acc: 0.9085 - val_loss: 0.4333 - val_acc: 0.8500
Epoch 22/35
          - 1s - loss: 0.2853 - acc: 0.9034 - val_loss: 0.4497 - val_acc: 0.8660
Epoch 23/35
          - 1s - loss: 0.3028 - acc: 0.9012 - val_loss: 0.3857 - val_acc: 0.8853
Epoch 24/35
          - 1s - loss: 0.3190 - acc: 0.9002 - val_loss: 0.3917 - val_acc: 0.8724
Epoch 25/35
          - 1s - loss: 0.2840 - acc: 0.9021 - val_loss: 0.3642 - val_acc: 0.8840
Epoch 26/35
          - 1s - loss: 0.2804 - acc: 0.9046 - val_loss: 0.3831 - val_acc: 0.8782
Epoch 27/35
          - 1s - loss: 0.2630 - acc: 0.9107 - val_loss: 0.4150 - val_acc: 0.8577
Epoch 28/35
          - 1s - loss: 0.3237 - acc: 0.8903 - val_loss: 0.3801 - val_acc: 0.8878
Epoch 29/35
          - 1s - loss: 0.2813 - acc: 0.9100 - val_loss: 0.3727 - val_acc: 0.8865
```

```
Epoch 30/35
 - 1s - loss: 0.2768 - acc: 0.9053 - val_loss: 0.4320 - val_acc: 0.8571
Epoch 31/35
 - 1s - loss: 0.2788 - acc: 0.9110 - val_loss: 0.4100 - val_acc: 0.8686
Epoch 32/35
 - 1s - loss: 0.2631 - acc: 0.9098 - val_loss: 0.4241 - val_acc: 0.8301
Epoch 33/35
 - 1s - loss: 0.2849 - acc: 0.9088 - val_loss: 0.4756 - val_acc: 0.8032
Epoch 34/35
 - 1s - loss: 0.2914 - acc: 0.9026 - val_loss: 0.4020 - val_acc: 0.8795
Epoch 35/35
 - 1s - loss: 0.2728 - acc: 0.9107 - val_loss: 0.4020 - val_acc: 0.8769
Train accuracy 0.8969756577329727 Test accuracy: 0.8769230769230769
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 32)	3104
dropout_1 (Dropout)	(None, 122, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 32)	0
flatten_1 (Flatten)	(None, 1952)	0
dense_1 (Dense)	(None, 16)	31248
dense_2 (Dense)	(None, 3)	51

```
Total params: 35,875
Trainable params: 35,875
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 3s - loss: 19.4982 - acc: 0.8360 - val_loss: 0.9021 - val_acc: 0.7244
Epoch 2/30
 - 2s - loss: 0.4458 - acc: 0.8618 - val_loss: 0.5058 - val_acc: 0.8474
Epoch 3/30
 - 2s - loss: 0.3918 - acc: 0.8746 - val_loss: 0.4610 - val_acc: 0.8333
```

```
Epoch 4/30
 - 2s - loss: 0.3691 - acc: 0.8864 - val_loss: 0.4135 - val_acc: 0.8423
Epoch 5/30
 - 2s - loss: 0.3640 - acc: 0.8842 - val_loss: 0.4855 - val_acc: 0.8128
Epoch 6/30
 - 2s - loss: 0.3469 - acc: 0.8854 - val_loss: 0.4867 - val_acc: 0.8000
Epoch 7/30
 - 2s - loss: 0.3520 - acc: 0.8866 - val_loss: 0.3838 - val_acc: 0.8628
Epoch 8/30
 - 2s - loss: 0.3661 - acc: 0.8780 - val_loss: 0.4235 - val_acc: 0.8346
Epoch 9/30
 - 2s - loss: 0.3347 - acc: 0.8898 - val_loss: 0.3832 - val_acc: 0.8782
Epoch 10/30
 - 2s - loss: 0.3440 - acc: 0.8842 - val_loss: 0.3684 - val_acc: 0.8776
Epoch 11/30
 - 2s - loss: 0.3299 - acc: 0.8874 - val_loss: 0.6600 - val_acc: 0.6853
Epoch 12/30
 - 2s - loss: 0.3413 - acc: 0.8874 - val_loss: 0.4796 - val_acc: 0.7968
Epoch 13/30
 - 2s - loss: 0.3597 - acc: 0.8785 - val_loss: 0.4552 - val_acc: 0.8045
Epoch 14/30
 - 2s - loss: 0.3473 - acc: 0.8830 - val_loss: 0.6236 - val_acc: 0.7071
Epoch 15/30
 - 2s - loss: 0.3320 - acc: 0.8884 - val_loss: 0.3361 - val_acc: 0.8731
Epoch 16/30
 - 2s - loss: 0.3479 - acc: 0.8842 - val_loss: 0.4142 - val_acc: 0.8538
Epoch 17/30
 - 2s - loss: 0.3374 - acc: 0.8847 - val_loss: 0.4251 - val_acc: 0.8571
Epoch 18/30
 - 2s - loss: 0.3406 - acc: 0.8866 - val_loss: 0.3728 - val_acc: 0.8827
Epoch 19/30
 - 2s - loss: 0.3275 - acc: 0.8866 - val_loss: 0.3588 - val_acc: 0.8731
Epoch 20/30
 - 2s - loss: 0.3214 - acc: 0.8928 - val_loss: 0.3749 - val_acc: 0.8641
Epoch 21/30
 - 2s - loss: 0.3295 - acc: 0.8857 - val_loss: 0.3679 - val_acc: 0.8686
Epoch 22/30
 - 2s - loss: 0.3290 - acc: 0.8842 - val_loss: 0.4216 - val_acc: 0.8333
Epoch 23/30
 - 2s - loss: 0.3414 - acc: 0.8805 - val_loss: 0.3559 - val_acc: 0.8724
Epoch 24/30
 - 2s - loss: 0.3270 - acc: 0.8869 - val_loss: 0.3590 - val_acc: 0.8692
Epoch 25/30
```

```
 - 2s - loss: 0.3269 - acc: 0.8805 - val_loss: 0.3393 - val_acc: 0.8718
Epoch 26/30
 - 2s - loss: 0.3343 - acc: 0.8835 - val_loss: 0.3589 - val_acc: 0.8776
Epoch 27/30
 - 2s - loss: 0.3307 - acc: 0.8852 - val_loss: 0.4721 - val_acc: 0.8481
Epoch 28/30
 - 2s - loss: 0.3318 - acc: 0.8869 - val_loss: 0.5002 - val_acc: 0.7353
Epoch 29/30
 - 2s - loss: 0.3237 - acc: 0.8876 - val_loss: 0.3974 - val_acc: 0.8635
Epoch 30/30
 - 2s - loss: 0.3231 - acc: 0.8854 - val_loss: 0.3540 - val_acc: 0.8699
Train accuracy 0.9117285468404229 Test accuracy: 0.8698717948717949
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 28)	1288
conv1d_2 (Conv1D)	(None, 122, 16)	1360
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 16)	0
flatten_1 (Flatten)	(None, 640)	0
dense_1 (Dense)	(None, 64)	41024
dense_2 (Dense)	(None, 3)	195

```
Total params: 43,867
Trainable params: 43,867
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 1s - loss: 96.6573 - acc: 0.7846 - val_loss: 34.2556 - val_acc: 0.8583
Epoch 2/25
 - 1s - loss: 13.4513 - acc: 0.8473 - val_loss: 2.4480 - val_acc: 0.8006
Epoch 3/25
 - 1s - loss: 0.8474 - acc: 0.8539 - val_loss: 0.5500 - val_acc: 0.8141
Epoch 4/25
```

```
       - 1s - loss: 0.4364 - acc: 0.8716 - val_loss: 0.5517 - val_acc: 0.7750
Epoch 5/25
       - 1s - loss: 0.4180 - acc: 0.8744 - val_loss: 0.5910 - val_acc: 0.7981
Epoch 6/25
       - 1s - loss: 0.3970 - acc: 0.8744 - val_loss: 0.4580 - val_acc: 0.8724
Epoch 7/25
       - 1s - loss: 0.3861 - acc: 0.8761 - val_loss: 0.4195 - val_acc: 0.8609
Epoch 8/25
       - 1s - loss: 0.3791 - acc: 0.8734 - val_loss: 0.4660 - val_acc: 0.8417
Epoch 9/25
       - 1s - loss: 0.3722 - acc: 0.8822 - val_loss: 0.4663 - val_acc: 0.8359
Epoch 10/25
       - 1s - loss: 0.3751 - acc: 0.8785 - val_loss: 0.4009 - val_acc: 0.8756
Epoch 11/25
       - 1s - loss: 0.3641 - acc: 0.8790 - val_loss: 0.4369 - val_acc: 0.8487
Epoch 12/25
       - 1s - loss: 0.3606 - acc: 0.8825 - val_loss: 0.3942 - val_acc: 0.8737
Epoch 13/25
       - 1s - loss: 0.3538 - acc: 0.8857 - val_loss: 0.3865 - val_acc: 0.8814
Epoch 14/25
       - 1s - loss: 0.3543 - acc: 0.8886 - val_loss: 0.5749 - val_acc: 0.8077
Epoch 15/25
       - 1s - loss: 0.3548 - acc: 0.8812 - val_loss: 0.4317 - val_acc: 0.8628
Epoch 16/25
       - 1s - loss: 0.3629 - acc: 0.8854 - val_loss: 0.4031 - val_acc: 0.8654
Epoch 17/25
       - 1s - loss: 0.3446 - acc: 0.8871 - val_loss: 0.3834 - val_acc: 0.8724
Epoch 18/25
       - 1s - loss: 0.3694 - acc: 0.8771 - val_loss: 0.4248 - val_acc: 0.8795
Epoch 19/25
       - 1s - loss: 0.3385 - acc: 0.8874 - val_loss: 0.4589 - val_acc: 0.8417
Epoch 20/25
       - 1s - loss: 0.3447 - acc: 0.8832 - val_loss: 0.9289 - val_acc: 0.6468
Epoch 21/25
       - 1s - loss: 0.3490 - acc: 0.8839 - val_loss: 0.3921 - val_acc: 0.8577
Epoch 22/25
       - 1s - loss: 0.3359 - acc: 0.8891 - val_loss: 0.4704 - val_acc: 0.8564
Epoch 23/25
       - 1s - loss: 0.3546 - acc: 0.8795 - val_loss: 0.4421 - val_acc: 0.8577
Epoch 24/25
       - 1s - loss: 0.3437 - acc: 0.8827 - val_loss: 0.4323 - val_acc: 0.8609
Epoch 25/25
       - 1s - loss: 0.3402 - acc: 0.8839 - val_loss: 0.5807 - val_acc: 0.8417
```

```
Train accuracy 0.8728792721908041 Test accuracy: 0.8416666666666667
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 24)	5400
dropout_1 (Dropout)	(None, 116, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 58, 24)	0
flatten_1 (Flatten)	(None, 1392)	0
dense_1 (Dense)	(None, 64)	89152
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 96,795
Trainable params: 96,795
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 80.7895 - acc: 0.8097 - val_loss: 40.2483 - val_acc: 0.8474
Epoch 2/30
 - 1s - loss: 22.3255 - acc: 0.8716 - val_loss: 10.2429 - val_acc: 0.8647
Epoch 3/30
 - 1s - loss: 5.3971 - acc: 0.8783 - val_loss: 2.2388 - val_acc: 0.8128
Epoch 4/30
 - 1s - loss: 1.0119 - acc: 0.8852 - val_loss: 0.6936 - val_acc: 0.7936
Epoch 5/30
 - 1s - loss: 0.3791 - acc: 0.8923 - val_loss: 0.4846 - val_acc: 0.8474
Epoch 6/30
 - 1s - loss: 0.3220 - acc: 0.8933 - val_loss: 0.3741 - val_acc: 0.8699
Epoch 7/30
 - 1s - loss: 0.3080 - acc: 0.8930 - val_loss: 0.3646 - val_acc: 0.8853
Epoch 8/30
 - 1s - loss: 0.2945 - acc: 0.8997 - val_loss: 0.4360 - val_acc: 0.8308
Epoch 9/30
 - 1s - loss: 0.2951 - acc: 0.9034 - val_loss: 0.3705 - val_acc: 0.8564
```

```
Epoch 10/30
 - 1s - loss: 0.2957 - acc: 0.8967 - val_loss: 0.4394 - val_acc: 0.8660
Epoch 11/30
 - 1s - loss: 0.2922 - acc: 0.8948 - val_loss: 0.3827 - val_acc: 0.8744
Epoch 12/30
 - 1s - loss: 0.2816 - acc: 0.9014 - val_loss: 0.3454 - val_acc: 0.8744
Epoch 13/30
 - 1s - loss: 0.2775 - acc: 0.9036 - val_loss: 0.3364 - val_acc: 0.8808
Epoch 14/30
 - 1s - loss: 0.2769 - acc: 0.9039 - val_loss: 0.3716 - val_acc: 0.8679
Epoch 15/30
 - 1s - loss: 0.2818 - acc: 0.8972 - val_loss: 0.3593 - val_acc: 0.8686
Epoch 16/30
 - 1s - loss: 0.2834 - acc: 0.8994 - val_loss: 0.3387 - val_acc: 0.8776
Epoch 17/30
 - 1s - loss: 0.2726 - acc: 0.9061 - val_loss: 0.3338 - val_acc: 0.8731
Epoch 18/30
 - 1s - loss: 0.2727 - acc: 0.9019 - val_loss: 0.3534 - val_acc: 0.8564
Epoch 19/30
 - 1s - loss: 0.2819 - acc: 0.8955 - val_loss: 0.3407 - val_acc: 0.8763
Epoch 20/30
 - 1s - loss: 0.2700 - acc: 0.8977 - val_loss: 0.3633 - val_acc: 0.8692
Epoch 21/30
 - 1s - loss: 0.2717 - acc: 0.9026 - val_loss: 0.3397 - val_acc: 0.8699
Epoch 22/30
 - 1s - loss: 0.2720 - acc: 0.8975 - val_loss: 0.3513 - val_acc: 0.8699
Epoch 23/30
 - 1s - loss: 0.2738 - acc: 0.8957 - val_loss: 0.3350 - val_acc: 0.8763
Epoch 24/30
 - 1s - loss: 0.2692 - acc: 0.9014 - val_loss: 0.3397 - val_acc: 0.8692
Epoch 25/30
 - 1s - loss: 0.2786 - acc: 0.8982 - val_loss: 0.3711 - val_acc: 0.8686
Epoch 26/30
 - 1s - loss: 0.2741 - acc: 0.8985 - val_loss: 0.3366 - val_acc: 0.8788
Epoch 27/30
 - 1s - loss: 0.2761 - acc: 0.8982 - val_loss: 0.3363 - val_acc: 0.8641
Epoch 28/30
 - 1s - loss: 0.2689 - acc: 0.8987 - val_loss: 0.3610 - val_acc: 0.8712
Epoch 29/30
 - 1s - loss: 0.2774 - acc: 0.8980 - val_loss: 0.3314 - val_acc: 0.8795
Epoch 30/30
 - 1s - loss: 0.2761 - acc: 0.8999 - val_loss: 0.3622 - val_acc: 0.8660
Train accuracy 0.8805015982296533 Test accuracy: 0.8660256410256411
```

```
------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 16)	1552
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 32)	31264
dense_2 (Dense)	(None, 3)	99

```
=================================================================
Total params: 34,387
Trainable params: 34,387
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 4s - loss: 16.7903 - acc: 0.8446 - val_loss: 1.0139 - val_acc: 0.8205
Epoch 2/30
 - 4s - loss: 0.4400 - acc: 0.8935 - val_loss: 0.3968 - val_acc: 0.8801
Epoch 3/30
 - 3s - loss: 0.3617 - acc: 0.8866 - val_loss: 0.4102 - val_acc: 0.8699
Epoch 4/30
 - 3s - loss: 0.3498 - acc: 0.8889 - val_loss: 0.4056 - val_acc: 0.8635
Epoch 5/30
 - 3s - loss: 0.3198 - acc: 0.8916 - val_loss: 0.4604 - val_acc: 0.8346
Epoch 6/30
 - 3s - loss: 0.2951 - acc: 0.8989 - val_loss: 0.3493 - val_acc: 0.8737
Epoch 7/30
 - 3s - loss: 0.3283 - acc: 0.8938 - val_loss: 0.3657 - val_acc: 0.8744
Epoch 8/30
 - 3s - loss: 0.3310 - acc: 0.8948 - val_loss: 0.4252 - val_acc: 0.8449
Epoch 9/30
 - 3s - loss: 0.3004 - acc: 0.8999 - val_loss: 0.4440 - val_acc: 0.8340
Epoch 10/30
```

```
            - 3s - loss: 0.3068 - acc: 0.8985 - val_loss: 0.3439 - val_acc: 0.8801
          Epoch 11/30
            - 3s - loss: 0.2968 - acc: 0.8965 - val_loss: 0.3549 - val_acc: 0.8635
          Epoch 12/30
            - 3s - loss: 0.2947 - acc: 0.8938 - val_loss: 0.3372 - val_acc: 0.8808
          Epoch 13/30
            - 3s - loss: 0.2934 - acc: 0.9012 - val_loss: 0.3355 - val_acc: 0.8763
          Epoch 14/30
            - 3s - loss: 0.2943 - acc: 0.8992 - val_loss: 0.3936 - val_acc: 0.8532
          Epoch 15/30
            - 3s - loss: 0.2998 - acc: 0.8997 - val_loss: 0.3552 - val_acc: 0.8788
          Epoch 16/30
            - 3s - loss: 0.3060 - acc: 0.8943 - val_loss: 0.3562 - val_acc: 0.8692
          Epoch 17/30
            - 3s - loss: 0.2871 - acc: 0.9026 - val_loss: 0.3270 - val_acc: 0.8756
          Epoch 18/30
            - 3s - loss: 0.2815 - acc: 0.8975 - val_loss: 0.3816 - val_acc: 0.8628
          Epoch 19/30
            - 3s - loss: 0.3059 - acc: 0.8896 - val_loss: 0.3353 - val_acc: 0.8750
          Epoch 20/30
            - 3s - loss: 0.2699 - acc: 0.9080 - val_loss: 0.3252 - val_acc: 0.8737
          Epoch 21/30
            - 3s - loss: 0.2771 - acc: 0.9031 - val_loss: 0.3367 - val_acc: 0.8686
          Epoch 22/30
            - 3s - loss: 0.3104 - acc: 0.8903 - val_loss: 0.3443 - val_acc: 0.8782
          Epoch 23/30
            - 3s - loss: 0.2853 - acc: 0.8994 - val_loss: 0.3356 - val_acc: 0.8769
          Epoch 24/30
            - 3s - loss: 0.2943 - acc: 0.8953 - val_loss: 0.3362 - val_acc: 0.8744
          Epoch 25/30
            - 4s - loss: 0.2792 - acc: 0.8980 - val_loss: 0.3499 - val_acc: 0.8551
          Epoch 26/30
            - 3s - loss: 0.2889 - acc: 0.9002 - val_loss: 0.3564 - val_acc: 0.8718
          Epoch 27/30
            - 3s - loss: 0.2833 - acc: 0.8953 - val_loss: 0.3469 - val_acc: 0.8718
          Epoch 28/30
            - 3s - loss: 0.2791 - acc: 0.8972 - val_loss: 0.3675 - val_acc: 0.8692
          Epoch 29/30
            - 3s - loss: 0.2775 - acc: 0.8997 - val_loss: 0.3426 - val_acc: 0.8679
          Epoch 30/30
            - 3s - loss: 0.2900 - acc: 0.8994 - val_loss: 0.4086 - val_acc: 0.8795
          Train accuracy 0.904597983771822 Test accuracy: 0.8794871794871795
          -------------------------------------------------------------------------------
```

```
_____
Layer (type)                  Output Shape              Param #
====================================================================
conv1d_1 (Conv1D)             (None, 126, 42)           1176
_____
conv1d_2 (Conv1D)             (None, 122, 16)           3376
_____
dropout_1 (Dropout)           (None, 122, 16)           0
_____
max_pooling1d_1 (MaxPooling1  (None, 24, 16)            0
_____
flatten_1 (Flatten)           (None, 384)               0
_____
dense_1 (Dense)               (None, 64)                24640
_____
dense_2 (Dense)               (None, 3)                 195
====================================================================
Total params: 29,387
Trainable params: 29,387
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 1s - loss: 88.3123 - acc: 0.8380 - val_loss: 65.8523 - val_acc: 0.8795
Epoch 2/35
 - 1s - loss: 50.5570 - acc: 0.8992 - val_loss: 37.2190 - val_acc: 0.8936
Epoch 3/35
 - 1s - loss: 27.8650 - acc: 0.9053 - val_loss: 19.7581 - val_acc: 0.8788
Epoch 4/35
 - 1s - loss: 14.0072 - acc: 0.9125 - val_loss: 9.2594 - val_acc: 0.8705
Epoch 5/35
 - 1s - loss: 6.0161 - acc: 0.9031 - val_loss: 3.5882 - val_acc: 0.8673
Epoch 6/35
 - 1s - loss: 2.0215 - acc: 0.9075 - val_loss: 1.1131 - val_acc: 0.8801
Epoch 7/35
 - 1s - loss: 0.6072 - acc: 0.9009 - val_loss: 0.4822 - val_acc: 0.8769
Epoch 8/35
 - 1s - loss: 0.3417 - acc: 0.8967 - val_loss: 0.4498 - val_acc: 0.8410
Epoch 9/35
 - 1s - loss: 0.3204 - acc: 0.9016 - val_loss: 0.4311 - val_acc: 0.8641
Epoch 10/35
 - 1s - loss: 0.3076 - acc: 0.8960 - val_loss: 0.3939 - val_acc: 0.8853
```

```
Epoch 11/35
 - 1s - loss: 0.2954 - acc: 0.9007 - val_loss: 0.3817 - val_acc: 0.8769
Epoch 12/35
 - 1s - loss: 0.2942 - acc: 0.8982 - val_loss: 0.3821 - val_acc: 0.8833
Epoch 13/35
 - 1s - loss: 0.2863 - acc: 0.9056 - val_loss: 0.3624 - val_acc: 0.8801
Epoch 14/35
 - 1s - loss: 0.2747 - acc: 0.9071 - val_loss: 0.5354 - val_acc: 0.7936
Epoch 15/35
 - 1s - loss: 0.2811 - acc: 0.9021 - val_loss: 0.4567 - val_acc: 0.8462
Epoch 16/35
 - 1s - loss: 0.2750 - acc: 0.9073 - val_loss: 0.3726 - val_acc: 0.8647
Epoch 17/35
 - 1s - loss: 0.2688 - acc: 0.9083 - val_loss: 0.3671 - val_acc: 0.8628
Epoch 18/35
 - 1s - loss: 0.2680 - acc: 0.9073 - val_loss: 0.3798 - val_acc: 0.8731
Epoch 19/35
 - 1s - loss: 0.2700 - acc: 0.9051 - val_loss: 0.3890 - val_acc: 0.8750
Epoch 20/35
 - 1s - loss: 0.2625 - acc: 0.9073 - val_loss: 0.5366 - val_acc: 0.7859
Epoch 21/35
 - 1s - loss: 0.2559 - acc: 0.9139 - val_loss: 0.3662 - val_acc: 0.8609
Epoch 22/35
 - 1s - loss: 0.2556 - acc: 0.9073 - val_loss: 0.3524 - val_acc: 0.8910
Epoch 23/35
 - 1s - loss: 0.2591 - acc: 0.9078 - val_loss: 0.3824 - val_acc: 0.8731
Epoch 24/35
 - 1s - loss: 0.2545 - acc: 0.9112 - val_loss: 0.3795 - val_acc: 0.8821
Epoch 25/35
 - 1s - loss: 0.2575 - acc: 0.9083 - val_loss: 0.3457 - val_acc: 0.8814
Epoch 26/35
 - 1s - loss: 0.2485 - acc: 0.9132 - val_loss: 0.3581 - val_acc: 0.8821
Epoch 27/35
 - 1s - loss: 0.2473 - acc: 0.9103 - val_loss: 0.3729 - val_acc: 0.8827
Epoch 28/35
 - 1s - loss: 0.2471 - acc: 0.9093 - val_loss: 0.3715 - val_acc: 0.8744
Epoch 29/35
 - 1s - loss: 0.2457 - acc: 0.9169 - val_loss: 0.3473 - val_acc: 0.8923
Epoch 30/35
 - 1s - loss: 0.2494 - acc: 0.9184 - val_loss: 0.3720 - val_acc: 0.8679
Epoch 31/35
 - 1s - loss: 0.2480 - acc: 0.9159 - val_loss: 0.3271 - val_acc: 0.8897
Epoch 32/35
```

```
 - 1s - loss: 0.2431 - acc: 0.9149 - val_loss: 0.3357 - val_acc: 0.8750
Epoch 33/35
 - 1s - loss: 0.2404 - acc: 0.9203 - val_loss: 0.3416 - val_acc: 0.8853
Epoch 34/35
 - 1s - loss: 0.2420 - acc: 0.9184 - val_loss: 0.3462 - val_acc: 0.8872
Epoch 35/35
 - 1s - loss: 0.2409 - acc: 0.9169 - val_loss: 0.3571 - val_acc: 0.8827
Train accuracy 0.904597983771822 Test accuracy: 0.8826923076923077
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 16)	23440
dense_2 (Dense)	(None, 3)	51

```
Total params: 27,291
Trainable params: 27,291
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 26.6547 - acc: 0.8549 - val_loss: 3.8163 - val_acc: 0.7910
Epoch 2/30
 - 2s - loss: 1.1559 - acc: 0.8898 - val_loss: 0.5383 - val_acc: 0.8487
Epoch 3/30
 - 2s - loss: 0.3711 - acc: 0.8896 - val_loss: 0.4926 - val_acc: 0.8423
Epoch 4/30
 - 2s - loss: 0.3315 - acc: 0.8921 - val_loss: 0.3869 - val_acc: 0.8538
Epoch 5/30
 - 2s - loss: 0.3170 - acc: 0.8960 - val_loss: 0.3781 - val_acc: 0.8641
Epoch 6/30
```

```
          - 2s - loss: 0.3130 - acc: 0.8935 - val_loss: 0.4571 - val_acc: 0.8128
      Epoch 7/30
          - 2s - loss: 0.3003 - acc: 0.8911 - val_loss: 0.3922 - val_acc: 0.8526
      Epoch 8/30
          - 2s - loss: 0.2985 - acc: 0.8906 - val_loss: 0.4293 - val_acc: 0.8308
      Epoch 9/30
          - 2s - loss: 0.2967 - acc: 0.8977 - val_loss: 0.3474 - val_acc: 0.8763
      Epoch 10/30
          - 2s - loss: 0.2883 - acc: 0.8977 - val_loss: 0.3338 - val_acc: 0.8788
      Epoch 11/30
          - 2s - loss: 0.2827 - acc: 0.8972 - val_loss: 0.5226 - val_acc: 0.7083
      Epoch 12/30
          - 2s - loss: 0.2879 - acc: 0.8965 - val_loss: 0.4005 - val_acc: 0.8282
      Epoch 13/30
          - 2s - loss: 0.2836 - acc: 0.8970 - val_loss: 0.3814 - val_acc: 0.8359
      Epoch 14/30
          - 2s - loss: 0.2779 - acc: 0.9019 - val_loss: 0.4220 - val_acc: 0.8250
      Epoch 15/30
          - 2s - loss: 0.2713 - acc: 0.9031 - val_loss: 0.3198 - val_acc: 0.8795
      Epoch 16/30
          - 2s - loss: 0.2797 - acc: 0.9048 - val_loss: 0.3243 - val_acc: 0.8814
      Epoch 17/30
          - 2s - loss: 0.2769 - acc: 0.8985 - val_loss: 0.3767 - val_acc: 0.8596
      Epoch 18/30
          - 2s - loss: 0.2694 - acc: 0.9034 - val_loss: 0.4402 - val_acc: 0.8090
      Epoch 19/30
          - 2s - loss: 0.2735 - acc: 0.8965 - val_loss: 0.3139 - val_acc: 0.8756
      Epoch 20/30
          - 2s - loss: 0.2701 - acc: 0.9068 - val_loss: 0.3086 - val_acc: 0.8788
      Epoch 21/30
          - 2s - loss: 0.2580 - acc: 0.9046 - val_loss: 0.3336 - val_acc: 0.8801
      Epoch 22/30
          - 2s - loss: 0.2684 - acc: 0.9019 - val_loss: 0.3954 - val_acc: 0.8603
      Epoch 23/30
          - 2s - loss: 0.2653 - acc: 0.8994 - val_loss: 0.3112 - val_acc: 0.8872
      Epoch 24/30
          - 2s - loss: 0.2676 - acc: 0.9026 - val_loss: 0.3631 - val_acc: 0.8622
      Epoch 25/30
          - 2s - loss: 0.2717 - acc: 0.8985 - val_loss: 0.3126 - val_acc: 0.8872
      Epoch 26/30
          - 2s - loss: 0.2756 - acc: 0.8997 - val_loss: 0.3151 - val_acc: 0.8801
      Epoch 27/30
          - 2s - loss: 0.2692 - acc: 0.9053 - val_loss: 0.3444 - val_acc: 0.8699
```

```
Epoch 28/30
 - 2s - loss: 0.2624 - acc: 0.9019 - val_loss: 0.3491 - val_acc: 0.8737
Epoch 29/30
 - 2s - loss: 0.2642 - acc: 0.9044 - val_loss: 0.3755 - val_acc: 0.8647
Epoch 30/30
 - 2s - loss: 0.2586 - acc: 0.9044 - val_loss: 0.3316 - val_acc: 0.8686
Train accuracy 0.9085320875338087 Test accuracy: 0.8685897435897436
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 120, 16)	1360
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 16)	0
flatten_1 (Flatten)	(None, 640)	0
dense_1 (Dense)	(None, 64)	41024
dense_2 (Dense)	(None, 3)	195

```
Total params: 44,371
Trainable params: 44,371
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 1s - loss: 32.2318 - acc: 0.7976 - val_loss: 19.2997 - val_acc: 0.8327
Epoch 2/25
 - 1s - loss: 11.7204 - acc: 0.8879 - val_loss: 6.0006 - val_acc: 0.8622
Epoch 3/25
 - 1s - loss: 3.1424 - acc: 0.8975 - val_loss: 1.4425 - val_acc: 0.8391
Epoch 4/25
 - 1s - loss: 0.7016 - acc: 0.9026 - val_loss: 0.5836 - val_acc: 0.8167
Epoch 5/25
 - 1s - loss: 0.3632 - acc: 0.8950 - val_loss: 0.4525 - val_acc: 0.8551
Epoch 6/25
 - 1s - loss: 0.3034 - acc: 0.8985 - val_loss: 0.3797 - val_acc: 0.8609
```

```
Epoch 7/25
 - 1s - loss: 0.2925 - acc: 0.8992 - val_loss: 0.3646 - val_acc: 0.8712
Epoch 8/25
 - 1s - loss: 0.2749 - acc: 0.9004 - val_loss: 0.3680 - val_acc: 0.8628
Epoch 9/25
 - 1s - loss: 0.2769 - acc: 0.9066 - val_loss: 0.3639 - val_acc: 0.8814
Epoch 10/25
 - 1s - loss: 0.2722 - acc: 0.8989 - val_loss: 0.3334 - val_acc: 0.8865
Epoch 11/25
 - 1s - loss: 0.2714 - acc: 0.9019 - val_loss: 0.3905 - val_acc: 0.8545
Epoch 12/25
 - 1s - loss: 0.2623 - acc: 0.9029 - val_loss: 0.3299 - val_acc: 0.8769
Epoch 13/25
 - 1s - loss: 0.2640 - acc: 0.9085 - val_loss: 0.3264 - val_acc: 0.8885
Epoch 14/25
 - 1s - loss: 0.2557 - acc: 0.9046 - val_loss: 0.3682 - val_acc: 0.8801
Epoch 15/25
 - 1s - loss: 0.2635 - acc: 0.9058 - val_loss: 0.3446 - val_acc: 0.8712
Epoch 16/25
 - 1s - loss: 0.2550 - acc: 0.9063 - val_loss: 0.3381 - val_acc: 0.8827
Epoch 17/25
 - 1s - loss: 0.2554 - acc: 0.9056 - val_loss: 0.3273 - val_acc: 0.8737
Epoch 18/25
 - 1s - loss: 0.2577 - acc: 0.9093 - val_loss: 0.3187 - val_acc: 0.8827
Epoch 19/25
 - 1s - loss: 0.2547 - acc: 0.9066 - val_loss: 0.3149 - val_acc: 0.8968
Epoch 20/25
 - 1s - loss: 0.2594 - acc: 0.9068 - val_loss: 0.3196 - val_acc: 0.8897
Epoch 21/25
 - 1s - loss: 0.2454 - acc: 0.9139 - val_loss: 0.3244 - val_acc: 0.8756
Epoch 22/25
 - 1s - loss: 0.2494 - acc: 0.9058 - val_loss: 0.3194 - val_acc: 0.8872
Epoch 23/25
 - 1s - loss: 0.2476 - acc: 0.9130 - val_loss: 0.3184 - val_acc: 0.8968
Epoch 24/25
 - 1s - loss: 0.2517 - acc: 0.9093 - val_loss: 0.3210 - val_acc: 0.8936
Epoch 25/25
 - 1s - loss: 0.2490 - acc: 0.9088 - val_loss: 0.3281 - val_acc: 0.8699
Train accuracy 0.8996803540693386 Test accuracy: 0.8698717948717949
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

```
conv1d_1 (Conv1D)              (None, 124, 32)              1472
_____
conv1d_2 (Conv1D)              (None, 122, 32)              3104
_____
dropout_1 (Dropout)            (None, 122, 32)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 61, 32)               0
_____
flatten_1 (Flatten)            (None, 1952)                 0
_____
dense_1 (Dense)                (None, 64)                   124992
_____
dense_2 (Dense)                (None, 3)                    195
=================================================================
Total params: 129,763
Trainable params: 129,763
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 10.0057 - acc: 0.8687 - val_loss: 3.4167 - val_acc: 0.8814
Epoch 2/30
 - 1s - loss: 1.7159 - acc: 0.9019 - val_loss: 0.9507 - val_acc: 0.8769
Epoch 3/30
 - 1s - loss: 0.5528 - acc: 0.9107 - val_loss: 0.4761 - val_acc: 0.8788
Epoch 4/30
 - 1s - loss: 0.3398 - acc: 0.9090 - val_loss: 0.4049 - val_acc: 0.8679
Epoch 5/30
 - 1s - loss: 0.3185 - acc: 0.9078 - val_loss: 0.4680 - val_acc: 0.8660
Epoch 6/30
 - 1s - loss: 0.2707 - acc: 0.9196 - val_loss: 0.3481 - val_acc: 0.8801
Epoch 7/30
 - 1s - loss: 0.2572 - acc: 0.9139 - val_loss: 0.3454 - val_acc: 0.8622
Epoch 8/30
 - 1s - loss: 0.2525 - acc: 0.9134 - val_loss: 0.3320 - val_acc: 0.8814
Epoch 9/30
 - 1s - loss: 0.2641 - acc: 0.9147 - val_loss: 0.3624 - val_acc: 0.8737
Epoch 10/30
 - 1s - loss: 0.2770 - acc: 0.9157 - val_loss: 0.3432 - val_acc: 0.8840
Epoch 11/30
 - 1s - loss: 0.2424 - acc: 0.9233 - val_loss: 0.3154 - val_acc: 0.8821
Epoch 12/30
```

```
         - 1s - loss: 0.2566 - acc: 0.9196 - val_loss: 0.3218 - val_acc: 0.8917
Epoch 13/30
         - 1s - loss: 0.2872 - acc: 0.9225 - val_loss: 0.3443 - val_acc: 0.8827
Epoch 14/30
         - 1s - loss: 0.2373 - acc: 0.9270 - val_loss: 0.3226 - val_acc: 0.8840
Epoch 15/30
         - 1s - loss: 0.2281 - acc: 0.9316 - val_loss: 0.3231 - val_acc: 0.9071
Epoch 16/30
         - 1s - loss: 0.2516 - acc: 0.9245 - val_loss: 0.3656 - val_acc: 0.8622
Epoch 17/30
         - 1s - loss: 0.2481 - acc: 0.9267 - val_loss: 0.2809 - val_acc: 0.9096
Epoch 18/30
         - 1s - loss: 0.2389 - acc: 0.9280 - val_loss: 0.2919 - val_acc: 0.8955
Epoch 19/30
         - 1s - loss: 0.2218 - acc: 0.9326 - val_loss: 0.3749 - val_acc: 0.8923
Epoch 20/30
         - 1s - loss: 0.2398 - acc: 0.9324 - val_loss: 0.2885 - val_acc: 0.9013
Epoch 21/30
         - 1s - loss: 0.2194 - acc: 0.9353 - val_loss: 0.3267 - val_acc: 0.8712
Epoch 22/30
         - 1s - loss: 0.2420 - acc: 0.9287 - val_loss: 0.2816 - val_acc: 0.9128
Epoch 23/30
         - 1s - loss: 0.2297 - acc: 0.9302 - val_loss: 0.2955 - val_acc: 0.8936
Epoch 24/30
         - 1s - loss: 0.2278 - acc: 0.9307 - val_loss: 0.2616 - val_acc: 0.9115
Epoch 25/30
         - 1s - loss: 0.2326 - acc: 0.9297 - val_loss: 0.2706 - val_acc: 0.9103
Epoch 26/30
         - 1s - loss: 0.2326 - acc: 0.9275 - val_loss: 0.2897 - val_acc: 0.9103
Epoch 27/30
         - 1s - loss: 0.2368 - acc: 0.9312 - val_loss: 0.2979 - val_acc: 0.8872
Epoch 28/30
         - 1s - loss: 0.2135 - acc: 0.9368 - val_loss: 0.2558 - val_acc: 0.9154
Epoch 29/30
         - 1s - loss: 0.2027 - acc: 0.9398 - val_loss: 0.2627 - val_acc: 0.9237
Epoch 30/30
         - 1s - loss: 0.2334 - acc: 0.9312 - val_loss: 0.2833 - val_acc: 0.9064
Train accuracy 0.9326284730759774 Test accuracy: 0.9064102564102564
---------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=======================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
```

```
_____
conv1d_2 (Conv1D)              (None, 118, 24)           5400
_____
dropout_1 (Dropout)            (None, 118, 24)           0
_____
max_pooling1d_1 (MaxPooling1   (None, 59, 24)            0
_____
flatten_1 (Flatten)            (None, 1416)              0
_____
dense_1 (Dense)                (None, 32)                45344
_____
dense_2 (Dense)                (None, 3)                 99
========================================================
Total params: 52,315
Trainable params: 52,315
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 22.4676 - acc: 0.8291 - val_loss: 7.0795 - val_acc: 0.8737
Epoch 2/30
 - 1s - loss: 3.4653 - acc: 0.8822 - val_loss: 1.6366 - val_acc: 0.8718
Epoch 3/30
 - 1s - loss: 0.9939 - acc: 0.8886 - val_loss: 0.7105 - val_acc: 0.8417
Epoch 4/30
 - 1s - loss: 0.4601 - acc: 0.9019 - val_loss: 0.5303 - val_acc: 0.8449
Epoch 5/30
 - 1s - loss: 0.3735 - acc: 0.8948 - val_loss: 0.4582 - val_acc: 0.8577
Epoch 6/30
 - 1s - loss: 0.3159 - acc: 0.9036 - val_loss: 0.4019 - val_acc: 0.8551
Epoch 7/30
 - 1s - loss: 0.3131 - acc: 0.8980 - val_loss: 0.4248 - val_acc: 0.8583
Epoch 8/30
 - 1s - loss: 0.2836 - acc: 0.9066 - val_loss: 0.4361 - val_acc: 0.8442
Epoch 9/30
 - 1s - loss: 0.2802 - acc: 0.9112 - val_loss: 0.3534 - val_acc: 0.8788
Epoch 10/30
 - 1s - loss: 0.2768 - acc: 0.9071 - val_loss: 0.3414 - val_acc: 0.8782
Epoch 11/30
 - 1s - loss: 0.2834 - acc: 0.9051 - val_loss: 0.3296 - val_acc: 0.8718
Epoch 12/30
 - 1s - loss: 0.2733 - acc: 0.9071 - val_loss: 0.3458 - val_acc: 0.8853
```

```
Epoch 13/30
 - 1s - loss: 0.2601 - acc: 0.9130 - val_loss: 0.3358 - val_acc: 0.8801
Epoch 14/30
 - 1s - loss: 0.2601 - acc: 0.9154 - val_loss: 0.3633 - val_acc: 0.8718
Epoch 15/30
 - 1s - loss: 0.2666 - acc: 0.9132 - val_loss: 0.3593 - val_acc: 0.8609
Epoch 16/30
 - 1s - loss: 0.2624 - acc: 0.9142 - val_loss: 0.3138 - val_acc: 0.8821
Epoch 17/30
 - 1s - loss: 0.2513 - acc: 0.9159 - val_loss: 0.3302 - val_acc: 0.8788
Epoch 18/30
 - 1s - loss: 0.2532 - acc: 0.9159 - val_loss: 0.3494 - val_acc: 0.8699
Epoch 19/30
 - 1s - loss: 0.2572 - acc: 0.9115 - val_loss: 0.3099 - val_acc: 0.8974
Epoch 20/30
 - 1s - loss: 0.2654 - acc: 0.9166 - val_loss: 0.3787 - val_acc: 0.8577
Epoch 21/30
 - 1s - loss: 0.2489 - acc: 0.9191 - val_loss: 0.3299 - val_acc: 0.8705
Epoch 22/30
 - 1s - loss: 0.2507 - acc: 0.9191 - val_loss: 0.2976 - val_acc: 0.8949
Epoch 23/30
 - 1s - loss: 0.2514 - acc: 0.9169 - val_loss: 0.3026 - val_acc: 0.9058
Epoch 24/30
 - 1s - loss: 0.2501 - acc: 0.9216 - val_loss: 0.2877 - val_acc: 0.9109
Epoch 25/30
 - 1s - loss: 0.2538 - acc: 0.9238 - val_loss: 0.3303 - val_acc: 0.8756
Epoch 26/30
 - 1s - loss: 0.2399 - acc: 0.9218 - val_loss: 0.3014 - val_acc: 0.9000
Epoch 27/30
 - 1s - loss: 0.2391 - acc: 0.9255 - val_loss: 0.2931 - val_acc: 0.8936
Epoch 28/30
 - 1s - loss: 0.2390 - acc: 0.9292 - val_loss: 0.2864 - val_acc: 0.9160
Epoch 29/30
 - 1s - loss: 0.2570 - acc: 0.9243 - val_loss: 0.2950 - val_acc: 0.9109
Epoch 30/30
 - 1s - loss: 0.2405 - acc: 0.9243 - val_loss: 0.3049 - val_acc: 0.8981
Train accuracy 0.9129579542660438 Test accuracy: 0.8980769230769231
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
```

```
conv1d_2 (Conv1D)              (None, 118, 16)              2576
_____
dropout_1 (Dropout)            (None, 118, 16)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 59, 16)               0
_____
flatten_1 (Flatten)            (None, 944)                  0
_____
dense_1 (Dense)                (None, 64)                   60480
_____
dense_2 (Dense)                (None, 3)                    195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 4s - loss: 15.9496 - acc: 0.8242 - val_loss: 0.5152 - val_acc: 0.8256
Epoch 2/35
 - 3s - loss: 0.4211 - acc: 0.8702 - val_loss: 0.4228 - val_acc: 0.8545
Epoch 3/35
 - 3s - loss: 0.3833 - acc: 0.8741 - val_loss: 0.5028 - val_acc: 0.8019
Epoch 4/35
 - 3s - loss: 0.3824 - acc: 0.8758 - val_loss: 0.3764 - val_acc: 0.8647
Epoch 5/35
 - 3s - loss: 0.3600 - acc: 0.8773 - val_loss: 0.4623 - val_acc: 0.8417
Epoch 6/35
 - 3s - loss: 0.3547 - acc: 0.8803 - val_loss: 0.4013 - val_acc: 0.8423
Epoch 7/35
 - 3s - loss: 0.3557 - acc: 0.8825 - val_loss: 0.3875 - val_acc: 0.8615
Epoch 8/35
 - 3s - loss: 0.3529 - acc: 0.8842 - val_loss: 0.6293 - val_acc: 0.8295
Epoch 9/35
 - 3s - loss: 0.3678 - acc: 0.8773 - val_loss: 0.4303 - val_acc: 0.8538
Epoch 10/35
 - 3s - loss: 0.3496 - acc: 0.8837 - val_loss: 0.4019 - val_acc: 0.8615
Epoch 11/35
 - 3s - loss: 0.3453 - acc: 0.8862 - val_loss: 0.5411 - val_acc: 0.7340
Epoch 12/35
 - 3s - loss: 0.3481 - acc: 0.8847 - val_loss: 0.4430 - val_acc: 0.8436
Epoch 13/35
```

```
         - 3s - loss: 0.3409 - acc: 0.8839 - val_loss: 0.5106 - val_acc: 0.8538
Epoch 14/35
         - 3s - loss: 0.3381 - acc: 0.8854 - val_loss: 0.4769 - val_acc: 0.7596
Epoch 15/35
         - 3s - loss: 0.3469 - acc: 0.8913 - val_loss: 0.3484 - val_acc: 0.8737
Epoch 16/35
         - 3s - loss: 0.3406 - acc: 0.8884 - val_loss: 0.4157 - val_acc: 0.8660
Epoch 17/35
         - 3s - loss: 0.3460 - acc: 0.8827 - val_loss: 0.3993 - val_acc: 0.8558
Epoch 18/35
         - 3s - loss: 0.3502 - acc: 0.8876 - val_loss: 0.5816 - val_acc: 0.8558
Epoch 19/35
         - 3s - loss: 0.3290 - acc: 0.8869 - val_loss: 0.3637 - val_acc: 0.8769
Epoch 20/35
         - 3s - loss: 0.3339 - acc: 0.8943 - val_loss: 0.3936 - val_acc: 0.8750
Epoch 21/35
         - 3s - loss: 0.3513 - acc: 0.8876 - val_loss: 0.3763 - val_acc: 0.8609
Epoch 22/35
         - 3s - loss: 0.3349 - acc: 0.8903 - val_loss: 0.4910 - val_acc: 0.7474
Epoch 23/35
         - 3s - loss: 0.3481 - acc: 0.8830 - val_loss: 0.3735 - val_acc: 0.8827
Epoch 24/35
         - 3s - loss: 0.3336 - acc: 0.8866 - val_loss: 0.4003 - val_acc: 0.8705
Epoch 25/35
         - 3s - loss: 0.3714 - acc: 0.8810 - val_loss: 0.4869 - val_acc: 0.8609
Epoch 26/35
         - 3s - loss: 0.3415 - acc: 0.8839 - val_loss: 0.4230 - val_acc: 0.8686
Epoch 27/35
         - 3s - loss: 0.3378 - acc: 0.8891 - val_loss: 0.5606 - val_acc: 0.8558
Epoch 28/35
         - 3s - loss: 0.3443 - acc: 0.8889 - val_loss: 0.5335 - val_acc: 0.7417
Epoch 29/35
         - 3s - loss: 0.3292 - acc: 0.8903 - val_loss: 0.3568 - val_acc: 0.8769
Epoch 30/35
         - 3s - loss: 0.3719 - acc: 0.8820 - val_loss: 0.3863 - val_acc: 0.8808
Epoch 31/35
         - 3s - loss: 0.3631 - acc: 0.8849 - val_loss: 0.4213 - val_acc: 0.8526
Epoch 32/35
         - 3s - loss: 0.3326 - acc: 0.8815 - val_loss: 0.5157 - val_acc: 0.8519
Epoch 33/35
         - 3s - loss: 0.3440 - acc: 0.8930 - val_loss: 0.7066 - val_acc: 0.7051
Epoch 34/35
         - 3s - loss: 0.3439 - acc: 0.8857 - val_loss: 0.3625 - val_acc: 0.8923
```

```
Epoch 35/35
 - 3s - loss: 0.3373 - acc: 0.8837 - val_loss: 0.4079 - val_acc: 0.8583
Train accuracy 0.8551758052618638 Test accuracy: 0.8583333333333333
------------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)            (None, 126, 42)           1176

conv1d_2 (Conv1D)            (None, 124, 16)           2032

dropout_1 (Dropout)          (None, 124, 16)           0

max_pooling1d_1 (MaxPooling1 (None, 24, 16)            0

flatten_1 (Flatten)          (None, 384)               0

dense_1 (Dense)              (None, 64)                24640

dense_2 (Dense)              (None, 3)                 195
===============================================================
Total params: 28,043
Trainable params: 28,043
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 1s - loss: 102.1896 - acc: 0.8021 - val_loss: 65.2995 - val_acc: 0.8635
Epoch 2/30
 - 1s - loss: 43.6306 - acc: 0.8820 - val_loss: 26.3283 - val_acc: 0.8718
Epoch 3/30
 - 1s - loss: 16.2827 - acc: 0.8933 - val_loss: 8.6139 - val_acc: 0.8314
Epoch 4/30
 - 1s - loss: 4.4810 - acc: 0.8948 - val_loss: 1.9211 - val_acc: 0.8006
Epoch 5/30
 - 1s - loss: 0.8381 - acc: 0.8803 - val_loss: 0.5928 - val_acc: 0.8494
Epoch 6/30
 - 1s - loss: 0.3835 - acc: 0.8866 - val_loss: 0.5036 - val_acc: 0.8603
Epoch 7/30
 - 1s - loss: 0.3634 - acc: 0.8889 - val_loss: 0.4525 - val_acc: 0.8750
Epoch 8/30
 - 1s - loss: 0.3393 - acc: 0.8906 - val_loss: 0.6429 - val_acc: 0.7737
```

```
Epoch 9/30
 - 1s - loss: 0.3384 - acc: 0.8918 - val_loss: 0.4492 - val_acc: 0.8603
Epoch 10/30
 - 1s - loss: 0.3306 - acc: 0.8869 - val_loss: 0.4883 - val_acc: 0.8712
Epoch 11/30
 - 1s - loss: 0.3178 - acc: 0.8930 - val_loss: 0.4321 - val_acc: 0.8583
Epoch 12/30
 - 1s - loss: 0.3146 - acc: 0.8935 - val_loss: 0.4328 - val_acc: 0.8718
Epoch 13/30
 - 1s - loss: 0.3155 - acc: 0.8962 - val_loss: 0.4139 - val_acc: 0.8769
Epoch 14/30
 - 1s - loss: 0.2986 - acc: 0.9016 - val_loss: 0.5129 - val_acc: 0.8237
Epoch 15/30
 - 1s - loss: 0.3094 - acc: 0.8965 - val_loss: 0.4999 - val_acc: 0.8429
Epoch 16/30
 - 1s - loss: 0.3051 - acc: 0.8957 - val_loss: 0.4087 - val_acc: 0.8699
Epoch 17/30
 - 1s - loss: 0.2908 - acc: 0.9061 - val_loss: 0.4238 - val_acc: 0.8609
Epoch 18/30
 - 1s - loss: 0.2949 - acc: 0.8967 - val_loss: 0.3962 - val_acc: 0.8814
Epoch 19/30
 - 1s - loss: 0.2910 - acc: 0.9019 - val_loss: 0.4207 - val_acc: 0.8712
Epoch 20/30
 - 1s - loss: 0.2892 - acc: 0.8980 - val_loss: 0.6593 - val_acc: 0.7205
Epoch 21/30
 - 1s - loss: 0.2855 - acc: 0.8992 - val_loss: 0.3948 - val_acc: 0.8571
Epoch 22/30
 - 1s - loss: 0.2866 - acc: 0.8975 - val_loss: 0.4282 - val_acc: 0.8667
Epoch 23/30
 - 1s - loss: 0.2913 - acc: 0.8945 - val_loss: 0.4251 - val_acc: 0.8667
Epoch 24/30
 - 1s - loss: 0.2853 - acc: 0.8994 - val_loss: 0.4170 - val_acc: 0.8622
Epoch 25/30
 - 1s - loss: 0.2868 - acc: 0.8962 - val_loss: 0.4571 - val_acc: 0.8314
Epoch 26/30
 - 1s - loss: 0.2857 - acc: 0.8965 - val_loss: 0.3839 - val_acc: 0.8827
Epoch 27/30
 - 1s - loss: 0.2822 - acc: 0.9016 - val_loss: 0.4124 - val_acc: 0.8667
Epoch 28/30
 - 1s - loss: 0.2823 - acc: 0.9009 - val_loss: 0.4114 - val_acc: 0.8635
Epoch 29/30
 - 1s - loss: 0.2810 - acc: 0.9046 - val_loss: 0.4019 - val_acc: 0.8686
Epoch 30/30
```

```
 - 1s - loss: 0.2826 - acc: 0.9026 - val_loss: 0.4549 - val_acc: 0.7936
Train accuracy 0.7855913449717237 Test accuracy: 0.7935897435897435
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 38.5988 - acc: 0.8001 - val_loss: 11.7248 - val_acc: 0.8468
Epoch 2/30
 - 1s - loss: 4.1769 - acc: 0.8626 - val_loss: 0.8169 - val_acc: 0.8571
Epoch 3/30
 - 1s - loss: 0.4792 - acc: 0.8761 - val_loss: 0.5424 - val_acc: 0.7904
Epoch 4/30
 - 1s - loss: 0.3763 - acc: 0.8844 - val_loss: 0.5073 - val_acc: 0.7974
Epoch 5/30
 - 1s - loss: 0.3405 - acc: 0.8874 - val_loss: 0.4136 - val_acc: 0.8468
Epoch 6/30
 - 1s - loss: 0.3423 - acc: 0.8889 - val_loss: 0.3759 - val_acc: 0.8654
Epoch 7/30
 - 1s - loss: 0.3292 - acc: 0.8852 - val_loss: 0.3997 - val_acc: 0.8660
Epoch 8/30
 - 1s - loss: 0.3146 - acc: 0.8906 - val_loss: 0.4046 - val_acc: 0.8410
Epoch 9/30
```

```
         - 1s - loss: 0.3114 - acc: 0.8960 - val_loss: 0.3593 - val_acc: 0.8795
Epoch 10/30
         - 1s - loss: 0.3225 - acc: 0.8891 - val_loss: 0.3535 - val_acc: 0.8801
Epoch 11/30
         - 1s - loss: 0.3065 - acc: 0.8992 - val_loss: 0.3836 - val_acc: 0.8731
Epoch 12/30
         - 1s - loss: 0.3073 - acc: 0.8970 - val_loss: 0.3663 - val_acc: 0.8686
Epoch 13/30
         - 1s - loss: 0.3155 - acc: 0.8989 - val_loss: 0.3448 - val_acc: 0.8821
Epoch 14/30
         - 1s - loss: 0.2992 - acc: 0.9031 - val_loss: 0.4048 - val_acc: 0.8660
Epoch 15/30
         - 1s - loss: 0.3118 - acc: 0.8965 - val_loss: 0.3678 - val_acc: 0.8667
Epoch 16/30
         - 1s - loss: 0.2975 - acc: 0.8948 - val_loss: 0.3312 - val_acc: 0.8859
Epoch 17/30
         - 1s - loss: 0.3047 - acc: 0.9024 - val_loss: 0.3714 - val_acc: 0.8590
Epoch 18/30
         - 1s - loss: 0.2954 - acc: 0.9031 - val_loss: 0.3396 - val_acc: 0.8814
Epoch 19/30
         - 1s - loss: 0.3035 - acc: 0.8955 - val_loss: 0.3320 - val_acc: 0.8878
Epoch 20/30
         - 1s - loss: 0.2936 - acc: 0.9012 - val_loss: 0.3356 - val_acc: 0.8853
Epoch 21/30
         - 1s - loss: 0.3010 - acc: 0.8972 - val_loss: 0.3497 - val_acc: 0.8737
Epoch 22/30
         - 1s - loss: 0.3003 - acc: 0.9014 - val_loss: 0.3447 - val_acc: 0.8808
Epoch 23/30
         - 1s - loss: 0.2946 - acc: 0.8953 - val_loss: 0.3321 - val_acc: 0.8910
Epoch 24/30
         - 1s - loss: 0.2909 - acc: 0.8987 - val_loss: 0.3449 - val_acc: 0.8878
Epoch 25/30
         - 1s - loss: 0.2945 - acc: 0.8982 - val_loss: 0.5724 - val_acc: 0.8526
Epoch 26/30
         - 1s - loss: 0.3004 - acc: 0.8987 - val_loss: 0.3542 - val_acc: 0.8865
Epoch 27/30
         - 1s - loss: 0.2859 - acc: 0.9051 - val_loss: 0.3363 - val_acc: 0.8897
Epoch 28/30
         - 1s - loss: 0.2970 - acc: 0.9016 - val_loss: 0.3596 - val_acc: 0.8814
Epoch 29/30
         - 1s - loss: 0.2843 - acc: 0.9046 - val_loss: 0.3600 - val_acc: 0.8788
Epoch 30/30
         - 1s - loss: 0.2894 - acc: 0.9024 - val_loss: 0.3720 - val_acc: 0.8481
```

```
Train accuracy 0.8182935824932382 Test accuracy: 0.8480769230769231
----------------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)            (None, 120, 16)           1552
_____
dropout_1 (Dropout)          (None, 120, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 60, 16)            0
_____
flatten_1 (Flatten)          (None, 960)               0
_____
dense_1 (Dense)              (None, 64)                61504
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 16.6819 - acc: 0.8308 - val_loss: 3.8002 - val_acc: 0.8006
Epoch 2/30
 - 1s - loss: 1.5202 - acc: 0.8785 - val_loss: 0.7406 - val_acc: 0.8724
Epoch 3/30
 - 1s - loss: 0.4934 - acc: 0.8945 - val_loss: 0.5887 - val_acc: 0.8250
Epoch 4/30
 - 1s - loss: 0.3732 - acc: 0.8982 - val_loss: 0.4533 - val_acc: 0.8462
Epoch 5/30
 - 1s - loss: 0.3298 - acc: 0.8992 - val_loss: 0.3826 - val_acc: 0.8692
Epoch 6/30
 - 1s - loss: 0.3023 - acc: 0.8980 - val_loss: 0.3871 - val_acc: 0.8814
Epoch 7/30
 - 1s - loss: 0.2899 - acc: 0.9071 - val_loss: 0.3595 - val_acc: 0.8853
Epoch 8/30
 - 1s - loss: 0.2898 - acc: 0.9041 - val_loss: 0.4025 - val_acc: 0.8590
Epoch 9/30
 - 1s - loss: 0.3064 - acc: 0.8980 - val_loss: 0.3395 - val_acc: 0.8731
```

```
Epoch 10/30
 - 1s - loss: 0.2719 - acc: 0.9034 - val_loss: 0.6688 - val_acc: 0.8090
Epoch 11/30
 - 1s - loss: 0.2748 - acc: 0.9009 - val_loss: 0.3566 - val_acc: 0.8827
Epoch 12/30
 - 1s - loss: 0.2721 - acc: 0.9036 - val_loss: 0.3198 - val_acc: 0.8814
Epoch 13/30
 - 1s - loss: 0.2676 - acc: 0.9041 - val_loss: 0.3260 - val_acc: 0.8865
Epoch 14/30
 - 1s - loss: 0.2559 - acc: 0.9122 - val_loss: 0.3265 - val_acc: 0.8827
Epoch 15/30
 - 1s - loss: 0.2771 - acc: 0.9056 - val_loss: 0.3431 - val_acc: 0.8795
Epoch 16/30
 - 1s - loss: 0.2607 - acc: 0.9071 - val_loss: 0.3213 - val_acc: 0.8821
Epoch 17/30
 - 1s - loss: 0.2515 - acc: 0.9093 - val_loss: 0.3047 - val_acc: 0.8840
Epoch 18/30
 - 1s - loss: 0.2573 - acc: 0.9075 - val_loss: 0.3038 - val_acc: 0.8872
Epoch 19/30
 - 1s - loss: 0.2626 - acc: 0.9044 - val_loss: 0.3275 - val_acc: 0.8872
Epoch 20/30
 - 1s - loss: 0.2692 - acc: 0.9090 - val_loss: 0.3122 - val_acc: 0.8962
Epoch 21/30
 - 1s - loss: 0.2513 - acc: 0.9149 - val_loss: 0.3205 - val_acc: 0.8821
Epoch 22/30
 - 1s - loss: 0.2630 - acc: 0.9046 - val_loss: 0.3207 - val_acc: 0.8795
Epoch 23/30
 - 1s - loss: 0.2563 - acc: 0.9061 - val_loss: 0.3069 - val_acc: 0.8981
Epoch 24/30
 - 1s - loss: 0.2516 - acc: 0.9117 - val_loss: 0.3085 - val_acc: 0.8981
Epoch 25/30
 - 1s - loss: 0.2629 - acc: 0.9115 - val_loss: 0.3033 - val_acc: 0.8936
Epoch 26/30
 - 1s - loss: 0.2469 - acc: 0.9122 - val_loss: 0.2995 - val_acc: 0.9019
Epoch 27/30
 - 1s - loss: 0.2498 - acc: 0.9134 - val_loss: 0.2796 - val_acc: 0.9186
Epoch 28/30
 - 1s - loss: 0.2565 - acc: 0.9194 - val_loss: 0.3053 - val_acc: 0.9019
Epoch 29/30
 - 1s - loss: 0.2481 - acc: 0.9196 - val_loss: 0.2967 - val_acc: 0.9167
Epoch 30/30
 - 1s - loss: 0.2521 - acc: 0.9194 - val_loss: 0.2976 - val_acc: 0.9077
Train accuracy 0.9166461765429064 Test accuracy: 0.9076923076923077
```

```
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 26.0715 - acc: 0.8114 - val_loss: 8.0125 - val_acc: 0.8429
Epoch 2/30
 - 1s - loss: 3.0103 - acc: 0.8778 - val_loss: 0.8008 - val_acc: 0.8859
Epoch 3/30
 - 1s - loss: 0.4960 - acc: 0.8832 - val_loss: 0.5324 - val_acc: 0.8167
Epoch 4/30
 - 1s - loss: 0.3484 - acc: 0.8940 - val_loss: 0.5180 - val_acc: 0.8071
Epoch 5/30
 - 1s - loss: 0.3180 - acc: 0.8928 - val_loss: 0.3853 - val_acc: 0.8647
Epoch 6/30
 - 1s - loss: 0.3083 - acc: 0.8943 - val_loss: 0.3865 - val_acc: 0.8583
Epoch 7/30
 - 1s - loss: 0.2976 - acc: 0.8987 - val_loss: 0.3398 - val_acc: 0.8833
Epoch 8/30
 - 1s - loss: 0.2922 - acc: 0.8980 - val_loss: 0.4431 - val_acc: 0.8308
Epoch 9/30
 - 1s - loss: 0.2930 - acc: 0.9029 - val_loss: 0.3940 - val_acc: 0.8635
Epoch 10/30
```

```
          - 1s - loss: 0.2857 - acc: 0.8933 - val_loss: 0.3360 - val_acc: 0.8859
        Epoch 11/30
          - 1s - loss: 0.2743 - acc: 0.9058 - val_loss: 0.4205 - val_acc: 0.8276
        Epoch 12/30
          - 1s - loss: 0.2778 - acc: 0.8982 - val_loss: 0.3300 - val_acc: 0.8840
        Epoch 13/30
          - 1s - loss: 0.2722 - acc: 0.9095 - val_loss: 0.3322 - val_acc: 0.8840
        Epoch 14/30
          - 1s - loss: 0.2846 - acc: 0.9063 - val_loss: 0.3451 - val_acc: 0.8795
        Epoch 15/30
          - 1s - loss: 0.2814 - acc: 0.9068 - val_loss: 0.3576 - val_acc: 0.8750
        Epoch 16/30
          - 1s - loss: 0.2675 - acc: 0.9085 - val_loss: 0.3226 - val_acc: 0.8891
        Epoch 17/30
          - 1s - loss: 0.2721 - acc: 0.9090 - val_loss: 0.3670 - val_acc: 0.8615
        Epoch 18/30
          - 1s - loss: 0.2706 - acc: 0.9071 - val_loss: 0.3626 - val_acc: 0.8673
        Epoch 19/30
          - 1s - loss: 0.2723 - acc: 0.9041 - val_loss: 0.3227 - val_acc: 0.8865
        Epoch 20/30
          - 1s - loss: 0.2642 - acc: 0.9088 - val_loss: 0.3231 - val_acc: 0.8846
        Epoch 21/30
          - 1s - loss: 0.2689 - acc: 0.9112 - val_loss: 0.3286 - val_acc: 0.8821
        Epoch 22/30
          - 1s - loss: 0.2625 - acc: 0.9068 - val_loss: 0.3246 - val_acc: 0.8904
        Epoch 23/30
          - 1s - loss: 0.2648 - acc: 0.9046 - val_loss: 0.3321 - val_acc: 0.8904
        Epoch 24/30
          - 1s - loss: 0.2581 - acc: 0.9103 - val_loss: 0.3206 - val_acc: 0.8962
        Epoch 25/30
          - 1s - loss: 0.2651 - acc: 0.9044 - val_loss: 0.4467 - val_acc: 0.8532
        Epoch 26/30
          - 1s - loss: 0.2726 - acc: 0.9066 - val_loss: 0.3296 - val_acc: 0.8840
        Epoch 27/30
          - 1s - loss: 0.2521 - acc: 0.9169 - val_loss: 0.3066 - val_acc: 0.8981
        Epoch 28/30
          - 1s - loss: 0.2579 - acc: 0.9134 - val_loss: 0.3241 - val_acc: 0.8872
        Epoch 29/30
          - 1s - loss: 0.2573 - acc: 0.9132 - val_loss: 0.3412 - val_acc: 0.8814
        Epoch 30/30
          - 1s - loss: 0.2579 - acc: 0.9125 - val_loss: 0.3310 - val_acc: 0.8885
        Train accuracy 0.8851733464470125 Test accuracy: 0.8884615384615384
        -------------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape               Param #
=================================================================
conv1d_1 (Conv1D)               (None, 122, 32)            2048

conv1d_2 (Conv1D)               (None, 120, 16)            1552

dropout_1 (Dropout)             (None, 120, 16)            0

max_pooling1d_1 (MaxPooling1    (None, 60, 16)             0

flatten_1 (Flatten)             (None, 960)                0

dense_1 (Dense)                 (None, 64)                 61504

dense_2 (Dense)                 (None, 3)                  195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 10.8029 - acc: 0.8232 - val_loss: 1.8159 - val_acc: 0.8590
Epoch 2/30
 - 1s - loss: 1.0262 - acc: 0.8687 - val_loss: 0.6634 - val_acc: 0.8827
Epoch 3/30
 - 1s - loss: 0.4958 - acc: 0.9004 - val_loss: 0.4915 - val_acc: 0.8615
Epoch 4/30
 - 1s - loss: 0.3864 - acc: 0.8994 - val_loss: 0.4591 - val_acc: 0.8385
Epoch 5/30
 - 1s - loss: 0.3364 - acc: 0.9021 - val_loss: 0.4042 - val_acc: 0.8699
Epoch 6/30
 - 1s - loss: 0.3290 - acc: 0.8957 - val_loss: 0.3584 - val_acc: 0.8756
Epoch 7/30
 - 1s - loss: 0.2975 - acc: 0.9063 - val_loss: 0.4067 - val_acc: 0.8731
Epoch 8/30
 - 1s - loss: 0.2793 - acc: 0.9117 - val_loss: 0.3541 - val_acc: 0.8712
Epoch 9/30
 - 1s - loss: 0.2857 - acc: 0.9093 - val_loss: 0.3370 - val_acc: 0.8942
Epoch 10/30
 - 1s - loss: 0.2827 - acc: 0.9112 - val_loss: 0.3098 - val_acc: 0.8885
```

```
Epoch 11/30
 - 1s - loss: 0.2988 - acc: 0.9014 - val_loss: 0.3698 - val_acc: 0.8923
Epoch 12/30
 - 1s - loss: 0.2730 - acc: 0.9134 - val_loss: 0.3395 - val_acc: 0.8897
Epoch 13/30
 - 1s - loss: 0.2666 - acc: 0.9112 - val_loss: 0.3086 - val_acc: 0.8865
Epoch 14/30
 - 1s - loss: 0.2682 - acc: 0.9100 - val_loss: 0.3977 - val_acc: 0.8808
Epoch 15/30
 - 1s - loss: 0.2571 - acc: 0.9147 - val_loss: 0.3214 - val_acc: 0.8923
Epoch 16/30
 - 1s - loss: 0.2587 - acc: 0.9154 - val_loss: 0.3164 - val_acc: 0.8949
Epoch 17/30
 - 1s - loss: 0.2657 - acc: 0.9184 - val_loss: 0.3351 - val_acc: 0.8859
Epoch 18/30
 - 1s - loss: 0.2502 - acc: 0.9206 - val_loss: 0.3054 - val_acc: 0.8923
Epoch 19/30
 - 1s - loss: 0.2500 - acc: 0.9186 - val_loss: 0.2975 - val_acc: 0.9077
Epoch 20/30
 - 1s - loss: 0.2677 - acc: 0.9203 - val_loss: 0.9886 - val_acc: 0.7404
Epoch 21/30
 - 1s - loss: 0.2628 - acc: 0.9216 - val_loss: 0.2988 - val_acc: 0.8910
Epoch 22/30
 - 1s - loss: 0.2725 - acc: 0.9208 - val_loss: 0.3164 - val_acc: 0.8808
Epoch 23/30
 - 1s - loss: 0.2430 - acc: 0.9230 - val_loss: 0.2807 - val_acc: 0.9103
Epoch 24/30
 - 1s - loss: 0.2497 - acc: 0.9216 - val_loss: 0.2737 - val_acc: 0.9173
Epoch 25/30
 - 1s - loss: 0.2503 - acc: 0.9189 - val_loss: 0.3437 - val_acc: 0.8814
Epoch 26/30
 - 1s - loss: 0.2483 - acc: 0.9189 - val_loss: 0.2838 - val_acc: 0.9179
Epoch 27/30
 - 1s - loss: 0.2321 - acc: 0.9255 - val_loss: 0.2662 - val_acc: 0.9237
Epoch 28/30
 - 1s - loss: 0.2393 - acc: 0.9299 - val_loss: 0.2793 - val_acc: 0.9173
Epoch 29/30
 - 1s - loss: 0.2563 - acc: 0.9270 - val_loss: 0.3099 - val_acc: 0.8936
Epoch 30/30
 - 1s - loss: 0.2461 - acc: 0.9253 - val_loss: 0.4254 - val_acc: 0.8814
Train accuracy 0.898942709613966 Test accuracy: 0.8814102564102564
-----------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)               (None, 122, 32)            2048

conv1d_2 (Conv1D)               (None, 120, 16)            1552

dropout_1 (Dropout)             (None, 120, 16)            0

max_pooling1d_1 (MaxPooling1    (None, 60, 16)             0

flatten_1 (Flatten)             (None, 960)                0

dense_1 (Dense)                 (None, 64)                 61504

dense_2 (Dense)                 (None, 3)                  195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 30.9653 - acc: 0.8153 - val_loss: 5.8020 - val_acc: 0.8423
Epoch 2/30
 - 1s - loss: 1.7216 - acc: 0.8618 - val_loss: 0.5674 - val_acc: 0.8545
Epoch 3/30
 - 1s - loss: 0.4267 - acc: 0.8699 - val_loss: 0.4857 - val_acc: 0.8333
Epoch 4/30
 - 1s - loss: 0.3928 - acc: 0.8832 - val_loss: 0.5152 - val_acc: 0.7846
Epoch 5/30
 - 1s - loss: 0.3720 - acc: 0.8795 - val_loss: 0.5215 - val_acc: 0.8474
Epoch 6/30
 - 1s - loss: 0.3634 - acc: 0.8832 - val_loss: 0.3808 - val_acc: 0.8776
Epoch 7/30
 - 1s - loss: 0.3504 - acc: 0.8805 - val_loss: 0.3770 - val_acc: 0.8763
Epoch 8/30
 - 1s - loss: 0.3383 - acc: 0.8871 - val_loss: 0.4348 - val_acc: 0.8199
Epoch 9/30
 - 1s - loss: 0.3181 - acc: 0.8928 - val_loss: 0.3996 - val_acc: 0.8583
Epoch 10/30
 - 1s - loss: 0.3321 - acc: 0.8842 - val_loss: 0.3630 - val_acc: 0.8801
Epoch 11/30
```

```
     - 1s - loss: 0.3180 - acc: 0.8923 - val_loss: 0.3866 - val_acc: 0.8795
Epoch 12/30
     - 1s - loss: 0.3132 - acc: 0.8921 - val_loss: 0.3481 - val_acc: 0.8756
Epoch 13/30
     - 1s - loss: 0.3341 - acc: 0.8913 - val_loss: 0.3613 - val_acc: 0.8833
Epoch 14/30
     - 1s - loss: 0.3186 - acc: 0.8945 - val_loss: 0.4622 - val_acc: 0.8571
Epoch 15/30
     - 1s - loss: 0.3251 - acc: 0.8925 - val_loss: 0.4008 - val_acc: 0.8622
Epoch 16/30
     - 1s - loss: 0.3135 - acc: 0.8916 - val_loss: 0.3371 - val_acc: 0.8750
Epoch 17/30
     - 1s - loss: 0.3173 - acc: 0.8933 - val_loss: 0.3454 - val_acc: 0.8724
Epoch 18/30
     - 1s - loss: 0.3106 - acc: 0.8913 - val_loss: 0.3439 - val_acc: 0.8782
Epoch 19/30
     - 1s - loss: 0.3006 - acc: 0.8923 - val_loss: 0.3501 - val_acc: 0.8744
Epoch 20/30
     - 1s - loss: 0.3034 - acc: 0.8957 - val_loss: 0.4884 - val_acc: 0.8346
Epoch 21/30
     - 1s - loss: 0.3146 - acc: 0.8965 - val_loss: 0.3536 - val_acc: 0.8705
Epoch 22/30
     - 1s - loss: 0.2971 - acc: 0.8975 - val_loss: 0.3468 - val_acc: 0.8686
Epoch 23/30
     - 1s - loss: 0.3167 - acc: 0.8925 - val_loss: 0.3586 - val_acc: 0.8769
Epoch 24/30
     - 1s - loss: 0.3032 - acc: 0.8972 - val_loss: 0.4479 - val_acc: 0.8513
Epoch 25/30
     - 1s - loss: 0.3204 - acc: 0.8913 - val_loss: 0.3923 - val_acc: 0.8404
Epoch 26/30
     - 1s - loss: 0.2935 - acc: 0.8997 - val_loss: 0.3702 - val_acc: 0.8737
Epoch 27/30
     - 1s - loss: 0.2950 - acc: 0.8903 - val_loss: 0.3551 - val_acc: 0.8673
Epoch 28/30
     - 1s - loss: 0.2983 - acc: 0.8935 - val_loss: 0.3852 - val_acc: 0.8635
Epoch 29/30
     - 1s - loss: 0.3017 - acc: 0.8987 - val_loss: 0.3490 - val_acc: 0.8782
Epoch 30/30
     - 1s - loss: 0.3063 - acc: 0.8950 - val_loss: 0.4495 - val_acc: 0.8333
Train accuracy 0.8374723383329236 Test accuracy: 0.8333333333333334
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
```

```
=================================================================
conv1d_1 (Conv1D)              (None, 122, 32)            2048

_____
conv1d_2 (Conv1D)              (None, 120, 16)            1552

_____
dropout_1 (Dropout)            (None, 120, 16)            0

_____
max_pooling1d_1 (MaxPooling1   (None, 60, 16)             0

_____
flatten_1 (Flatten)            (None, 960)                0

_____
dense_1 (Dense)                (None, 64)                 61504

_____
dense_2 (Dense)                (None, 3)                  195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0

_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 19.5192 - acc: 0.8119 - val_loss: 5.2518 - val_acc: 0.8128
Epoch 2/30
 - 1s - loss: 1.8561 - acc: 0.8793 - val_loss: 0.5971 - val_acc: 0.8526
Epoch 3/30
 - 1s - loss: 0.3928 - acc: 0.8832 - val_loss: 0.4446 - val_acc: 0.8353
Epoch 4/30
 - 1s - loss: 0.3459 - acc: 0.8894 - val_loss: 0.5246 - val_acc: 0.8026
Epoch 5/30
 - 1s - loss: 0.3234 - acc: 0.8903 - val_loss: 0.3703 - val_acc: 0.8641
Epoch 6/30
 - 1s - loss: 0.3061 - acc: 0.8933 - val_loss: 0.5315 - val_acc: 0.8609
Epoch 7/30
 - 1s - loss: 0.3076 - acc: 0.8925 - val_loss: 0.3802 - val_acc: 0.8660
Epoch 8/30
 - 1s - loss: 0.3054 - acc: 0.8982 - val_loss: 0.4429 - val_acc: 0.8378
Epoch 9/30
 - 1s - loss: 0.2963 - acc: 0.8987 - val_loss: 0.3616 - val_acc: 0.8615
Epoch 10/30
 - 1s - loss: 0.2929 - acc: 0.8967 - val_loss: 0.4813 - val_acc: 0.8417
Epoch 11/30
 - 1s - loss: 0.3009 - acc: 0.8955 - val_loss: 0.4235 - val_acc: 0.8462
```

```
Epoch 12/30
 - 1s - loss: 0.2903 - acc: 0.8970 - val_loss: 0.3391 - val_acc: 0.8737
Epoch 13/30
 - 1s - loss: 0.2879 - acc: 0.9009 - val_loss: 0.3381 - val_acc: 0.8788
Epoch 14/30
 - 1s - loss: 0.2740 - acc: 0.9031 - val_loss: 0.3852 - val_acc: 0.8654
Epoch 15/30
 - 1s - loss: 0.2953 - acc: 0.8953 - val_loss: 0.3911 - val_acc: 0.8705
Epoch 16/30
 - 1s - loss: 0.2771 - acc: 0.8967 - val_loss: 0.3290 - val_acc: 0.8763
Epoch 17/30
 - 1s - loss: 0.2820 - acc: 0.8977 - val_loss: 0.3547 - val_acc: 0.8583
Epoch 18/30
 - 1s - loss: 0.2824 - acc: 0.8987 - val_loss: 0.3396 - val_acc: 0.8705
Epoch 19/30
 - 1s - loss: 0.2851 - acc: 0.8960 - val_loss: 0.3313 - val_acc: 0.8763
Epoch 20/30
 - 1s - loss: 0.2712 - acc: 0.8975 - val_loss: 0.3156 - val_acc: 0.8769
Epoch 21/30
 - 1s - loss: 0.2777 - acc: 0.8975 - val_loss: 0.3492 - val_acc: 0.8635
Epoch 22/30
 - 1s - loss: 0.2692 - acc: 0.8997 - val_loss: 0.3246 - val_acc: 0.8795
Epoch 23/30
 - 1s - loss: 0.2929 - acc: 0.8925 - val_loss: 0.4272 - val_acc: 0.8564
Epoch 24/30
 - 1s - loss: 0.2746 - acc: 0.8953 - val_loss: 0.4219 - val_acc: 0.8564
Epoch 25/30
 - 1s - loss: 0.2820 - acc: 0.8982 - val_loss: 0.3748 - val_acc: 0.8551
Epoch 26/30
 - 1s - loss: 0.2829 - acc: 0.8972 - val_loss: 0.3344 - val_acc: 0.8718
Epoch 27/30
 - 1s - loss: 0.2649 - acc: 0.9019 - val_loss: 0.3207 - val_acc: 0.8763
Epoch 28/30
 - 1s - loss: 0.2941 - acc: 0.9021 - val_loss: 0.3782 - val_acc: 0.8429
Epoch 29/30
 - 1s - loss: 0.2990 - acc: 0.8992 - val_loss: 0.3503 - val_acc: 0.8705
Epoch 30/30
 - 1s - loss: 0.2692 - acc: 0.9024 - val_loss: 0.4224 - val_acc: 0.8513
Train accuracy 0.8480452421932628 Test accuracy: 0.8512820512820513
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 23.5383 - acc: 0.8210 - val_loss: 5.7818 - val_acc: 0.8167
Epoch 2/30
 - 1s - loss: 2.0037 - acc: 0.8758 - val_loss: 0.6015 - val_acc: 0.8821
Epoch 3/30
 - 1s - loss: 0.4384 - acc: 0.8788 - val_loss: 0.5451 - val_acc: 0.8032
Epoch 4/30
 - 1s - loss: 0.3719 - acc: 0.8894 - val_loss: 0.5168 - val_acc: 0.8090
Epoch 5/30
 - 1s - loss: 0.3240 - acc: 0.8935 - val_loss: 0.4272 - val_acc: 0.8615
Epoch 6/30
 - 1s - loss: 0.3051 - acc: 0.8957 - val_loss: 0.3826 - val_acc: 0.8571
Epoch 7/30
 - 1s - loss: 0.3041 - acc: 0.8972 - val_loss: 0.3800 - val_acc: 0.8673
Epoch 8/30
 - 1s - loss: 0.2941 - acc: 0.8960 - val_loss: 0.4571 - val_acc: 0.8224
Epoch 9/30
 - 1s - loss: 0.2909 - acc: 0.8975 - val_loss: 0.3771 - val_acc: 0.8596
Epoch 10/30
 - 1s - loss: 0.2925 - acc: 0.8921 - val_loss: 0.7420 - val_acc: 0.8128
Epoch 11/30
 - 1s - loss: 0.2915 - acc: 0.8925 - val_loss: 0.4014 - val_acc: 0.8372
Epoch 12/30
```

```
                    - 1s - loss: 0.2780 - acc: 0.9007 - val_loss: 0.3523 - val_acc: 0.8615
          Epoch 13/30
                    - 1s - loss: 0.2881 - acc: 0.9004 - val_loss: 0.3184 - val_acc: 0.8821
          Epoch 14/30
                    - 1s - loss: 0.2754 - acc: 0.8994 - val_loss: 0.4149 - val_acc: 0.8436
          Epoch 15/30
                    - 1s - loss: 0.2834 - acc: 0.9014 - val_loss: 0.3285 - val_acc: 0.8840
          Epoch 16/30
                    - 1s - loss: 0.2828 - acc: 0.8999 - val_loss: 0.3150 - val_acc: 0.8814
          Epoch 17/30
                    - 1s - loss: 0.2756 - acc: 0.9083 - val_loss: 0.3558 - val_acc: 0.8622
          Epoch 18/30
                    - 1s - loss: 0.2738 - acc: 0.9093 - val_loss: 0.3323 - val_acc: 0.8769
          Epoch 19/30
                    - 1s - loss: 0.2757 - acc: 0.9034 - val_loss: 0.3234 - val_acc: 0.8910
          Epoch 20/30
                    - 1s - loss: 0.2628 - acc: 0.9066 - val_loss: 0.3066 - val_acc: 0.8910
          Epoch 21/30
                    - 1s - loss: 0.2573 - acc: 0.9117 - val_loss: 0.3705 - val_acc: 0.8686
          Epoch 22/30
                    - 1s - loss: 0.2560 - acc: 0.9120 - val_loss: 0.3344 - val_acc: 0.8821
          Epoch 23/30
                    - 1s - loss: 0.2671 - acc: 0.9071 - val_loss: 0.3083 - val_acc: 0.8865
          Epoch 24/30
                    - 1s - loss: 0.2609 - acc: 0.9085 - val_loss: 0.3156 - val_acc: 0.8942
          Epoch 25/30
                    - 1s - loss: 0.2627 - acc: 0.9093 - val_loss: 0.3435 - val_acc: 0.8929
          Epoch 26/30
                    - 1s - loss: 0.2687 - acc: 0.9075 - val_loss: 0.3242 - val_acc: 0.8853
          Epoch 27/30
                    - 1s - loss: 0.2625 - acc: 0.9100 - val_loss: 0.3262 - val_acc: 0.8872
          Epoch 28/30
                    - 1s - loss: 0.2625 - acc: 0.9164 - val_loss: 0.3073 - val_acc: 0.8968
          Epoch 29/30
                    - 1s - loss: 0.2683 - acc: 0.9115 - val_loss: 0.3174 - val_acc: 0.8955
          Epoch 30/30
                    - 1s - loss: 0.2536 - acc: 0.9149 - val_loss: 0.3300 - val_acc: 0.8667
          Train accuracy 0.8500122940742562 Test accuracy: 0.8666666666666667
          -------------------------------------------------------------------------------

          _____
          Layer (type)                 Output Shape              Param #
          =================================================================
          conv1d_1 (Conv1D)            (None, 122, 32)           2048
```

```
conv1d_2 (Conv1D)              (None, 120, 16)              1552
_____
dropout_1 (Dropout)            (None, 120, 16)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 60, 16)               0
_____
flatten_1 (Flatten)            (None, 960)                  0
_____
dense_1 (Dense)                (None, 64)                   61504
_____
dense_2 (Dense)                (None, 3)                    195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 26.3178 - acc: 0.8107 - val_loss: 9.0461 - val_acc: 0.8622
Epoch 2/30
 - 1s - loss: 3.5803 - acc: 0.8837 - val_loss: 0.9784 - val_acc: 0.8596
Epoch 3/30
 - 1s - loss: 0.5376 - acc: 0.8896 - val_loss: 0.5245 - val_acc: 0.8083
Epoch 4/30
 - 1s - loss: 0.3563 - acc: 0.8960 - val_loss: 0.4672 - val_acc: 0.8250
Epoch 5/30
 - 1s - loss: 0.3250 - acc: 0.8938 - val_loss: 0.4541 - val_acc: 0.8359
Epoch 6/30
 - 1s - loss: 0.3040 - acc: 0.8982 - val_loss: 0.3845 - val_acc: 0.8615
Epoch 7/30
 - 1s - loss: 0.2971 - acc: 0.8953 - val_loss: 0.3360 - val_acc: 0.8859
Epoch 8/30
 - 1s - loss: 0.2949 - acc: 0.8975 - val_loss: 0.3855 - val_acc: 0.8526
Epoch 9/30
 - 1s - loss: 0.2820 - acc: 0.9046 - val_loss: 0.3467 - val_acc: 0.8679
Epoch 10/30
 - 1s - loss: 0.2935 - acc: 0.8906 - val_loss: 0.3326 - val_acc: 0.8846
Epoch 11/30
 - 1s - loss: 0.2743 - acc: 0.9026 - val_loss: 0.3938 - val_acc: 0.8378
Epoch 12/30
 - 1s - loss: 0.2851 - acc: 0.8999 - val_loss: 0.3458 - val_acc: 0.8801
```

```
Epoch 13/30
 - 1s - loss: 0.2764 - acc: 0.9075 - val_loss: 0.3258 - val_acc: 0.8865
Epoch 14/30
 - 1s - loss: 0.2675 - acc: 0.9071 - val_loss: 0.3518 - val_acc: 0.8821
Epoch 15/30
 - 1s - loss: 0.2823 - acc: 0.8992 - val_loss: 0.3242 - val_acc: 0.8910
Epoch 16/30
 - 1s - loss: 0.2658 - acc: 0.9048 - val_loss: 0.3165 - val_acc: 0.8872
Epoch 17/30
 - 1s - loss: 0.2640 - acc: 0.9120 - val_loss: 0.3370 - val_acc: 0.8750
Epoch 18/30
 - 1s - loss: 0.2683 - acc: 0.9063 - val_loss: 0.3441 - val_acc: 0.8846
Epoch 19/30
 - 1s - loss: 0.2664 - acc: 0.9063 - val_loss: 0.3234 - val_acc: 0.8846
Epoch 20/30
 - 1s - loss: 0.2603 - acc: 0.9075 - val_loss: 0.6709 - val_acc: 0.7468
Epoch 21/30
 - 1s - loss: 0.2729 - acc: 0.9075 - val_loss: 0.3350 - val_acc: 0.8756
Epoch 22/30
 - 1s - loss: 0.2609 - acc: 0.9061 - val_loss: 0.3660 - val_acc: 0.8647
Epoch 23/30
 - 1s - loss: 0.2593 - acc: 0.9090 - val_loss: 0.3146 - val_acc: 0.8859
Epoch 24/30
 - 1s - loss: 0.2633 - acc: 0.9095 - val_loss: 0.3200 - val_acc: 0.8923
Epoch 25/30
 - 1s - loss: 0.2676 - acc: 0.9090 - val_loss: 0.3753 - val_acc: 0.8628
Epoch 26/30
 - 1s - loss: 0.2643 - acc: 0.9078 - val_loss: 0.3246 - val_acc: 0.8865
Epoch 27/30
 - 1s - loss: 0.2510 - acc: 0.9134 - val_loss: 0.3744 - val_acc: 0.8744
Epoch 28/30
 - 1s - loss: 0.2604 - acc: 0.9152 - val_loss: 0.3079 - val_acc: 0.8929
Epoch 29/30
 - 1s - loss: 0.2595 - acc: 0.9115 - val_loss: 0.3263 - val_acc: 0.8878
Epoch 30/30
 - 1s - loss: 0.2559 - acc: 0.9100 - val_loss: 0.3137 - val_acc: 0.8891
Train accuracy 0.8925497910007376 Test accuracy: 0.889102564102564
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
```

```
conv1d_2 (Conv1D)              (None, 120, 16)              1552
_____
dropout_1 (Dropout)            (None, 120, 16)               0
_____
max_pooling1d_1 (MaxPooling1   (None, 60, 16)                0
_____
flatten_1 (Flatten)            (None, 960)                   0
_____
dense_1 (Dense)                (None, 64)                  61504
_____
dense_2 (Dense)                (None, 3)                    195
================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 33.8383 - acc: 0.8011 - val_loss: 5.7532 - val_acc: 0.8481
Epoch 2/30
 - 1s - loss: 1.6383 - acc: 0.8594 - val_loss: 0.4907 - val_acc: 0.8500
Epoch 3/30
 - 1s - loss: 0.4743 - acc: 0.8623 - val_loss: 0.5213 - val_acc: 0.7917
Epoch 4/30
 - 1s - loss: 0.3988 - acc: 0.8753 - val_loss: 0.4840 - val_acc: 0.8077
Epoch 5/30
 - 1s - loss: 0.3781 - acc: 0.8810 - val_loss: 0.4645 - val_acc: 0.8192
Epoch 6/30
 - 1s - loss: 0.3660 - acc: 0.8827 - val_loss: 0.3947 - val_acc: 0.8577
Epoch 7/30
 - 1s - loss: 0.3642 - acc: 0.8778 - val_loss: 0.3853 - val_acc: 0.8769
Epoch 8/30
 - 1s - loss: 0.3487 - acc: 0.8820 - val_loss: 0.4797 - val_acc: 0.8071
Epoch 9/30
 - 1s - loss: 0.3443 - acc: 0.8839 - val_loss: 0.3819 - val_acc: 0.8686
Epoch 10/30
 - 1s - loss: 0.3372 - acc: 0.8817 - val_loss: 0.3800 - val_acc: 0.8705
Epoch 11/30
 - 1s - loss: 0.3543 - acc: 0.8820 - val_loss: 0.4182 - val_acc: 0.8635
Epoch 12/30
 - 1s - loss: 0.3300 - acc: 0.8894 - val_loss: 0.3691 - val_acc: 0.8737
Epoch 13/30
```

```
             - 1s - loss: 0.3197 - acc: 0.8913 - val_loss: 0.3631 - val_acc: 0.8782
         Epoch 14/30
             - 1s - loss: 0.3334 - acc: 0.8943 - val_loss: 0.4235 - val_acc: 0.8692
         Epoch 15/30
             - 1s - loss: 0.3253 - acc: 0.8930 - val_loss: 0.3693 - val_acc: 0.8705
         Epoch 16/30
             - 1s - loss: 0.3244 - acc: 0.8864 - val_loss: 0.3510 - val_acc: 0.8744
         Epoch 17/30
             - 1s - loss: 0.3213 - acc: 0.8913 - val_loss: 0.3685 - val_acc: 0.8558
         Epoch 18/30
             - 1s - loss: 0.3235 - acc: 0.8891 - val_loss: 0.5949 - val_acc: 0.8449
         Epoch 19/30
             - 1s - loss: 0.3165 - acc: 0.8903 - val_loss: 0.3566 - val_acc: 0.8769
         Epoch 20/30
             - 1s - loss: 0.3189 - acc: 0.8923 - val_loss: 0.5926 - val_acc: 0.7699
         Epoch 21/30
             - 1s - loss: 0.3340 - acc: 0.8886 - val_loss: 0.3626 - val_acc: 0.8724
         Epoch 22/30
             - 1s - loss: 0.2976 - acc: 0.8977 - val_loss: 0.3586 - val_acc: 0.8647
         Epoch 23/30
             - 1s - loss: 0.3276 - acc: 0.8864 - val_loss: 0.3528 - val_acc: 0.8782
         Epoch 24/30
             - 1s - loss: 0.3130 - acc: 0.8908 - val_loss: 0.3945 - val_acc: 0.8660
         Epoch 25/30
             - 1s - loss: 0.3207 - acc: 0.8879 - val_loss: 0.5715 - val_acc: 0.8340
         Epoch 26/30
             - 1s - loss: 0.3154 - acc: 0.8935 - val_loss: 0.4350 - val_acc: 0.8577
         Epoch 27/30
             - 1s - loss: 0.3145 - acc: 0.8911 - val_loss: 0.3417 - val_acc: 0.8795
         Epoch 28/30
             - 1s - loss: 0.3156 - acc: 0.8916 - val_loss: 0.3938 - val_acc: 0.8429
         Epoch 29/30
             - 1s - loss: 0.3195 - acc: 0.8918 - val_loss: 0.3622 - val_acc: 0.8724
         Epoch 30/30
             - 1s - loss: 0.3065 - acc: 0.8943 - val_loss: 0.4040 - val_acc: 0.8250
         Train accuracy 0.8094418490287681 Test accuracy: 0.825
         -------------------------------------------------------------------------------

         _____
         Layer (type)                 Output Shape              Param #
         =================================================================
         conv1d_1 (Conv1D)            (None, 122, 32)           2048
         _____
         conv1d_2 (Conv1D)            (None, 120, 16)           1552
```

```
dropout_1 (Dropout)              (None, 120, 16)              0
_____
max_pooling1d_1 (MaxPooling1 (None, 60, 16)               0
_____
flatten_1 (Flatten)              (None, 960)                  0
_____
dense_1 (Dense)                  (None, 16)                  15376
_____
dense_2 (Dense)                  (None, 3)                   51
===============================================================
Total params: 19,027
Trainable params: 19,027
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 11.7422 - acc: 0.8210 - val_loss: 1.7948 - val_acc: 0.8679
Epoch 2/30
 - 1s - loss: 0.8690 - acc: 0.8672 - val_loss: 0.6572 - val_acc: 0.8776
Epoch 3/30
 - 1s - loss: 0.4639 - acc: 0.9007 - val_loss: 0.5763 - val_acc: 0.8372
Epoch 4/30
 - 1s - loss: 0.4223 - acc: 0.9026 - val_loss: 0.4796 - val_acc: 0.8455
Epoch 5/30
 - 1s - loss: 0.3382 - acc: 0.9078 - val_loss: 0.3887 - val_acc: 0.8865
Epoch 6/30
 - 1s - loss: 0.3065 - acc: 0.9073 - val_loss: 0.3465 - val_acc: 0.8897
Epoch 7/30
 - 1s - loss: 0.3032 - acc: 0.9019 - val_loss: 0.3360 - val_acc: 0.8974
Epoch 8/30
 - 1s - loss: 0.3084 - acc: 0.9115 - val_loss: 0.4243 - val_acc: 0.8513
Epoch 9/30
 - 1s - loss: 0.2849 - acc: 0.9061 - val_loss: 0.3814 - val_acc: 0.8654
Epoch 10/30
 - 1s - loss: 0.2664 - acc: 0.9117 - val_loss: 0.3439 - val_acc: 0.8891
Epoch 11/30
 - 1s - loss: 0.2926 - acc: 0.9112 - val_loss: 0.3220 - val_acc: 0.8731
Epoch 12/30
 - 1s - loss: 0.2611 - acc: 0.9171 - val_loss: 0.3274 - val_acc: 0.8962
Epoch 13/30
 - 1s - loss: 0.2670 - acc: 0.9132 - val_loss: 0.3379 - val_acc: 0.8885
```

```
Epoch 14/30
 - 1s - loss: 0.2458 - acc: 0.9196 - val_loss: 0.3068 - val_acc: 0.9013
Epoch 15/30
 - 1s - loss: 0.2553 - acc: 0.9152 - val_loss: 0.3468 - val_acc: 0.8833
Epoch 16/30
 - 1s - loss: 0.2493 - acc: 0.9166 - val_loss: 0.3041 - val_acc: 0.8974
Epoch 17/30
 - 1s - loss: 0.2568 - acc: 0.9223 - val_loss: 0.3184 - val_acc: 0.8897
Epoch 18/30
 - 1s - loss: 0.2313 - acc: 0.9272 - val_loss: 0.2988 - val_acc: 0.8994
Epoch 19/30
 - 1s - loss: 0.2412 - acc: 0.9176 - val_loss: 0.2829 - val_acc: 0.9160
Epoch 20/30
 - 1s - loss: 0.2387 - acc: 0.9275 - val_loss: 0.6275 - val_acc: 0.8340
Epoch 21/30
 - 1s - loss: 0.2355 - acc: 0.9243 - val_loss: 0.3079 - val_acc: 0.8814
Epoch 22/30
 - 1s - loss: 0.2317 - acc: 0.9235 - val_loss: 0.2853 - val_acc: 0.8994
Epoch 23/30
 - 1s - loss: 0.2421 - acc: 0.9213 - val_loss: 0.2883 - val_acc: 0.8910
Epoch 24/30
 - 1s - loss: 0.2374 - acc: 0.9255 - val_loss: 0.3012 - val_acc: 0.9058
Epoch 25/30
 - 1s - loss: 0.2327 - acc: 0.9216 - val_loss: 0.3098 - val_acc: 0.8763
Epoch 26/30
 - 1s - loss: 0.2337 - acc: 0.9211 - val_loss: 0.3423 - val_acc: 0.8929
Epoch 27/30
 - 1s - loss: 0.2203 - acc: 0.9289 - val_loss: 0.3006 - val_acc: 0.9045
Epoch 28/30
 - 1s - loss: 0.2394 - acc: 0.9272 - val_loss: 0.2832 - val_acc: 0.9006
Epoch 29/30
 - 1s - loss: 0.2297 - acc: 0.9272 - val_loss: 0.2963 - val_acc: 0.8929
Epoch 30/30
 - 1s - loss: 0.2233 - acc: 0.9282 - val_loss: 0.3972 - val_acc: 0.8891
Train accuracy 0.9114826653552988 Test accuracy: 0.889102564102564
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 28)	1288
conv1d_2 (Conv1D)	(None, 122, 24)	2040

```
dropout_1 (Dropout)              (None, 122, 24)              0
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 24)               0
_____
flatten_1 (Flatten)              (None, 960)                 0
_____
dense_1 (Dense)                  (None, 64)                 61504
_____
dense_2 (Dense)                  (None, 3)                  195
===============================================================
Total params: 65,027
Trainable params: 65,027
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 48.9803 - acc: 0.8345 - val_loss: 13.0954 - val_acc: 0.8359
Epoch 2/30
 - 1s - loss: 4.1190 - acc: 0.8908 - val_loss: 0.7221 - val_acc: 0.8558
Epoch 3/30
 - 1s - loss: 0.3878 - acc: 0.8918 - val_loss: 0.4709 - val_acc: 0.8256
Epoch 4/30
 - 1s - loss: 0.3207 - acc: 0.9014 - val_loss: 0.4282 - val_acc: 0.8481
Epoch 5/30
 - 1s - loss: 0.3081 - acc: 0.8982 - val_loss: 0.4179 - val_acc: 0.8635
Epoch 6/30
 - 1s - loss: 0.3048 - acc: 0.8943 - val_loss: 0.4543 - val_acc: 0.8122
Epoch 7/30
 - 1s - loss: 0.2943 - acc: 0.8943 - val_loss: 0.3578 - val_acc: 0.8731
Epoch 8/30
 - 1s - loss: 0.2965 - acc: 0.8911 - val_loss: 0.4086 - val_acc: 0.8256
Epoch 9/30
 - 1s - loss: 0.2870 - acc: 0.9002 - val_loss: 0.3379 - val_acc: 0.8795
Epoch 10/30
 - 1s - loss: 0.2856 - acc: 0.8982 - val_loss: 0.3387 - val_acc: 0.8788
Epoch 11/30
 - 1s - loss: 0.2789 - acc: 0.8994 - val_loss: 0.4721 - val_acc: 0.7340
Epoch 12/30
 - 1s - loss: 0.2865 - acc: 0.8975 - val_loss: 0.4152 - val_acc: 0.8237
Epoch 13/30
 - 1s - loss: 0.2823 - acc: 0.8982 - val_loss: 0.3985 - val_acc: 0.8353
Epoch 14/30
```

```
          - 1s - loss: 0.2772 - acc: 0.9026 - val_loss: 0.4299 - val_acc: 0.8179
         Epoch 15/30
          - 1s - loss: 0.2768 - acc: 0.8977 - val_loss: 0.3243 - val_acc: 0.8821
         Epoch 16/30
          - 1s - loss: 0.2795 - acc: 0.8970 - val_loss: 0.3447 - val_acc: 0.8718
         Epoch 17/30
          - 1s - loss: 0.2775 - acc: 0.8923 - val_loss: 0.3644 - val_acc: 0.8545
         Epoch 18/30
          - 1s - loss: 0.2734 - acc: 0.9002 - val_loss: 0.3510 - val_acc: 0.8737
         Epoch 19/30
          - 1s - loss: 0.2763 - acc: 0.8948 - val_loss: 0.3244 - val_acc: 0.8756
         Epoch 20/30
          - 1s - loss: 0.2779 - acc: 0.9002 - val_loss: 0.3314 - val_acc: 0.8756
         Epoch 21/30
          - 1s - loss: 0.2658 - acc: 0.8980 - val_loss: 0.3790 - val_acc: 0.8705
         Epoch 22/30
          - 1s - loss: 0.2682 - acc: 0.9019 - val_loss: 0.3490 - val_acc: 0.8718
         Epoch 23/30
          - 1s - loss: 0.2723 - acc: 0.8928 - val_loss: 0.3253 - val_acc: 0.8776
         Epoch 24/30
          - 1s - loss: 0.2735 - acc: 0.8970 - val_loss: 0.3145 - val_acc: 0.8731
         Epoch 25/30
          - 1s - loss: 0.2730 - acc: 0.8962 - val_loss: 0.3248 - val_acc: 0.8788
         Epoch 26/30
          - 1s - loss: 0.2738 - acc: 0.8967 - val_loss: 0.3256 - val_acc: 0.8846
         Epoch 27/30
          - 1s - loss: 0.2726 - acc: 0.8967 - val_loss: 0.3345 - val_acc: 0.8718
         Epoch 28/30
          - 1s - loss: 0.2751 - acc: 0.8940 - val_loss: 0.3884 - val_acc: 0.8269
         Epoch 29/30
          - 1s - loss: 0.2737 - acc: 0.8992 - val_loss: 0.3311 - val_acc: 0.8814
         Epoch 30/30
          - 1s - loss: 0.2693 - acc: 0.8975 - val_loss: 0.3147 - val_acc: 0.8801
         Train accuracy 0.9230390951561347 Test accuracy: 0.8801282051282051
         -------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0

```
max_pooling1d_1 (MaxPooling1  (None, 60, 16)                 0
_____

flatten_1 (Flatten)          (None, 960)                    0
_____

dense_1 (Dense)              (None, 64)                     61504
_____

dense_2 (Dense)              (None, 3)                      195
====================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0

_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 44.5844 - acc: 0.8067 - val_loss: 23.6495 - val_acc: 0.8596
Epoch 2/25
 - 1s - loss: 12.9508 - acc: 0.8825 - val_loss: 5.3133 - val_acc: 0.8712
Epoch 3/25
 - 1s - loss: 2.4584 - acc: 0.8864 - val_loss: 0.9626 - val_acc: 0.7891
Epoch 4/25
 - 1s - loss: 0.4976 - acc: 0.8884 - val_loss: 0.5267 - val_acc: 0.8058
Epoch 5/25
 - 1s - loss: 0.3492 - acc: 0.8921 - val_loss: 0.4260 - val_acc: 0.8468
Epoch 6/25
 - 1s - loss: 0.3205 - acc: 0.8923 - val_loss: 0.3829 - val_acc: 0.8622
Epoch 7/25
 - 1s - loss: 0.3103 - acc: 0.8938 - val_loss: 0.3703 - val_acc: 0.8654
Epoch 8/25
 - 1s - loss: 0.2921 - acc: 0.8972 - val_loss: 0.3912 - val_acc: 0.8487
Epoch 9/25
 - 1s - loss: 0.2961 - acc: 0.9026 - val_loss: 0.3587 - val_acc: 0.8590
Epoch 10/25
 - 1s - loss: 0.2941 - acc: 0.8933 - val_loss: 0.3819 - val_acc: 0.8705
Epoch 11/25
 - 1s - loss: 0.2891 - acc: 0.8962 - val_loss: 0.3785 - val_acc: 0.8609
Epoch 12/25
 - 1s - loss: 0.2899 - acc: 0.8957 - val_loss: 0.3407 - val_acc: 0.8788
Epoch 13/25
 - 1s - loss: 0.2749 - acc: 0.9036 - val_loss: 0.3315 - val_acc: 0.8840
Epoch 14/25
 - 1s - loss: 0.2733 - acc: 0.9031 - val_loss: 0.3581 - val_acc: 0.8769
```

```
Epoch 15/25
 - 1s - loss: 0.2770 - acc: 0.9021 - val_loss: 0.3676 - val_acc: 0.8577
Epoch 16/25
 - 1s - loss: 0.2777 - acc: 0.8989 - val_loss: 0.3310 - val_acc: 0.8808
Epoch 17/25
 - 1s - loss: 0.2676 - acc: 0.9046 - val_loss: 0.3283 - val_acc: 0.8744
Epoch 18/25
 - 1s - loss: 0.2742 - acc: 0.9002 - val_loss: 0.3234 - val_acc: 0.8808
Epoch 19/25
 - 1s - loss: 0.2737 - acc: 0.8994 - val_loss: 0.3344 - val_acc: 0.8750
Epoch 20/25
 - 1s - loss: 0.2724 - acc: 0.8989 - val_loss: 0.4092 - val_acc: 0.8417
Epoch 21/25
 - 1s - loss: 0.2697 - acc: 0.9039 - val_loss: 0.3444 - val_acc: 0.8692
Epoch 22/25
 - 1s - loss: 0.2751 - acc: 0.8940 - val_loss: 0.3192 - val_acc: 0.8814
Epoch 23/25
 - 1s - loss: 0.2703 - acc: 0.8975 - val_loss: 0.3277 - val_acc: 0.8756
Epoch 24/25
 - 1s - loss: 0.2782 - acc: 0.8975 - val_loss: 0.3765 - val_acc: 0.8603
Epoch 25/25
 - 1s - loss: 0.2746 - acc: 0.8972 - val_loss: 0.3541 - val_acc: 0.8603
Train accuracy 0.885910990902385 Test accuracy: 0.8602564102564103
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 32)	7200
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 32)	0
flatten_1 (Flatten)	(None, 1888)	0
dense_1 (Dense)	(None, 64)	120896
dense_2 (Dense)	(None, 3)	195

```
Total params: 129,763
Trainable params: 129,763
```

```
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 75.3213 - acc: 0.8097 - val_loss: 27.3598 - val_acc: 0.8667
Epoch 2/30
 - 1s - loss: 13.6074 - acc: 0.8517 - val_loss: 5.1650 - val_acc: 0.8449
Epoch 3/30
 - 1s - loss: 2.2216 - acc: 0.8655 - val_loss: 0.7722 - val_acc: 0.8212
Epoch 4/30
 - 1s - loss: 0.4473 - acc: 0.8906 - val_loss: 0.5548 - val_acc: 0.8045
Epoch 5/30
 - 1s - loss: 0.3654 - acc: 0.8896 - val_loss: 0.5112 - val_acc: 0.8526
Epoch 6/30
 - 1s - loss: 0.3362 - acc: 0.8945 - val_loss: 0.3989 - val_acc: 0.8603
Epoch 7/30
 - 1s - loss: 0.3297 - acc: 0.8911 - val_loss: 0.3810 - val_acc: 0.8615
Epoch 8/30
 - 1s - loss: 0.3208 - acc: 0.8982 - val_loss: 0.4327 - val_acc: 0.8340
Epoch 9/30
 - 1s - loss: 0.3104 - acc: 0.8957 - val_loss: 0.4437 - val_acc: 0.8628
Epoch 10/30
 - 1s - loss: 0.3178 - acc: 0.8938 - val_loss: 0.3727 - val_acc: 0.8724
Epoch 11/30
 - 1s - loss: 0.3201 - acc: 0.8891 - val_loss: 0.3766 - val_acc: 0.8692
Epoch 12/30
 - 1s - loss: 0.3125 - acc: 0.8953 - val_loss: 0.3797 - val_acc: 0.8744
Epoch 13/30
 - 1s - loss: 0.3024 - acc: 0.8985 - val_loss: 0.3472 - val_acc: 0.8801
Epoch 14/30
 - 1s - loss: 0.3057 - acc: 0.8967 - val_loss: 0.4728 - val_acc: 0.8583
Epoch 15/30
 - 1s - loss: 0.3153 - acc: 0.8901 - val_loss: 0.4271 - val_acc: 0.8558
Epoch 16/30
 - 1s - loss: 0.3056 - acc: 0.8950 - val_loss: 0.3611 - val_acc: 0.8712
Epoch 17/30
 - 1s - loss: 0.3129 - acc: 0.8957 - val_loss: 0.3911 - val_acc: 0.8558
Epoch 18/30
 - 1s - loss: 0.3000 - acc: 0.8985 - val_loss: 0.3878 - val_acc: 0.8545
Epoch 19/30
 - 1s - loss: 0.2987 - acc: 0.8938 - val_loss: 0.3493 - val_acc: 0.8801
Epoch 20/30
```

```
 - 1s - loss: 0.2976 - acc: 0.8994 - val_loss: 0.5055 - val_acc: 0.8167
Epoch 21/30
 - 1s - loss: 0.3006 - acc: 0.8960 - val_loss: 0.3684 - val_acc: 0.8641
Epoch 22/30
 - 1s - loss: 0.3026 - acc: 0.8928 - val_loss: 0.3680 - val_acc: 0.8628
Epoch 23/30
 - 1s - loss: 0.3102 - acc: 0.8896 - val_loss: 0.3511 - val_acc: 0.8737
Epoch 24/30
 - 1s - loss: 0.3054 - acc: 0.8928 - val_loss: 0.3493 - val_acc: 0.8744
Epoch 25/30
 - 1s - loss: 0.2940 - acc: 0.8940 - val_loss: 0.3725 - val_acc: 0.8622
Epoch 26/30
 - 1s - loss: 0.2957 - acc: 0.8962 - val_loss: 1.1632 - val_acc: 0.5974
Epoch 27/30
 - 1s - loss: 0.3146 - acc: 0.8928 - val_loss: 0.3496 - val_acc: 0.8654
Epoch 28/30
 - 1s - loss: 0.3078 - acc: 0.8928 - val_loss: 0.3675 - val_acc: 0.8744
Epoch 29/30
 - 1s - loss: 0.3329 - acc: 0.8901 - val_loss: 0.3984 - val_acc: 0.8692
Epoch 30/30
 - 1s - loss: 0.2944 - acc: 0.8992 - val_loss: 0.3617 - val_acc: 0.8801
Train accuracy 0.8868945168428818 Test accuracy: 0.8801282051282051
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0
dense_1 (Dense)	(None, 32)	12320
dense_2 (Dense)	(None, 3)	99

```
Total params: 16,019
Trainable params: 16,019
Non-trainable params: 0
```

```
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 49.3103 - acc: 0.8195 - val_loss: 8.0195 - val_acc: 0.8628
Epoch 2/30
 - 1s - loss: 2.4396 - acc: 0.8810 - val_loss: 0.6552 - val_acc: 0.8647
Epoch 3/30
 - 1s - loss: 0.3998 - acc: 0.8911 - val_loss: 0.4740 - val_acc: 0.8494
Epoch 4/30
 - 1s - loss: 0.3822 - acc: 0.8844 - val_loss: 0.4544 - val_acc: 0.8500
Epoch 5/30
 - 1s - loss: 0.3535 - acc: 0.8874 - val_loss: 0.4877 - val_acc: 0.8462
Epoch 6/30
 - 1s - loss: 0.3462 - acc: 0.8957 - val_loss: 0.5970 - val_acc: 0.7917
Epoch 7/30
 - 1s - loss: 0.4063 - acc: 0.8731 - val_loss: 0.4756 - val_acc: 0.8429
Epoch 8/30
 - 1s - loss: 0.3424 - acc: 0.8896 - val_loss: 0.4511 - val_acc: 0.8590
Epoch 9/30
 - 1s - loss: 0.3597 - acc: 0.8881 - val_loss: 0.4348 - val_acc: 0.8519
Epoch 10/30
 - 1s - loss: 0.3421 - acc: 0.8898 - val_loss: 0.4273 - val_acc: 0.8692
Epoch 11/30
 - 1s - loss: 0.3262 - acc: 0.8923 - val_loss: 0.4359 - val_acc: 0.8487
Epoch 12/30
 - 1s - loss: 0.3175 - acc: 0.8928 - val_loss: 0.4407 - val_acc: 0.8410
Epoch 13/30
 - 1s - loss: 0.3552 - acc: 0.8884 - val_loss: 0.4121 - val_acc: 0.8686
Epoch 14/30
 - 1s - loss: 0.3450 - acc: 0.8876 - val_loss: 0.4220 - val_acc: 0.8699
Epoch 15/30
 - 1s - loss: 0.3381 - acc: 0.8864 - val_loss: 0.4354 - val_acc: 0.8622
Epoch 16/30
 - 1s - loss: 0.3555 - acc: 0.8903 - val_loss: 0.4573 - val_acc: 0.8333
Epoch 17/30
 - 1s - loss: 0.3387 - acc: 0.8889 - val_loss: 0.3880 - val_acc: 0.8686
Epoch 18/30
 - 1s - loss: 0.3266 - acc: 0.8908 - val_loss: 0.4157 - val_acc: 0.8628
Epoch 19/30
 - 1s - loss: 0.3269 - acc: 0.8923 - val_loss: 0.4438 - val_acc: 0.8609
Epoch 20/30
 - 1s - loss: 0.3231 - acc: 0.8881 - val_loss: 0.4208 - val_acc: 0.8679
```

```
Epoch 21/30
 - 1s - loss: 0.3179 - acc: 0.8881 - val_loss: 0.4251 - val_acc: 0.8417
Epoch 22/30
 - 1s - loss: 0.3294 - acc: 0.8921 - val_loss: 0.3989 - val_acc: 0.8763
Epoch 23/30
 - 1s - loss: 0.3092 - acc: 0.8957 - val_loss: 0.4182 - val_acc: 0.8628
Epoch 24/30
 - 1s - loss: 0.3182 - acc: 0.8894 - val_loss: 0.4541 - val_acc: 0.8449
Epoch 25/30
 - 1s - loss: 0.3257 - acc: 0.8916 - val_loss: 0.4118 - val_acc: 0.8692
Epoch 26/30
 - 1s - loss: 0.3125 - acc: 0.8925 - val_loss: 0.3985 - val_acc: 0.8795
Epoch 27/30
 - 1s - loss: 0.2960 - acc: 0.8994 - val_loss: 0.4416 - val_acc: 0.8212
Epoch 28/30
 - 1s - loss: 0.3294 - acc: 0.8894 - val_loss: 0.4051 - val_acc: 0.8712
Epoch 29/30
 - 1s - loss: 0.3228 - acc: 0.8913 - val_loss: 0.4518 - val_acc: 0.8449
Epoch 30/30
 - 1s - loss: 0.3370 - acc: 0.8839 - val_loss: 0.4193 - val_acc: 0.8609
Train accuracy 0.895992131792476 Test accuracy: 0.860897435897436
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 122, 16)	2576
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 64)	62528
dense_2 (Dense)	(None, 3)	195

```
Total params: 66,195
Trainable params: 66,195
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 4s - loss: 6.0877 - acc: 0.8503 - val_loss: 0.5839 - val_acc: 0.8532
Epoch 2/35
 - 3s - loss: 0.4045 - acc: 0.8894 - val_loss: 0.4331 - val_acc: 0.8487
Epoch 3/35
 - 3s - loss: 0.3242 - acc: 0.8955 - val_loss: 0.4758 - val_acc: 0.8353
Epoch 4/35
 - 3s - loss: 0.3059 - acc: 0.9063 - val_loss: 0.4050 - val_acc: 0.8532
Epoch 5/35
 - 3s - loss: 0.3023 - acc: 0.9029 - val_loss: 0.3527 - val_acc: 0.8801
Epoch 6/35
 - 4s - loss: 0.3124 - acc: 0.9036 - val_loss: 0.3796 - val_acc: 0.8654
Epoch 7/35
 - 3s - loss: 0.3041 - acc: 0.9039 - val_loss: 0.4638 - val_acc: 0.8442
Epoch 8/35
 - 3s - loss: 0.3063 - acc: 0.9036 - val_loss: 0.4023 - val_acc: 0.8513
Epoch 9/35
 - 3s - loss: 0.3137 - acc: 0.9031 - val_loss: 0.5768 - val_acc: 0.8577
Epoch 10/35
 - 3s - loss: 0.3050 - acc: 0.9073 - val_loss: 0.4433 - val_acc: 0.8647
Epoch 11/35
 - 3s - loss: 0.2987 - acc: 0.9127 - val_loss: 0.5078 - val_acc: 0.8481
Epoch 12/35
 - 3s - loss: 0.3125 - acc: 0.9046 - val_loss: 0.4917 - val_acc: 0.8635
Epoch 13/35
 - 3s - loss: 0.3115 - acc: 0.9093 - val_loss: 0.4498 - val_acc: 0.8558
Epoch 14/35
 - 3s - loss: 0.2999 - acc: 0.9112 - val_loss: 0.5692 - val_acc: 0.8744
Epoch 15/35
 - 3s - loss: 0.3074 - acc: 0.9152 - val_loss: 0.3713 - val_acc: 0.8840
Epoch 16/35
 - 3s - loss: 0.2956 - acc: 0.9112 - val_loss: 0.3314 - val_acc: 0.8737
Epoch 17/35
 - 4s - loss: 0.2966 - acc: 0.9093 - val_loss: 0.4800 - val_acc: 0.8667
Epoch 18/35
 - 3s - loss: 0.2969 - acc: 0.9127 - val_loss: 0.7542 - val_acc: 0.7372
Epoch 19/35
 - 3s - loss: 0.2854 - acc: 0.9122 - val_loss: 0.3563 - val_acc: 0.8949
Epoch 20/35
 - 3s - loss: 0.2921 - acc: 0.9125 - val_loss: 0.6105 - val_acc: 0.8705
Epoch 21/35
```

```
    - 3s - loss: 0.2961 - acc: 0.9147 - val_loss: 0.6273 - val_acc: 0.8615
Epoch 22/35
    - 3s - loss: 0.3023 - acc: 0.9078 - val_loss: 0.5586 - val_acc: 0.6853
Epoch 23/35
    - 3s - loss: 0.4116 - acc: 0.9039 - val_loss: 0.6040 - val_acc: 0.8673
Epoch 24/35
    - 3s - loss: 0.3038 - acc: 0.9105 - val_loss: 0.3333 - val_acc: 0.8846
Epoch 25/35
    - 3s - loss: 0.2953 - acc: 0.9093 - val_loss: 0.3247 - val_acc: 0.8821
Epoch 26/35
    - 3s - loss: 0.3096 - acc: 0.9075 - val_loss: 0.2954 - val_acc: 0.9071
Epoch 27/35
    - 3s - loss: 0.2754 - acc: 0.9144 - val_loss: 0.5213 - val_acc: 0.8667
Epoch 28/35
    - 3s - loss: 0.3077 - acc: 0.9147 - val_loss: 0.2984 - val_acc: 0.9038
Epoch 29/35
    - 3s - loss: 0.3049 - acc: 0.9125 - val_loss: 0.3087 - val_acc: 0.8994
Epoch 30/35
    - 3s - loss: 0.3018 - acc: 0.9142 - val_loss: 0.3111 - val_acc: 0.9103
Epoch 31/35
    - 3s - loss: 0.3030 - acc: 0.9181 - val_loss: 0.4090 - val_acc: 0.8833
Epoch 32/35
    - 3s - loss: 0.2913 - acc: 0.9130 - val_loss: 0.3280 - val_acc: 0.8929
Epoch 33/35
    - 3s - loss: 0.2952 - acc: 0.9130 - val_loss: 0.3197 - val_acc: 0.9064
Epoch 34/35
    - 3s - loss: 0.3033 - acc: 0.9149 - val_loss: 0.3015 - val_acc: 0.8994
Epoch 35/35
    - 3s - loss: 0.3197 - acc: 0.9149 - val_loss: 0.3212 - val_acc: 0.9064
Train accuracy 0.9282026063437423 Test accuracy: 0.9064102564102564
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 120, 24)	3048
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 24)	0
flatten_1 (Flatten)	(None, 1440)	0

```
_____
dense_1 (Dense)                  (None, 16)                   23056
_____
dense_2 (Dense)                  (None, 3)                    51
================================================================
Total params: 28,843
Trainable params: 28,843
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 12.7366 - acc: 0.8294 - val_loss: 0.5700 - val_acc: 0.7929
Epoch 2/30
 - 1s - loss: 0.4456 - acc: 0.8665 - val_loss: 0.4383 - val_acc: 0.8596
Epoch 3/30
 - 1s - loss: 0.4124 - acc: 0.8680 - val_loss: 0.4537 - val_acc: 0.8346
Epoch 4/30
 - 1s - loss: 0.3821 - acc: 0.8790 - val_loss: 0.3826 - val_acc: 0.8699
Epoch 5/30
 - 1s - loss: 0.3827 - acc: 0.8795 - val_loss: 0.3774 - val_acc: 0.8673
Epoch 6/30
 - 1s - loss: 0.3684 - acc: 0.8827 - val_loss: 0.5504 - val_acc: 0.7788
Epoch 7/30
 - 1s - loss: 0.3739 - acc: 0.8798 - val_loss: 0.3811 - val_acc: 0.8679
Epoch 8/30
 - 1s - loss: 0.3756 - acc: 0.8825 - val_loss: 0.4707 - val_acc: 0.8436
Epoch 9/30
 - 1s - loss: 0.3592 - acc: 0.8849 - val_loss: 0.3980 - val_acc: 0.8679
Epoch 10/30
 - 1s - loss: 0.3349 - acc: 0.8857 - val_loss: 0.3560 - val_acc: 0.8763
Epoch 11/30
 - 1s - loss: 0.3335 - acc: 0.8874 - val_loss: 0.8999 - val_acc: 0.6506
Epoch 12/30
 - 1s - loss: 0.3481 - acc: 0.8847 - val_loss: 0.4332 - val_acc: 0.8154
Epoch 13/30
 - 1s - loss: 0.3431 - acc: 0.8822 - val_loss: 0.4443 - val_acc: 0.8192
Epoch 14/30
 - 1s - loss: 0.3425 - acc: 0.8822 - val_loss: 0.6525 - val_acc: 0.7013
Epoch 15/30
 - 1s - loss: 0.3375 - acc: 0.8921 - val_loss: 0.3547 - val_acc: 0.8737
Epoch 16/30
 - 1s - loss: 0.3398 - acc: 0.8859 - val_loss: 0.3759 - val_acc: 0.8564
```

```
Epoch 17/30
 - 1s - loss: 0.3323 - acc: 0.8837 - val_loss: 0.3774 - val_acc: 0.8571
Epoch 18/30
 - 1s - loss: 0.3395 - acc: 0.8881 - val_loss: 0.4366 - val_acc: 0.8788
Epoch 19/30
 - 1s - loss: 0.3297 - acc: 0.8881 - val_loss: 0.3423 - val_acc: 0.8731
Epoch 20/30
 - 1s - loss: 0.3192 - acc: 0.8950 - val_loss: 0.4801 - val_acc: 0.8628
Epoch 21/30
 - 1s - loss: 0.3312 - acc: 0.8903 - val_loss: 0.3461 - val_acc: 0.8718
Epoch 22/30
 - 1s - loss: 0.3317 - acc: 0.8894 - val_loss: 0.6345 - val_acc: 0.7679
Epoch 23/30
 - 1s - loss: 0.3268 - acc: 0.8844 - val_loss: 0.3805 - val_acc: 0.8679
Epoch 24/30
 - 1s - loss: 0.3278 - acc: 0.8842 - val_loss: 0.3678 - val_acc: 0.8692
Epoch 25/30
 - 1s - loss: 0.3247 - acc: 0.8894 - val_loss: 0.3472 - val_acc: 0.8917
Epoch 26/30
 - 1s - loss: 0.3283 - acc: 0.8866 - val_loss: 0.4050 - val_acc: 0.8635
Epoch 27/30
 - 1s - loss: 0.3279 - acc: 0.8876 - val_loss: 0.4146 - val_acc: 0.8571
Epoch 28/30
 - 1s - loss: 0.3265 - acc: 0.8950 - val_loss: 0.3907 - val_acc: 0.8667
Epoch 29/30
 - 1s - loss: 0.3308 - acc: 0.8898 - val_loss: 0.3676 - val_acc: 0.8673
Epoch 30/30
 - 1s - loss: 0.3212 - acc: 0.8886 - val_loss: 0.3432 - val_acc: 0.8936
Train accuracy 0.9139414802065404 Test accuracy: 0.8935897435897436
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 28)	1288
conv1d_2 (Conv1D)	(None, 122, 16)	1360
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 16)	0
flatten_1 (Flatten)	(None, 640)	0

```
dense_1 (Dense)                    (None, 64)                    41024
_____

dense_2 (Dense)                    (None, 3)                     195
=================================================================
Total params: 43,867
Trainable params: 43,867
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 1s - loss: 33.2705 - acc: 0.7974 - val_loss: 12.1803 - val_acc: 0.8590
Epoch 2/25
 - 1s - loss: 5.0652 - acc: 0.8793 - val_loss: 1.4917 - val_acc: 0.8128
Epoch 3/25
 - 1s - loss: 0.6818 - acc: 0.8825 - val_loss: 0.5389 - val_acc: 0.8462
Epoch 4/25
 - 1s - loss: 0.3529 - acc: 0.8896 - val_loss: 0.4971 - val_acc: 0.8077
Epoch 5/25
 - 1s - loss: 0.3317 - acc: 0.8918 - val_loss: 0.3877 - val_acc: 0.8763
Epoch 6/25
 - 1s - loss: 0.3198 - acc: 0.8886 - val_loss: 0.4281 - val_acc: 0.8506
Epoch 7/25
 - 1s - loss: 0.3285 - acc: 0.8896 - val_loss: 0.4177 - val_acc: 0.8667
Epoch 8/25
 - 1s - loss: 0.3054 - acc: 0.8906 - val_loss: 0.4108 - val_acc: 0.8385
Epoch 9/25
 - 1s - loss: 0.2990 - acc: 0.8960 - val_loss: 0.3754 - val_acc: 0.8827
Epoch 10/25
 - 1s - loss: 0.3081 - acc: 0.8930 - val_loss: 0.3719 - val_acc: 0.8833
Epoch 11/25
 - 1s - loss: 0.2974 - acc: 0.8955 - val_loss: 0.4289 - val_acc: 0.8205
Epoch 12/25
 - 1s - loss: 0.2921 - acc: 0.9009 - val_loss: 0.3557 - val_acc: 0.8763
Epoch 13/25
 - 1s - loss: 0.2827 - acc: 0.9012 - val_loss: 0.3412 - val_acc: 0.8808
Epoch 14/25
 - 1s - loss: 0.2838 - acc: 0.9044 - val_loss: 0.4762 - val_acc: 0.7955
Epoch 15/25
 - 1s - loss: 0.2838 - acc: 0.8965 - val_loss: 0.5708 - val_acc: 0.7571
Epoch 16/25
 - 1s - loss: 0.2873 - acc: 0.8965 - val_loss: 0.3468 - val_acc: 0.8795
Epoch 17/25
```

```
 - 1s - loss: 0.2911 - acc: 0.8960 - val_loss: 0.3393 - val_acc: 0.8795
Epoch 18/25
 - 1s - loss: 0.2837 - acc: 0.8977 - val_loss: 0.3542 - val_acc: 0.8801
Epoch 19/25
 - 1s - loss: 0.2956 - acc: 0.8916 - val_loss: 0.3606 - val_acc: 0.8769
Epoch 20/25
 - 1s - loss: 0.2811 - acc: 0.8957 - val_loss: 0.3535 - val_acc: 0.8782
Epoch 21/25
 - 1s - loss: 0.2731 - acc: 0.8997 - val_loss: 0.3358 - val_acc: 0.8737
Epoch 22/25
 - 1s - loss: 0.2790 - acc: 0.8957 - val_loss: 0.3541 - val_acc: 0.8776
Epoch 23/25
 - 1s - loss: 0.2892 - acc: 0.8901 - val_loss: 0.3543 - val_acc: 0.8821
Epoch 24/25
 - 1s - loss: 0.2771 - acc: 0.8992 - val_loss: 0.3703 - val_acc: 0.8673
Epoch 25/25
 - 1s - loss: 0.2779 - acc: 0.8967 - val_loss: 0.3714 - val_acc: 0.8628
Train accuracy 0.8832062945660192 Test accuracy: 0.8628205128205129
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 32)	3104
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 32)	0
flatten_1 (Flatten)	(None, 1920)	0
dense_1 (Dense)	(None, 64)	122944
dense_2 (Dense)	(None, 3)	195

```
Total params: 128,291
Trainable params: 128,291
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
```

```
         - 2s - loss: 90.0975 - acc: 0.8355 - val_loss: 23.5573 - val_acc: 0.8603
        Epoch 2/30
         - 1s - loss: 8.8094 - acc: 0.8911 - val_loss: 1.9796 - val_acc: 0.8609
        Epoch 3/30
         - 1s - loss: 0.8302 - acc: 0.8923 - val_loss: 0.5005 - val_acc: 0.8468
        Epoch 4/30
         - 1s - loss: 0.4098 - acc: 0.8788 - val_loss: 0.4449 - val_acc: 0.8333
        Epoch 5/30
         - 1s - loss: 0.3493 - acc: 0.8864 - val_loss: 0.4343 - val_acc: 0.8494
        Epoch 6/30
         - 1s - loss: 0.3832 - acc: 0.8935 - val_loss: 0.4320 - val_acc: 0.8603
        Epoch 7/30
         - 1s - loss: 0.3752 - acc: 0.8793 - val_loss: 0.4176 - val_acc: 0.8564
        Epoch 8/30
         - 1s - loss: 0.3403 - acc: 0.8955 - val_loss: 0.3886 - val_acc: 0.8667
        Epoch 9/30
         - 1s - loss: 0.3284 - acc: 0.8945 - val_loss: 0.3734 - val_acc: 0.8641
        Epoch 10/30
         - 1s - loss: 0.3296 - acc: 0.8896 - val_loss: 0.4065 - val_acc: 0.8667
        Epoch 11/30
         - 1s - loss: 0.3273 - acc: 0.8935 - val_loss: 0.4311 - val_acc: 0.8571
        Epoch 12/30
         - 1s - loss: 0.3240 - acc: 0.8948 - val_loss: 0.3919 - val_acc: 0.8474
        Epoch 13/30
         - 1s - loss: 0.2969 - acc: 0.8989 - val_loss: 0.3708 - val_acc: 0.8564
        Epoch 14/30
         - 1s - loss: 0.3534 - acc: 0.8835 - val_loss: 0.3888 - val_acc: 0.8635
        Epoch 15/30
         - 1s - loss: 0.3460 - acc: 0.8894 - val_loss: 0.4001 - val_acc: 0.8647
        Epoch 16/30
         - 1s - loss: 0.3070 - acc: 0.9007 - val_loss: 0.4308 - val_acc: 0.8321
        Epoch 17/30
         - 1s - loss: 0.3420 - acc: 0.8835 - val_loss: 0.3741 - val_acc: 0.8750
        Epoch 18/30
         - 1s - loss: 0.3291 - acc: 0.8918 - val_loss: 0.3947 - val_acc: 0.8615
        Epoch 19/30
         - 1s - loss: 0.3289 - acc: 0.8857 - val_loss: 0.3952 - val_acc: 0.8526
        Epoch 20/30
         - 1s - loss: 0.3020 - acc: 0.8972 - val_loss: 0.3552 - val_acc: 0.8699
        Epoch 21/30
         - 1s - loss: 0.3239 - acc: 0.8923 - val_loss: 0.4341 - val_acc: 0.8417
        Epoch 22/30
         - 1s - loss: 0.3039 - acc: 0.8925 - val_loss: 0.3898 - val_acc: 0.8513
```

```
Epoch 23/30
 - 1s - loss: 0.3172 - acc: 0.8923 - val_loss: 0.4819 - val_acc: 0.8410
Epoch 24/30
 - 1s - loss: 0.3177 - acc: 0.8948 - val_loss: 0.3974 - val_acc: 0.8737
Epoch 25/30
 - 1s - loss: 0.3137 - acc: 0.8903 - val_loss: 0.3987 - val_acc: 0.8474
Epoch 26/30
 - 1s - loss: 0.3039 - acc: 0.8938 - val_loss: 0.3561 - val_acc: 0.8776
Epoch 27/30
 - 1s - loss: 0.2983 - acc: 0.9014 - val_loss: 0.4686 - val_acc: 0.7994
Epoch 28/30
 - 1s - loss: 0.3433 - acc: 0.8827 - val_loss: 0.3499 - val_acc: 0.8705
Epoch 29/30
 - 1s - loss: 0.3178 - acc: 0.8933 - val_loss: 0.3678 - val_acc: 0.8647
Epoch 30/30
 - 1s - loss: 0.3036 - acc: 0.8933 - val_loss: 0.3582 - val_acc: 0.8737
Train accuracy 0.9124661912957954 Test accuracy: 0.8737179487179487
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 16)	3600
dropout_1 (Dropout)	(None, 118, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 16)	0
flatten_1 (Flatten)	(None, 944)	0
dense_1 (Dense)	(None, 64)	60480
dense_2 (Dense)	(None, 3)	195

```
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 18.1434 - acc: 0.8119 - val_loss: 8.6618 - val_acc: 0.8744
```

```
Epoch 2/30
 - 1s - loss: 4.9041 - acc: 0.8807 - val_loss: 2.4457 - val_acc: 0.8577
Epoch 3/30
 - 1s - loss: 1.3496 - acc: 0.8967 - val_loss: 0.8461 - val_acc: 0.8372
Epoch 4/30
 - 1s - loss: 0.5045 - acc: 0.8992 - val_loss: 0.5524 - val_acc: 0.8506
Epoch 5/30
 - 1s - loss: 0.3551 - acc: 0.8992 - val_loss: 0.4740 - val_acc: 0.8647
Epoch 6/30
 - 1s - loss: 0.3193 - acc: 0.9014 - val_loss: 0.3663 - val_acc: 0.8673
Epoch 7/30
 - 1s - loss: 0.2957 - acc: 0.9056 - val_loss: 0.4867 - val_acc: 0.8506
Epoch 8/30
 - 1s - loss: 0.2849 - acc: 0.9051 - val_loss: 0.3736 - val_acc: 0.8699
Epoch 9/30
 - 1s - loss: 0.2832 - acc: 0.9093 - val_loss: 0.3395 - val_acc: 0.8827
Epoch 10/30
 - 1s - loss: 0.2729 - acc: 0.9085 - val_loss: 0.3163 - val_acc: 0.8891
Epoch 11/30
 - 1s - loss: 0.2728 - acc: 0.9093 - val_loss: 0.3269 - val_acc: 0.8763
Epoch 12/30
 - 1s - loss: 0.2705 - acc: 0.9100 - val_loss: 0.3494 - val_acc: 0.8814
Epoch 13/30
 - 1s - loss: 0.2645 - acc: 0.9115 - val_loss: 0.3246 - val_acc: 0.8917
Epoch 14/30
 - 1s - loss: 0.2654 - acc: 0.9125 - val_loss: 0.3072 - val_acc: 0.9051
Epoch 15/30
 - 1s - loss: 0.2573 - acc: 0.9147 - val_loss: 0.3889 - val_acc: 0.8692
Epoch 16/30
 - 1s - loss: 0.2805 - acc: 0.9090 - val_loss: 0.3220 - val_acc: 0.8833
Epoch 17/30
 - 1s - loss: 0.2549 - acc: 0.9171 - val_loss: 0.3410 - val_acc: 0.8795
Epoch 18/30
 - 1s - loss: 0.2505 - acc: 0.9179 - val_loss: 0.3143 - val_acc: 0.8859
Epoch 19/30
 - 1s - loss: 0.2582 - acc: 0.9125 - val_loss: 0.3037 - val_acc: 0.8987
Epoch 20/30
 - 1s - loss: 0.2544 - acc: 0.9191 - val_loss: 0.4293 - val_acc: 0.8526
Epoch 21/30
 - 1s - loss: 0.2462 - acc: 0.9216 - val_loss: 0.3287 - val_acc: 0.8821
Epoch 22/30
 - 1s - loss: 0.2444 - acc: 0.9191 - val_loss: 0.3099 - val_acc: 0.8910
Epoch 23/30
```

```
 - 1s - loss: 0.2511 - acc: 0.9162 - val_loss: 0.3915 - val_acc: 0.8859
Epoch 24/30
 - 1s - loss: 0.2477 - acc: 0.9174 - val_loss: 0.5104 - val_acc: 0.8853
Epoch 25/30
 - 1s - loss: 0.2473 - acc: 0.9115 - val_loss: 0.4070 - val_acc: 0.8526
Epoch 26/30
 - 1s - loss: 0.2388 - acc: 0.9201 - val_loss: 0.3328 - val_acc: 0.8981
Epoch 27/30
 - 1s - loss: 0.2346 - acc: 0.9201 - val_loss: 0.2771 - val_acc: 0.9026
Epoch 28/30
 - 1s - loss: 0.2436 - acc: 0.9171 - val_loss: 0.2813 - val_acc: 0.9090
Epoch 29/30
 - 1s - loss: 0.2453 - acc: 0.9198 - val_loss: 0.2906 - val_acc: 0.9058
Epoch 30/30
 - 1s - loss: 0.2409 - acc: 0.9201 - val_loss: 0.3293 - val_acc: 0.8904
Train accuracy 0.9107450208999263 Test accuracy: 0.8903846153846153
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)            (None, 118, 16)           2576
_____
dropout_1 (Dropout)          (None, 118, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 23, 16)            0
_____
flatten_1 (Flatten)          (None, 368)               0
_____
dense_1 (Dense)              (None, 32)                11808
_____
dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 16,531
Trainable params: 16,531
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 3.2372 - acc: 0.8680 - val_loss: 0.6381 - val_acc: 0.8487
Epoch 2/35
```

```
         - 1s - loss: 0.4385 - acc: 0.9026 - val_loss: 0.4342 - val_acc: 0.8673
Epoch 3/35
         - 1s - loss: 0.3415 - acc: 0.9139 - val_loss: 0.4073 - val_acc: 0.8571
Epoch 4/35
         - 1s - loss: 0.2965 - acc: 0.9179 - val_loss: 0.3458 - val_acc: 0.8756
Epoch 5/35
         - 1s - loss: 0.2820 - acc: 0.9221 - val_loss: 0.3548 - val_acc: 0.8859
Epoch 6/35
         - 1s - loss: 0.2681 - acc: 0.9248 - val_loss: 0.3409 - val_acc: 0.8744
Epoch 7/35
         - 1s - loss: 0.2693 - acc: 0.9201 - val_loss: 0.3495 - val_acc: 0.8699
Epoch 8/35
         - 1s - loss: 0.2612 - acc: 0.9225 - val_loss: 0.3711 - val_acc: 0.8596
Epoch 9/35
         - 1s - loss: 0.2492 - acc: 0.9267 - val_loss: 0.5601 - val_acc: 0.8532
Epoch 10/35
         - 1s - loss: 0.2572 - acc: 0.9243 - val_loss: 0.3517 - val_acc: 0.9141
Epoch 11/35
         - 1s - loss: 0.2547 - acc: 0.9270 - val_loss: 0.2823 - val_acc: 0.9032
Epoch 12/35
         - 1s - loss: 0.2501 - acc: 0.9275 - val_loss: 0.2962 - val_acc: 0.8942
Epoch 13/35
         - 1s - loss: 0.2548 - acc: 0.9292 - val_loss: 0.3525 - val_acc: 0.8667
Epoch 14/35
         - 1s - loss: 0.2487 - acc: 0.9260 - val_loss: 0.2849 - val_acc: 0.9154
Epoch 15/35
         - 1s - loss: 0.2425 - acc: 0.9309 - val_loss: 0.3074 - val_acc: 0.8910
Epoch 16/35
         - 1s - loss: 0.2340 - acc: 0.9316 - val_loss: 0.3178 - val_acc: 0.8782
Epoch 17/35
         - 1s - loss: 0.2335 - acc: 0.9250 - val_loss: 0.3796 - val_acc: 0.8756
Epoch 18/35
         - 1s - loss: 0.2387 - acc: 0.9316 - val_loss: 0.3524 - val_acc: 0.9045
Epoch 19/35
         - 1s - loss: 0.2281 - acc: 0.9302 - val_loss: 0.3054 - val_acc: 0.8827
Epoch 20/35
         - 1s - loss: 0.2410 - acc: 0.9297 - val_loss: 0.2861 - val_acc: 0.9000
Epoch 21/35
         - 1s - loss: 0.2209 - acc: 0.9316 - val_loss: 0.3443 - val_acc: 0.8769
Epoch 22/35
         - 1s - loss: 0.2300 - acc: 0.9272 - val_loss: 0.3458 - val_acc: 0.9038
Epoch 23/35
         - 1s - loss: 0.2289 - acc: 0.9304 - val_loss: 0.3074 - val_acc: 0.8878
```

```
Epoch 24/35
 - 1s - loss: 0.2241 - acc: 0.9307 - val_loss: 0.2982 - val_acc: 0.8865
Epoch 25/35
 - 1s - loss: 0.2355 - acc: 0.9302 - val_loss: 0.3159 - val_acc: 0.8788
Epoch 26/35
 - 1s - loss: 0.2224 - acc: 0.9304 - val_loss: 0.3181 - val_acc: 0.8917
Epoch 27/35
 - 1s - loss: 0.2284 - acc: 0.9312 - val_loss: 0.3136 - val_acc: 0.8897
Epoch 28/35
 - 1s - loss: 0.2359 - acc: 0.9343 - val_loss: 0.2672 - val_acc: 0.9160
Epoch 29/35
 - 1s - loss: 0.2347 - acc: 0.9309 - val_loss: 0.3882 - val_acc: 0.8801
Epoch 30/35
 - 1s - loss: 0.2185 - acc: 0.9375 - val_loss: 0.3052 - val_acc: 0.8859
Epoch 31/35
 - 1s - loss: 0.2284 - acc: 0.9361 - val_loss: 0.3024 - val_acc: 0.8782
Epoch 32/35
 - 1s - loss: 0.2392 - acc: 0.9339 - val_loss: 0.3697 - val_acc: 0.8635
Epoch 33/35
 - 1s - loss: 0.2367 - acc: 0.9331 - val_loss: 0.2681 - val_acc: 0.9058
Epoch 34/35
 - 1s - loss: 0.2201 - acc: 0.9351 - val_loss: 0.2848 - val_acc: 0.9051
Epoch 35/35
 - 1s - loss: 0.2351 - acc: 0.9292 - val_loss: 0.2971 - val_acc: 0.8949
Train accuracy 0.9424637324809442 Test accuracy: 0.8948717948717949
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 124, 16)	2032
dropout_1 (Dropout)	(None, 124, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 62, 16)	0
flatten_1 (Flatten)	(None, 992)	0
dense_1 (Dense)	(None, 16)	15888
dense_2 (Dense)	(None, 3)	51

```
Total params: 19,147
Trainable params: 19,147
Non-trainable params: 0
```
_____

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 20.2201 - acc: 0.8065 - val_loss: 1.4877 - val_acc: 0.7647
Epoch 2/30
 - 1s - loss: 0.5541 - acc: 0.8586 - val_loss: 0.4453 - val_acc: 0.8622
Epoch 3/30
 - 1s - loss: 0.3970 - acc: 0.8714 - val_loss: 0.4273 - val_acc: 0.8519
Epoch 4/30
 - 1s - loss: 0.3771 - acc: 0.8773 - val_loss: 0.3933 - val_acc: 0.8660
Epoch 5/30
 - 1s - loss: 0.3765 - acc: 0.8753 - val_loss: 0.4360 - val_acc: 0.8506
Epoch 6/30
 - 1s - loss: 0.3606 - acc: 0.8832 - val_loss: 0.4841 - val_acc: 0.8038
Epoch 7/30
 - 1s - loss: 0.3486 - acc: 0.8817 - val_loss: 0.3848 - val_acc: 0.8647
Epoch 8/30
 - 1s - loss: 0.3425 - acc: 0.8756 - val_loss: 0.4604 - val_acc: 0.8128
Epoch 9/30
 - 1s - loss: 0.3269 - acc: 0.8906 - val_loss: 0.3677 - val_acc: 0.8705
Epoch 10/30
 - 1s - loss: 0.3318 - acc: 0.8903 - val_loss: 0.3585 - val_acc: 0.8737
Epoch 11/30
 - 1s - loss: 0.3270 - acc: 0.8916 - val_loss: 0.7221 - val_acc: 0.6891
Epoch 12/30
 - 1s - loss: 0.3293 - acc: 0.8876 - val_loss: 0.4747 - val_acc: 0.8019
Epoch 13/30
 - 1s - loss: 0.3325 - acc: 0.8842 - val_loss: 0.4376 - val_acc: 0.8135
Epoch 14/30
 - 1s - loss: 0.3230 - acc: 0.8881 - val_loss: 0.5703 - val_acc: 0.7115
Epoch 15/30
 - 1s - loss: 0.3203 - acc: 0.8884 - val_loss: 0.3408 - val_acc: 0.8801
Epoch 16/30
 - 1s - loss: 0.3261 - acc: 0.8889 - val_loss: 0.3621 - val_acc: 0.8705
Epoch 17/30
 - 1s - loss: 0.3276 - acc: 0.8847 - val_loss: 0.3722 - val_acc: 0.8564
Epoch 18/30
 - 1s - loss: 0.3159 - acc: 0.8921 - val_loss: 0.3758 - val_acc: 0.8821
Epoch 19/30
```

```
   - 1s - loss: 0.3255 - acc: 0.8842 - val_loss: 0.3529 - val_acc: 0.8692
Epoch 20/30
   - 1s - loss: 0.3182 - acc: 0.8906 - val_loss: 0.3491 - val_acc: 0.8705
Epoch 21/30
   - 1s - loss: 0.3076 - acc: 0.8930 - val_loss: 0.3520 - val_acc: 0.8686
Epoch 22/30
   - 1s - loss: 0.3273 - acc: 0.8852 - val_loss: 0.3623 - val_acc: 0.8769
Epoch 23/30
   - 1s - loss: 0.3209 - acc: 0.8881 - val_loss: 0.3420 - val_acc: 0.8756
Epoch 24/30
   - 1s - loss: 0.3163 - acc: 0.8866 - val_loss: 0.3409 - val_acc: 0.8737
Epoch 25/30
   - 1s - loss: 0.3082 - acc: 0.8874 - val_loss: 0.3623 - val_acc: 0.8782
Epoch 26/30
   - 1s - loss: 0.3168 - acc: 0.8898 - val_loss: 0.3477 - val_acc: 0.8737
Epoch 27/30
   - 1s - loss: 0.3139 - acc: 0.8921 - val_loss: 0.3931 - val_acc: 0.8462
Epoch 28/30
   - 1s - loss: 0.3081 - acc: 0.8898 - val_loss: 0.3985 - val_acc: 0.8577
Epoch 29/30
   - 1s - loss: 0.3271 - acc: 0.8908 - val_loss: 0.3386 - val_acc: 0.8788
Epoch 30/30
   - 1s - loss: 0.3143 - acc: 0.8889 - val_loss: 0.3575 - val_acc: 0.8596
Train accuracy 0.9043521022866978 Test accuracy: 0.8596153846153847
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 28)	1288
conv1d_2 (Conv1D)	(None, 122, 24)	2040
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 24)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
Total params: 65,027
```

```
Trainable params: 65,027
Non-trainable params: 0

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None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 9.3331 - acc: 0.8392 - val_loss: 5.6871 - val_acc: 0.8891
Epoch 2/25
 - 1s - loss: 3.6758 - acc: 0.9085 - val_loss: 2.3434 - val_acc: 0.8718
Epoch 3/25
 - 1s - loss: 1.4613 - acc: 0.9208 - val_loss: 1.0490 - val_acc: 0.8686
Epoch 4/25
 - 1s - loss: 0.6616 - acc: 0.9206 - val_loss: 0.5950 - val_acc: 0.8776
Epoch 5/25
 - 1s - loss: 0.4184 - acc: 0.9147 - val_loss: 0.4581 - val_acc: 0.8885
Epoch 6/25
 - 1s - loss: 0.3007 - acc: 0.9243 - val_loss: 0.3845 - val_acc: 0.8788
Epoch 7/25
 - 1s - loss: 0.2837 - acc: 0.9174 - val_loss: 0.3999 - val_acc: 0.8724
Epoch 8/25
 - 1s - loss: 0.2571 - acc: 0.9198 - val_loss: 0.3870 - val_acc: 0.8692
Epoch 9/25
 - 1s - loss: 0.2352 - acc: 0.9253 - val_loss: 0.3498 - val_acc: 0.8686
Epoch 10/25
 - 1s - loss: 0.2380 - acc: 0.9243 - val_loss: 0.3202 - val_acc: 0.8974
Epoch 11/25
 - 1s - loss: 0.2289 - acc: 0.9284 - val_loss: 0.3308 - val_acc: 0.8840
Epoch 12/25
 - 1s - loss: 0.2397 - acc: 0.9265 - val_loss: 0.3053 - val_acc: 0.9192
Epoch 13/25
 - 1s - loss: 0.2167 - acc: 0.9351 - val_loss: 0.3218 - val_acc: 0.8744
Epoch 14/25
 - 1s - loss: 0.2065 - acc: 0.9314 - val_loss: 0.3005 - val_acc: 0.8968
Epoch 15/25
 - 1s - loss: 0.2181 - acc: 0.9366 - val_loss: 0.3440 - val_acc: 0.8859
Epoch 16/25
 - 1s - loss: 0.2228 - acc: 0.9292 - val_loss: 0.3352 - val_acc: 0.8647
Epoch 17/25
 - 1s - loss: 0.2239 - acc: 0.9324 - val_loss: 0.3329 - val_acc: 0.8705
Epoch 18/25
 - 1s - loss: 0.2279 - acc: 0.9287 - val_loss: 0.3091 - val_acc: 0.8801
Epoch 19/25
 - 1s - loss: 0.2103 - acc: 0.9361 - val_loss: 0.3468 - val_acc: 0.8962
```

```
Epoch 20/25
 - 1s - loss: 0.1990 - acc: 0.9430 - val_loss: 0.2612 - val_acc: 0.9051
Epoch 21/25
 - 1s - loss: 0.1951 - acc: 0.9403 - val_loss: 0.3262 - val_acc: 0.8744
Epoch 22/25
 - 1s - loss: 0.2017 - acc: 0.9375 - val_loss: 0.2661 - val_acc: 0.9333
Epoch 23/25
 - 1s - loss: 0.2012 - acc: 0.9385 - val_loss: 0.2729 - val_acc: 0.8929
Epoch 24/25
 - 1s - loss: 0.1829 - acc: 0.9452 - val_loss: 0.2629 - val_acc: 0.9199
Epoch 25/25
 - 1s - loss: 0.1836 - acc: 0.9474 - val_loss: 0.2462 - val_acc: 0.9115
Train accuracy 0.9404966805999508 Test accuracy: 0.9115384615384615
-------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 120, 16)           1552

dropout_1 (Dropout)          (None, 120, 16)           0

max_pooling1d_1 (MaxPooling1 (None, 60, 16)            0

flatten_1 (Flatten)          (None, 960)               0

dense_1 (Dense)              (None, 64)                61504

dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 21.8776 - acc: 0.8112 - val_loss: 8.2071 - val_acc: 0.8500
Epoch 2/30
 - 1s - loss: 3.4085 - acc: 0.8805 - val_loss: 0.9762 - val_acc: 0.8564
Epoch 3/30
 - 1s - loss: 0.5240 - acc: 0.8903 - val_loss: 0.5322 - val_acc: 0.8019
```

```
Epoch 4/30
 - 1s - loss: 0.3385 - acc: 0.8989 - val_loss: 0.4410 - val_acc: 0.8263
Epoch 5/30
 - 1s - loss: 0.3149 - acc: 0.8940 - val_loss: 0.3724 - val_acc: 0.8590
Epoch 6/30
 - 1s - loss: 0.2972 - acc: 0.8950 - val_loss: 0.3832 - val_acc: 0.8679
Epoch 7/30
 - 1s - loss: 0.2956 - acc: 0.8970 - val_loss: 0.3426 - val_acc: 0.8865
Epoch 8/30
 - 1s - loss: 0.2835 - acc: 0.9009 - val_loss: 0.3881 - val_acc: 0.8474
Epoch 9/30
 - 1s - loss: 0.2807 - acc: 0.9053 - val_loss: 0.3293 - val_acc: 0.8814
Epoch 10/30
 - 1s - loss: 0.2849 - acc: 0.8992 - val_loss: 0.3450 - val_acc: 0.8821
Epoch 11/30
 - 1s - loss: 0.2707 - acc: 0.9075 - val_loss: 0.4416 - val_acc: 0.7808
Epoch 12/30
 - 1s - loss: 0.2763 - acc: 0.9012 - val_loss: 0.3242 - val_acc: 0.8808
Epoch 13/30
 - 1s - loss: 0.2759 - acc: 0.9068 - val_loss: 0.3264 - val_acc: 0.8827
Epoch 14/30
 - 1s - loss: 0.2728 - acc: 0.9100 - val_loss: 0.3511 - val_acc: 0.8865
Epoch 15/30
 - 1s - loss: 0.2806 - acc: 0.9056 - val_loss: 0.4642 - val_acc: 0.8154
Epoch 16/30
 - 1s - loss: 0.2702 - acc: 0.9053 - val_loss: 0.3177 - val_acc: 0.8840
Epoch 17/30
 - 1s - loss: 0.2736 - acc: 0.9100 - val_loss: 0.3511 - val_acc: 0.8558
Epoch 18/30
 - 1s - loss: 0.2731 - acc: 0.9075 - val_loss: 0.3407 - val_acc: 0.8705
Epoch 19/30
 - 1s - loss: 0.2679 - acc: 0.9071 - val_loss: 0.3205 - val_acc: 0.8859
Epoch 20/30
 - 1s - loss: 0.2683 - acc: 0.9039 - val_loss: 0.5070 - val_acc: 0.8026
Epoch 21/30
 - 1s - loss: 0.2648 - acc: 0.9083 - val_loss: 0.4056 - val_acc: 0.8615
Epoch 22/30
 - 1s - loss: 0.2634 - acc: 0.9056 - val_loss: 0.3406 - val_acc: 0.8814
Epoch 23/30
 - 1s - loss: 0.2715 - acc: 0.9056 - val_loss: 0.3219 - val_acc: 0.8878
Epoch 24/30
 - 1s - loss: 0.2587 - acc: 0.9112 - val_loss: 0.3448 - val_acc: 0.8660
Epoch 25/30
```

```
 - 1s - loss: 0.2714 - acc: 0.9051 - val_loss: 0.3747 - val_acc: 0.8705
Epoch 26/30
 - 1s - loss: 0.2551 - acc: 0.9144 - val_loss: 0.3406 - val_acc: 0.8776
Epoch 27/30
 - 1s - loss: 0.2496 - acc: 0.9142 - val_loss: 0.3354 - val_acc: 0.8737
Epoch 28/30
 - 1s - loss: 0.2747 - acc: 0.9093 - val_loss: 0.3392 - val_acc: 0.8846
Epoch 29/30
 - 1s - loss: 0.2700 - acc: 0.9112 - val_loss: 0.3204 - val_acc: 0.8878
Epoch 30/30
 - 1s - loss: 0.2586 - acc: 0.9115 - val_loss: 0.3036 - val_acc: 0.8962
Train accuracy 0.9232849766412589 Test accuracy: 0.8961538461538462
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 32)	7200
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 32)	0
flatten_1 (Flatten)	(None, 1888)	0
dense_1 (Dense)	(None, 64)	120896
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 129,763
Trainable params: 129,763
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 134.1267 - acc: 0.8281 - val_loss: 84.5430 - val_acc: 0.8545
Epoch 2/30
 - 1s - loss: 56.5396 - acc: 0.8815 - val_loss: 34.2276 - val_acc: 0.8417
Epoch 3/30
 - 1s - loss: 21.5489 - acc: 0.8803 - val_loss: 11.6331 - val_acc: 0.8013
Epoch 4/30
```

```
         - 1s - loss: 6.2812 - acc: 0.8894 - val_loss: 2.6907 - val_acc: 0.8058
        Epoch 5/30
         - 1s - loss: 1.1943 - acc: 0.8832 - val_loss: 0.6548 - val_acc: 0.8462
        Epoch 6/30
         - 1s - loss: 0.3943 - acc: 0.8891 - val_loss: 0.4627 - val_acc: 0.8564
        Epoch 7/30
         - 1s - loss: 0.3490 - acc: 0.8943 - val_loss: 0.4004 - val_acc: 0.8686
        Epoch 8/30
         - 1s - loss: 0.3179 - acc: 0.8970 - val_loss: 0.4132 - val_acc: 0.8436
        Epoch 9/30
         - 1s - loss: 0.3129 - acc: 0.8975 - val_loss: 0.3891 - val_acc: 0.8558
        Epoch 10/30
         - 1s - loss: 0.3065 - acc: 0.8965 - val_loss: 0.4127 - val_acc: 0.8628
        Epoch 11/30
         - 1s - loss: 0.2999 - acc: 0.8940 - val_loss: 0.3695 - val_acc: 0.8724
        Epoch 12/30
         - 1s - loss: 0.2955 - acc: 0.8960 - val_loss: 0.3490 - val_acc: 0.8776
        Epoch 13/30
         - 1s - loss: 0.2979 - acc: 0.8989 - val_loss: 0.3483 - val_acc: 0.8827
        Epoch 14/30
         - 1s - loss: 0.2807 - acc: 0.9004 - val_loss: 0.4537 - val_acc: 0.8455
        Epoch 15/30
         - 1s - loss: 0.2865 - acc: 0.8965 - val_loss: 0.3693 - val_acc: 0.8641
        Epoch 16/30
         - 1s - loss: 0.2869 - acc: 0.8965 - val_loss: 0.3556 - val_acc: 0.8737
        Epoch 17/30
         - 1s - loss: 0.2853 - acc: 0.9009 - val_loss: 0.3493 - val_acc: 0.8705
        Epoch 18/30
         - 1s - loss: 0.2905 - acc: 0.8985 - val_loss: 0.3616 - val_acc: 0.8596
        Epoch 19/30
         - 1s - loss: 0.2838 - acc: 0.8997 - val_loss: 0.3369 - val_acc: 0.8801
        Epoch 20/30
         - 1s - loss: 0.2771 - acc: 0.9004 - val_loss: 0.6362 - val_acc: 0.7288
        Epoch 21/30
         - 1s - loss: 0.2821 - acc: 0.9004 - val_loss: 0.3572 - val_acc: 0.8628
        Epoch 22/30
         - 1s - loss: 0.2849 - acc: 0.8933 - val_loss: 0.3309 - val_acc: 0.8846
        Epoch 23/30
         - 1s - loss: 0.2787 - acc: 0.8967 - val_loss: 0.3393 - val_acc: 0.8744
        Epoch 24/30
         - 1s - loss: 0.2759 - acc: 0.8977 - val_loss: 0.3373 - val_acc: 0.8731
        Epoch 25/30
         - 1s - loss: 0.2814 - acc: 0.8967 - val_loss: 0.3650 - val_acc: 0.8564
```

```
Epoch 26/30
 - 1s - loss: 0.2789 - acc: 0.8977 - val_loss: 0.3347 - val_acc: 0.8763
Epoch 27/30
 - 1s - loss: 0.2713 - acc: 0.8970 - val_loss: 0.3421 - val_acc: 0.8712
Epoch 28/30
 - 1s - loss: 0.2835 - acc: 0.8945 - val_loss: 0.3459 - val_acc: 0.8801
Epoch 29/30
 - 1s - loss: 0.2877 - acc: 0.8967 - val_loss: 0.3558 - val_acc: 0.8718
Epoch 30/30
 - 1s - loss: 0.2792 - acc: 0.8992 - val_loss: 0.3323 - val_acc: 0.8801
Train accuracy 0.9230390951561347 Test accuracy: 0.8801282051282051
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0
dense_1 (Dense)	(None, 32)	12320
dense_2 (Dense)	(None, 3)	99

```
Total params: 16,019
Trainable params: 16,019
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 14.7731 - acc: 0.8279 - val_loss: 0.5994 - val_acc: 0.7821
Epoch 2/30
 - 1s - loss: 0.3990 - acc: 0.8719 - val_loss: 0.4631 - val_acc: 0.8551
Epoch 3/30
 - 1s - loss: 0.3678 - acc: 0.8790 - val_loss: 0.4502 - val_acc: 0.8397
Epoch 4/30
 - 1s - loss: 0.3464 - acc: 0.8839 - val_loss: 0.4166 - val_acc: 0.8737
```

```
Epoch 5/30
 - 1s - loss: 0.3418 - acc: 0.8837 - val_loss: 0.3935 - val_acc: 0.8763
Epoch 6/30
 - 1s - loss: 0.3357 - acc: 0.8842 - val_loss: 0.4331 - val_acc: 0.8340
Epoch 7/30
 - 1s - loss: 0.3332 - acc: 0.8839 - val_loss: 0.3864 - val_acc: 0.8609
Epoch 8/30
 - 1s - loss: 0.3243 - acc: 0.8876 - val_loss: 0.4445 - val_acc: 0.8423
Epoch 9/30
 - 1s - loss: 0.3179 - acc: 0.8923 - val_loss: 0.3803 - val_acc: 0.8718
Epoch 10/30
 - 1s - loss: 0.3252 - acc: 0.8862 - val_loss: 0.3791 - val_acc: 0.8782
Epoch 11/30
 - 1s - loss: 0.3213 - acc: 0.8928 - val_loss: 0.5263 - val_acc: 0.7000
Epoch 12/30
 - 1s - loss: 0.3247 - acc: 0.8812 - val_loss: 0.3930 - val_acc: 0.8590
Epoch 13/30
 - 1s - loss: 0.3238 - acc: 0.8817 - val_loss: 0.4065 - val_acc: 0.8429
Epoch 14/30
 - 1s - loss: 0.3137 - acc: 0.8869 - val_loss: 0.4432 - val_acc: 0.7891
Epoch 15/30
 - 1s - loss: 0.3218 - acc: 0.8908 - val_loss: 0.3937 - val_acc: 0.8705
Epoch 16/30
 - 1s - loss: 0.3175 - acc: 0.8908 - val_loss: 0.3816 - val_acc: 0.8872
Epoch 17/30
 - 1s - loss: 0.3078 - acc: 0.8857 - val_loss: 0.3411 - val_acc: 0.8737
Epoch 18/30
 - 1s - loss: 0.3137 - acc: 0.8891 - val_loss: 0.5001 - val_acc: 0.8731
Epoch 19/30
 - 1s - loss: 0.3095 - acc: 0.8908 - val_loss: 0.4098 - val_acc: 0.8603
Epoch 20/30
 - 1s - loss: 0.3045 - acc: 0.8879 - val_loss: 0.4579 - val_acc: 0.8692
Epoch 21/30
 - 1s - loss: 0.2958 - acc: 0.8930 - val_loss: 0.3381 - val_acc: 0.8724
Epoch 22/30
 - 1s - loss: 0.3088 - acc: 0.8945 - val_loss: 0.5607 - val_acc: 0.7994
Epoch 23/30
 - 1s - loss: 0.3079 - acc: 0.8862 - val_loss: 0.3454 - val_acc: 0.8750
Epoch 24/30
 - 1s - loss: 0.3145 - acc: 0.8859 - val_loss: 0.4384 - val_acc: 0.8571
Epoch 25/30
 - 1s - loss: 0.3062 - acc: 0.8928 - val_loss: 0.3940 - val_acc: 0.8462
Epoch 26/30
```

```
 - 1s - loss: 0.3019 - acc: 0.8965 - val_loss: 0.4422 - val_acc: 0.8718
Epoch 27/30
 - 1s - loss: 0.3038 - acc: 0.8987 - val_loss: 0.3417 - val_acc: 0.8827
Epoch 28/30
 - 1s - loss: 0.3069 - acc: 0.8928 - val_loss: 0.4843 - val_acc: 0.7545
Epoch 29/30
 - 1s - loss: 0.3001 - acc: 0.8960 - val_loss: 0.4172 - val_acc: 0.8333
Epoch 30/30
 - 1s - loss: 0.2977 - acc: 0.8945 - val_loss: 0.3839 - val_acc: 0.8782
Train accuracy 0.8748463240717974 Test accuracy: 0.8782051282051282
---------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 122, 16)	3376
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 16)	15632
dense_2 (Dense)	(None, 3)	51

```
Total params: 20,235
Trainable params: 20,235
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 1s - loss: 59.0001 - acc: 0.7817 - val_loss: 19.4260 - val_acc: 0.8436
Epoch 2/35
 - 1s - loss: 7.7998 - acc: 0.8409 - val_loss: 1.4972 - val_acc: 0.8346
Epoch 3/35
 - 1s - loss: 0.6662 - acc: 0.8495 - val_loss: 0.5592 - val_acc: 0.7872
Epoch 4/35
 - 1s - loss: 0.4417 - acc: 0.8643 - val_loss: 0.5790 - val_acc: 0.7885
Epoch 5/35
```

```
                - 1s - loss: 0.4149 - acc: 0.8768 - val_loss: 0.5205 - val_acc: 0.8179
        Epoch 6/35
                - 1s - loss: 0.4002 - acc: 0.8761 - val_loss: 0.4478 - val_acc: 0.8731
        Epoch 7/35
                - 1s - loss: 0.3978 - acc: 0.8731 - val_loss: 0.4367 - val_acc: 0.8628
        Epoch 8/35
                - 1s - loss: 0.3713 - acc: 0.8820 - val_loss: 0.4748 - val_acc: 0.8135
        Epoch 9/35
                - 1s - loss: 0.3693 - acc: 0.8854 - val_loss: 0.4100 - val_acc: 0.8769
        Epoch 10/35
                - 1s - loss: 0.3837 - acc: 0.8766 - val_loss: 0.4244 - val_acc: 0.8641
        Epoch 11/35
                - 1s - loss: 0.3649 - acc: 0.8812 - val_loss: 0.4307 - val_acc: 0.8365
        Epoch 12/35
                - 1s - loss: 0.3630 - acc: 0.8832 - val_loss: 0.4849 - val_acc: 0.8596
        Epoch 13/35
                - 1s - loss: 0.3712 - acc: 0.8879 - val_loss: 0.3910 - val_acc: 0.8795
        Epoch 14/35
                - 1s - loss: 0.3412 - acc: 0.8982 - val_loss: 0.4395 - val_acc: 0.8744
        Epoch 15/35
                - 1s - loss: 0.3519 - acc: 0.8807 - val_loss: 0.5866 - val_acc: 0.7641
        Epoch 16/35
                - 1s - loss: 0.3587 - acc: 0.8827 - val_loss: 0.3797 - val_acc: 0.8705
        Epoch 17/35
                - 1s - loss: 0.3519 - acc: 0.8835 - val_loss: 0.3778 - val_acc: 0.8724
        Epoch 18/35
                - 1s - loss: 0.3549 - acc: 0.8862 - val_loss: 0.3787 - val_acc: 0.8712
        Epoch 19/35
                - 1s - loss: 0.3541 - acc: 0.8859 - val_loss: 0.3773 - val_acc: 0.8705
        Epoch 20/35
                - 1s - loss: 0.3519 - acc: 0.8881 - val_loss: 0.4039 - val_acc: 0.8673
        Epoch 21/35
                - 1s - loss: 0.3480 - acc: 0.8906 - val_loss: 0.4127 - val_acc: 0.8513
        Epoch 22/35
                - 1s - loss: 0.3235 - acc: 0.8913 - val_loss: 0.3782 - val_acc: 0.8692
        Epoch 23/35
                - 1s - loss: 0.3647 - acc: 0.8830 - val_loss: 0.4007 - val_acc: 0.8814
        Epoch 24/35
                - 1s - loss: 0.3343 - acc: 0.8894 - val_loss: 0.4586 - val_acc: 0.8564
        Epoch 25/35
                - 1s - loss: 0.3548 - acc: 0.8837 - val_loss: 0.4396 - val_acc: 0.8212
        Epoch 26/35
                - 1s - loss: 0.3322 - acc: 0.8916 - val_loss: 0.3784 - val_acc: 0.8763
```

```
Epoch 27/35
 - 1s - loss: 0.3527 - acc: 0.8852 - val_loss: 0.3645 - val_acc: 0.8782
Epoch 28/35
 - 1s - loss: 0.3373 - acc: 0.8844 - val_loss: 0.4151 - val_acc: 0.8756
Epoch 29/35
 - 1s - loss: 0.3514 - acc: 0.8921 - val_loss: 0.3943 - val_acc: 0.8776
Epoch 30/35
 - 1s - loss: 0.3382 - acc: 0.8866 - val_loss: 0.4066 - val_acc: 0.8673
Epoch 31/35
 - 1s - loss: 0.3405 - acc: 0.8903 - val_loss: 0.3800 - val_acc: 0.8660
Epoch 32/35
 - 1s - loss: 0.3283 - acc: 0.8896 - val_loss: 0.3778 - val_acc: 0.8763
Epoch 33/35
 - 1s - loss: 0.3327 - acc: 0.8866 - val_loss: 0.3815 - val_acc: 0.8769
Epoch 34/35
 - 1s - loss: 0.3445 - acc: 0.8866 - val_loss: 0.3853 - val_acc: 0.8724
Epoch 35/35
 - 1s - loss: 0.3250 - acc: 0.8859 - val_loss: 0.3624 - val_acc: 0.8718
Train accuracy 0.9014015244652077 Test accuracy: 0.8717948717948718
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 16)	1552
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 64)	62528
dense_2 (Dense)	(None, 3)	195

```
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
```

```
Epoch 1/30
 - 2s - loss: 24.5985 - acc: 0.8394 - val_loss: 1.1983 - val_acc: 0.7776
Epoch 2/30
 - 2s - loss: 0.5059 - acc: 0.8827 - val_loss: 0.5739 - val_acc: 0.8494
Epoch 3/30
 - 2s - loss: 0.3960 - acc: 0.8844 - val_loss: 0.4404 - val_acc: 0.8551
Epoch 4/30
 - 1s - loss: 0.3767 - acc: 0.8795 - val_loss: 0.4483 - val_acc: 0.8436
Epoch 5/30
 - 1s - loss: 0.3457 - acc: 0.8894 - val_loss: 0.4324 - val_acc: 0.8615
Epoch 6/30
 - 1s - loss: 0.3152 - acc: 0.8965 - val_loss: 0.3665 - val_acc: 0.8628
Epoch 7/30
 - 1s - loss: 0.3450 - acc: 0.8911 - val_loss: 0.3882 - val_acc: 0.8814
Epoch 8/30
 - 2s - loss: 0.3443 - acc: 0.8903 - val_loss: 0.4357 - val_acc: 0.8417
Epoch 9/30
 - 1s - loss: 0.3306 - acc: 0.8962 - val_loss: 0.4020 - val_acc: 0.8577
Epoch 10/30
 - 1s - loss: 0.3373 - acc: 0.8930 - val_loss: 0.3819 - val_acc: 0.8744
Epoch 11/30
 - 1s - loss: 0.3478 - acc: 0.8869 - val_loss: 0.4091 - val_acc: 0.8731
Epoch 12/30
 - 1s - loss: 0.3412 - acc: 0.8825 - val_loss: 0.3692 - val_acc: 0.8788
Epoch 13/30
 - 1s - loss: 0.3280 - acc: 0.8884 - val_loss: 0.4466 - val_acc: 0.8308
Epoch 14/30
 - 2s - loss: 0.3417 - acc: 0.8921 - val_loss: 0.3902 - val_acc: 0.8731
Epoch 15/30
 - 2s - loss: 0.3297 - acc: 0.8923 - val_loss: 0.4331 - val_acc: 0.8423
Epoch 16/30
 - 1s - loss: 0.3372 - acc: 0.8901 - val_loss: 0.3815 - val_acc: 0.8628
Epoch 17/30
 - 1s - loss: 0.3139 - acc: 0.8933 - val_loss: 0.3689 - val_acc: 0.8692
Epoch 18/30
 - 2s - loss: 0.3090 - acc: 0.8938 - val_loss: 0.4037 - val_acc: 0.8500
Epoch 19/30
 - 1s - loss: 0.3164 - acc: 0.8945 - val_loss: 0.3578 - val_acc: 0.8731
Epoch 20/30
 - 1s - loss: 0.3247 - acc: 0.8955 - val_loss: 0.3505 - val_acc: 0.8769
Epoch 21/30
 - 1s - loss: 0.3158 - acc: 0.8972 - val_loss: 0.4510 - val_acc: 0.8577
Epoch 22/30
```

```
 - 1s - loss: 0.3083 - acc: 0.8967 - val_loss: 0.3420 - val_acc: 0.8782
Epoch 23/30
 - 1s - loss: 0.3592 - acc: 0.8871 - val_loss: 0.3878 - val_acc: 0.8622
Epoch 24/30
 - 1s - loss: 0.3201 - acc: 0.8871 - val_loss: 0.3903 - val_acc: 0.8705
Epoch 25/30
 - 1s - loss: 0.3155 - acc: 0.8921 - val_loss: 0.3545 - val_acc: 0.8692
Epoch 26/30
 - 1s - loss: 0.3174 - acc: 0.8953 - val_loss: 0.4639 - val_acc: 0.8442
Epoch 27/30
 - 1s - loss: 0.2957 - acc: 0.9004 - val_loss: 0.3652 - val_acc: 0.8679
Epoch 28/30
 - 1s - loss: 0.3297 - acc: 0.8923 - val_loss: 0.3785 - val_acc: 0.8744
Epoch 29/30
 - 2s - loss: 0.3132 - acc: 0.8962 - val_loss: 0.4102 - val_acc: 0.8667
Epoch 30/30
 - 1s - loss: 0.3383 - acc: 0.8921 - val_loss: 0.3645 - val_acc: 0.8788
Train accuracy 0.9154167691172854 Test accuracy: 0.8788461538461538
--------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 28)           1792
_____
conv1d_2 (Conv1D)            (None, 120, 24)           2040
_____
dropout_1 (Dropout)          (None, 120, 24)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 24)            0
_____
flatten_1 (Flatten)          (None, 960)               0
_____
dense_1 (Dense)              (None, 64)                61504
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,531
Trainable params: 65,531
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
```

```
         - 2s - loss: 39.8979 - acc: 0.8188 - val_loss: 17.8152 - val_acc: 0.8551
         Epoch 2/25
         - 1s - loss: 8.2806 - acc: 0.8874 - val_loss: 2.4766 - val_acc: 0.8538
         Epoch 3/25
         - 1s - loss: 0.9804 - acc: 0.8820 - val_loss: 0.5882 - val_acc: 0.8019
         Epoch 4/25
         - 1s - loss: 0.3854 - acc: 0.8879 - val_loss: 0.5122 - val_acc: 0.7987
         Epoch 5/25
         - 1s - loss: 0.3371 - acc: 0.8898 - val_loss: 0.4443 - val_acc: 0.8481
         Epoch 6/25
         - 1s - loss: 0.3167 - acc: 0.8916 - val_loss: 0.4012 - val_acc: 0.8571
         Epoch 7/25
         - 1s - loss: 0.3146 - acc: 0.8913 - val_loss: 0.4099 - val_acc: 0.8705
         Epoch 8/25
         - 1s - loss: 0.2958 - acc: 0.8982 - val_loss: 0.3923 - val_acc: 0.8526
         Epoch 9/25
         - 1s - loss: 0.3006 - acc: 0.8972 - val_loss: 0.3733 - val_acc: 0.8769
         Epoch 10/25
         - 1s - loss: 0.2936 - acc: 0.8943 - val_loss: 0.3598 - val_acc: 0.8808
         Epoch 11/25
         - 1s - loss: 0.2881 - acc: 0.8992 - val_loss: 0.3710 - val_acc: 0.8814
         Epoch 12/25
         - 1s - loss: 0.2789 - acc: 0.9046 - val_loss: 0.3589 - val_acc: 0.8776
         Epoch 13/25
         - 1s - loss: 0.2826 - acc: 0.9039 - val_loss: 0.3543 - val_acc: 0.8827
         Epoch 14/25
         - 1s - loss: 0.2760 - acc: 0.9044 - val_loss: 0.3940 - val_acc: 0.8718
         Epoch 15/25
         - 1s - loss: 0.2826 - acc: 0.9009 - val_loss: 0.5577 - val_acc: 0.7564
         Epoch 16/25
         - 1s - loss: 0.2827 - acc: 0.8999 - val_loss: 0.3416 - val_acc: 0.8821
         Epoch 17/25
         - 1s - loss: 0.2761 - acc: 0.9095 - val_loss: 0.3694 - val_acc: 0.8558
         Epoch 18/25
         - 1s - loss: 0.2897 - acc: 0.8994 - val_loss: 0.3598 - val_acc: 0.8724
         Epoch 19/25
         - 1s - loss: 0.2762 - acc: 0.9068 - val_loss: 0.3388 - val_acc: 0.8859
         Epoch 20/25
         - 1s - loss: 0.2843 - acc: 0.9034 - val_loss: 0.3243 - val_acc: 0.8859
         Epoch 21/25
         - 1s - loss: 0.2747 - acc: 0.9093 - val_loss: 0.3551 - val_acc: 0.8724
         Epoch 22/25
         - 1s - loss: 0.2703 - acc: 0.9009 - val_loss: 0.3488 - val_acc: 0.8692
```

```
Epoch 23/25
 - 1s - loss: 0.2759 - acc: 0.9046 - val_loss: 0.3451 - val_acc: 0.8827
Epoch 24/25
 - 1s - loss: 0.2684 - acc: 0.9083 - val_loss: 0.3358 - val_acc: 0.8891
Epoch 25/25
 - 1s - loss: 0.2676 - acc: 0.9051 - val_loss: 0.4777 - val_acc: 0.8372
Train accuracy 0.8532087533808704 Test accuracy: 0.8371794871794872
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 58, 32)	0
flatten_1 (Flatten)	(None, 1856)	0
dense_1 (Dense)	(None, 64)	118848
dense_2 (Dense)	(None, 3)	195

```
Total params: 128,291
Trainable params: 128,291
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 28.8646 - acc: 0.7349 - val_loss: 2.5690 - val_acc: 0.8128
Epoch 2/30
 - 1s - loss: 0.8468 - acc: 0.8495 - val_loss: 0.5242 - val_acc: 0.8538
Epoch 3/30
 - 2s - loss: 0.4756 - acc: 0.8660 - val_loss: 0.6238 - val_acc: 0.7904
Epoch 4/30
 - 1s - loss: 0.4630 - acc: 0.8677 - val_loss: 0.6125 - val_acc: 0.7936
Epoch 5/30
 - 1s - loss: 0.4598 - acc: 0.8672 - val_loss: 0.5314 - val_acc: 0.8141
Epoch 6/30
 - 1s - loss: 0.4139 - acc: 0.8778 - val_loss: 0.4944 - val_acc: 0.8590
```

```
Epoch 7/30
 - 1s - loss: 0.4418 - acc: 0.8726 - val_loss: 0.4535 - val_acc: 0.8782
Epoch 8/30
 - 1s - loss: 0.3781 - acc: 0.8832 - val_loss: 0.4348 - val_acc: 0.8359
Epoch 9/30
 - 1s - loss: 0.3982 - acc: 0.8766 - val_loss: 0.4344 - val_acc: 0.8519
Epoch 10/30
 - 1s - loss: 0.3721 - acc: 0.8839 - val_loss: 0.4103 - val_acc: 0.8750
Epoch 11/30
 - 1s - loss: 0.3969 - acc: 0.8788 - val_loss: 0.4315 - val_acc: 0.8378
Epoch 12/30
 - 1s - loss: 0.3820 - acc: 0.8761 - val_loss: 0.4192 - val_acc: 0.8519
Epoch 13/30
 - 1s - loss: 0.3815 - acc: 0.8825 - val_loss: 0.4301 - val_acc: 0.8744
Epoch 14/30
 - 1s - loss: 0.3598 - acc: 0.8903 - val_loss: 0.5088 - val_acc: 0.8526
Epoch 15/30
 - 1s - loss: 0.3785 - acc: 0.8830 - val_loss: 0.4130 - val_acc: 0.8686
Epoch 16/30
 - 1s - loss: 0.4003 - acc: 0.8817 - val_loss: 0.6697 - val_acc: 0.8500
Epoch 17/30
 - 1s - loss: 0.3681 - acc: 0.8839 - val_loss: 0.3889 - val_acc: 0.8615
Epoch 18/30
 - 1s - loss: 0.3645 - acc: 0.8832 - val_loss: 0.4410 - val_acc: 0.8622
Epoch 19/30
 - 1s - loss: 0.3695 - acc: 0.8807 - val_loss: 0.3884 - val_acc: 0.8782
Epoch 20/30
 - 1s - loss: 0.3645 - acc: 0.8916 - val_loss: 0.3970 - val_acc: 0.8801
Epoch 21/30
 - 1s - loss: 0.3826 - acc: 0.8866 - val_loss: 0.5478 - val_acc: 0.8564
Epoch 22/30
 - 1s - loss: 0.3533 - acc: 0.8876 - val_loss: 0.4154 - val_acc: 0.8558
Epoch 23/30
 - 1s - loss: 0.3653 - acc: 0.8803 - val_loss: 0.3994 - val_acc: 0.8788
Epoch 24/30
 - 1s - loss: 0.3587 - acc: 0.8871 - val_loss: 0.4814 - val_acc: 0.8474
Epoch 25/30
 - 1s - loss: 0.4035 - acc: 0.8837 - val_loss: 0.3648 - val_acc: 0.8756
Epoch 26/30
 - 1s - loss: 0.3583 - acc: 0.8903 - val_loss: 0.4033 - val_acc: 0.8724
Epoch 27/30
 - 1s - loss: 0.3773 - acc: 0.8812 - val_loss: 0.3743 - val_acc: 0.8692
Epoch 28/30
```

```
 - 1s - loss: 0.3562 - acc: 0.8830 - val_loss: 0.6539 - val_acc: 0.8333
Epoch 29/30
 - 1s - loss: 0.4096 - acc: 0.8842 - val_loss: 0.4305 - val_acc: 0.8673
Epoch 30/30
 - 1s - loss: 0.3570 - acc: 0.8869 - val_loss: 0.4119 - val_acc: 0.8692
Train accuracy 0.8790263093189082 Test accuracy: 0.8692307692307693
------------------------------------------------------------------------
```

```
_____
Layer (type)                  Output Shape             Param #
================================================================
conv1d_1 (Conv1D)             (None, 124, 32)          1472
_____
conv1d_2 (Conv1D)             (None, 122, 16)          1552
_____
dropout_1 (Dropout)           (None, 122, 16)          0
_____
max_pooling1d_1 (MaxPooling1  (None, 61, 16)           0
_____
flatten_1 (Flatten)           (None, 976)              0
_____
dense_1 (Dense)               (None, 64)               62528
_____
dense_2 (Dense)               (None, 3)                195
================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 35.7699 - acc: 0.8114 - val_loss: 19.9249 - val_acc: 0.8891
Epoch 2/30
 - 1s - loss: 11.6576 - acc: 0.8911 - val_loss: 5.6323 - val_acc: 0.8737
Epoch 3/30
 - 1s - loss: 3.0623 - acc: 0.8982 - val_loss: 1.5883 - val_acc: 0.8276
Epoch 4/30
 - 1s - loss: 0.9279 - acc: 0.8987 - val_loss: 0.7385 - val_acc: 0.8147
Epoch 5/30
 - 1s - loss: 0.4642 - acc: 0.9048 - val_loss: 0.5324 - val_acc: 0.8641
Epoch 6/30
 - 1s - loss: 0.3640 - acc: 0.8967 - val_loss: 0.4491 - val_acc: 0.8596
Epoch 7/30
```

```
              - 1s - loss: 0.3429 - acc: 0.8940 - val_loss: 0.4363 - val_acc: 0.8718
             Epoch 8/30
              - 1s - loss: 0.3034 - acc: 0.9039 - val_loss: 0.4570 - val_acc: 0.8160
             Epoch 9/30
              - 1s - loss: 0.2991 - acc: 0.9046 - val_loss: 0.3721 - val_acc: 0.8705
             Epoch 10/30
              - 1s - loss: 0.2927 - acc: 0.9012 - val_loss: 0.3387 - val_acc: 0.8833
             Epoch 11/30
              - 1s - loss: 0.2805 - acc: 0.9009 - val_loss: 0.3493 - val_acc: 0.8519
             Epoch 12/30
              - 1s - loss: 0.2784 - acc: 0.9053 - val_loss: 0.3613 - val_acc: 0.8538
             Epoch 13/30
              - 1s - loss: 0.2682 - acc: 0.9046 - val_loss: 0.3252 - val_acc: 0.8872
             Epoch 14/30
              - 1s - loss: 0.2630 - acc: 0.9098 - val_loss: 0.3749 - val_acc: 0.8699
             Epoch 15/30
              - 1s - loss: 0.2632 - acc: 0.9061 - val_loss: 0.4205 - val_acc: 0.8615
             Epoch 16/30
              - 1s - loss: 0.2604 - acc: 0.9112 - val_loss: 0.3159 - val_acc: 0.8782
             Epoch 17/30
              - 1s - loss: 0.2489 - acc: 0.9134 - val_loss: 0.3299 - val_acc: 0.8622
             Epoch 18/30
              - 1s - loss: 0.2553 - acc: 0.9130 - val_loss: 0.3369 - val_acc: 0.8667
             Epoch 19/30
              - 1s - loss: 0.2542 - acc: 0.9085 - val_loss: 0.3254 - val_acc: 0.8923
             Epoch 20/30
              - 1s - loss: 0.2500 - acc: 0.9115 - val_loss: 0.3232 - val_acc: 0.8603
             Epoch 21/30
              - 1s - loss: 0.2413 - acc: 0.9134 - val_loss: 0.3359 - val_acc: 0.8692
             Epoch 22/30
              - 1s - loss: 0.2456 - acc: 0.9122 - val_loss: 0.2958 - val_acc: 0.8859
             Epoch 23/30
              - 1s - loss: 0.2506 - acc: 0.9090 - val_loss: 0.3004 - val_acc: 0.8910
             Epoch 24/30
              - 1s - loss: 0.2398 - acc: 0.9122 - val_loss: 0.3583 - val_acc: 0.8705
             Epoch 25/30
              - 1s - loss: 0.2486 - acc: 0.9134 - val_loss: 0.3528 - val_acc: 0.8558
             Epoch 26/30
              - 1s - loss: 0.2450 - acc: 0.9078 - val_loss: 0.3162 - val_acc: 0.8917
             Epoch 27/30
              - 1s - loss: 0.2374 - acc: 0.9132 - val_loss: 0.3191 - val_acc: 0.8699
             Epoch 28/30
              - 1s - loss: 0.2467 - acc: 0.9127 - val_loss: 0.3413 - val_acc: 0.8814
```

```
Epoch 29/30
 - 1s - loss: 0.2402 - acc: 0.9142 - val_loss: 0.3166 - val_acc: 0.8936
Epoch 30/30
 - 1s - loss: 0.2454 - acc: 0.9125 - val_loss: 0.4126 - val_acc: 0.8654
Train accuracy 0.869928694369314 Test accuracy: 0.8653846153846154
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 122, 16)	2576
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0
dense_1 (Dense)	(None, 32)	12320
dense_2 (Dense)	(None, 3)	99

```
Total params: 15,891
Trainable params: 15,891
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 19.8048 - acc: 0.8527 - val_loss: 0.6335 - val_acc: 0.8699
Epoch 2/35
 - 1s - loss: 0.4510 - acc: 0.8761 - val_loss: 0.5094 - val_acc: 0.8340
Epoch 3/35
 - 1s - loss: 0.4304 - acc: 0.8694 - val_loss: 0.5046 - val_acc: 0.8295
Epoch 4/35
 - 1s - loss: 0.4330 - acc: 0.8761 - val_loss: 0.5016 - val_acc: 0.8532
Epoch 5/35
 - 1s - loss: 0.3977 - acc: 0.8830 - val_loss: 0.5584 - val_acc: 0.8224
Epoch 6/35
 - 1s - loss: 0.3723 - acc: 0.8839 - val_loss: 0.4468 - val_acc: 0.8603
Epoch 7/35
 - 1s - loss: 0.3760 - acc: 0.8805 - val_loss: 0.4046 - val_acc: 0.8814
```

```
Epoch 8/35
 - 1s - loss: 0.3575 - acc: 0.8852 - val_loss: 0.4753 - val_acc: 0.8295
Epoch 9/35
 - 1s - loss: 0.3499 - acc: 0.8884 - val_loss: 0.4224 - val_acc: 0.8654
Epoch 10/35
 - 1s - loss: 0.3728 - acc: 0.8780 - val_loss: 0.4347 - val_acc: 0.8776
Epoch 11/35
 - 1s - loss: 0.3844 - acc: 0.8825 - val_loss: 0.4267 - val_acc: 0.8615
Epoch 12/35
 - 1s - loss: 0.3646 - acc: 0.8817 - val_loss: 0.4143 - val_acc: 0.8744
Epoch 13/35
 - 1s - loss: 0.3546 - acc: 0.8906 - val_loss: 0.3982 - val_acc: 0.8679
Epoch 14/35
 - 1s - loss: 0.3730 - acc: 0.8844 - val_loss: 0.5589 - val_acc: 0.8353
Epoch 15/35
 - 1s - loss: 0.3761 - acc: 0.8822 - val_loss: 0.4248 - val_acc: 0.8635
Epoch 16/35
 - 1s - loss: 0.3508 - acc: 0.8835 - val_loss: 0.4882 - val_acc: 0.8045
Epoch 17/35
 - 1s - loss: 0.3436 - acc: 0.8896 - val_loss: 0.4742 - val_acc: 0.8237
Epoch 18/35
 - 1s - loss: 0.3609 - acc: 0.8820 - val_loss: 0.5305 - val_acc: 0.8372
Epoch 19/35
 - 1s - loss: 0.3561 - acc: 0.8871 - val_loss: 0.4524 - val_acc: 0.8417
Epoch 20/35
 - 1s - loss: 0.3635 - acc: 0.8805 - val_loss: 0.4503 - val_acc: 0.8301
Epoch 21/35
 - 1s - loss: 0.3464 - acc: 0.8839 - val_loss: 0.5888 - val_acc: 0.7808
Epoch 22/35
 - 1s - loss: 0.3548 - acc: 0.8783 - val_loss: 0.4230 - val_acc: 0.8731
Epoch 23/35
 - 1s - loss: 0.3775 - acc: 0.8820 - val_loss: 0.4347 - val_acc: 0.8314
Epoch 24/35
 - 1s - loss: 0.3600 - acc: 0.8854 - val_loss: 0.4303 - val_acc: 0.8577
Epoch 25/35
 - 1s - loss: 0.3464 - acc: 0.8866 - val_loss: 0.4443 - val_acc: 0.8269
Epoch 26/35
 - 1s - loss: 0.3787 - acc: 0.8776 - val_loss: 0.5983 - val_acc: 0.8135
Epoch 27/35
 - 1s - loss: 0.3653 - acc: 0.8844 - val_loss: 0.4770 - val_acc: 0.7981
Epoch 28/35
 - 1s - loss: 0.3430 - acc: 0.8815 - val_loss: 0.4575 - val_acc: 0.8276
Epoch 29/35
```

```
 - 1s - loss: 0.3310 - acc: 0.8916 - val_loss: 0.4240 - val_acc: 0.8673
Epoch 30/35
 - 1s - loss: 0.3560 - acc: 0.8891 - val_loss: 0.3987 - val_acc: 0.8776
Epoch 31/35
 - 1s - loss: 0.3487 - acc: 0.8830 - val_loss: 0.4771 - val_acc: 0.8192
Epoch 32/35
 - 1s - loss: 0.3430 - acc: 0.8894 - val_loss: 0.5364 - val_acc: 0.7987
Epoch 33/35
 - 1s - loss: 0.3725 - acc: 0.8812 - val_loss: 0.4473 - val_acc: 0.8365
Epoch 34/35
 - 1s - loss: 0.3401 - acc: 0.8832 - val_loss: 0.4911 - val_acc: 0.8192
Epoch 35/35
 - 1s - loss: 0.3591 - acc: 0.8822 - val_loss: 0.4479 - val_acc: 0.8179
Train accuracy 0.8443570199164003 Test accuracy: 0.8179487179487179
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 120, 16)	2032
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 16)	15376
dense_2 (Dense)	(None, 3)	51

```
Total params: 20,147
Trainable params: 20,147
Non-trainable params: 0

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 1s - loss: 28.4293 - acc: 0.8478 - val_loss: 12.5319 - val_acc: 0.8744
Epoch 2/30
 - 1s - loss: 5.9227 - acc: 0.9002 - val_loss: 2.0666 - val_acc: 0.8872
Epoch 3/30
```

```
      - 1s - loss: 1.0969 - acc: 0.8972 - val_loss: 0.7310 - val_acc: 0.8282
Epoch 4/30
      - 1s - loss: 0.4620 - acc: 0.8987 - val_loss: 0.5090 - val_acc: 0.8487
Epoch 5/30
      - 1s - loss: 0.3577 - acc: 0.9019 - val_loss: 0.4143 - val_acc: 0.8673
Epoch 6/30
      - 1s - loss: 0.3185 - acc: 0.9024 - val_loss: 0.3947 - val_acc: 0.8840
Epoch 7/30
      - 1s - loss: 0.3125 - acc: 0.9007 - val_loss: 0.4081 - val_acc: 0.8558
Epoch 8/30
      - 1s - loss: 0.2826 - acc: 0.9073 - val_loss: 0.3928 - val_acc: 0.8564
Epoch 9/30
      - 1s - loss: 0.2856 - acc: 0.9088 - val_loss: 0.3604 - val_acc: 0.8615
Epoch 10/30
      - 1s - loss: 0.2797 - acc: 0.9068 - val_loss: 0.3365 - val_acc: 0.8865
Epoch 11/30
      - 1s - loss: 0.2767 - acc: 0.9083 - val_loss: 0.3553 - val_acc: 0.8673
Epoch 12/30
      - 1s - loss: 0.2715 - acc: 0.9071 - val_loss: 0.3288 - val_acc: 0.8923
Epoch 13/30
      - 1s - loss: 0.2657 - acc: 0.9120 - val_loss: 0.3400 - val_acc: 0.8769
Epoch 14/30
      - 1s - loss: 0.2543 - acc: 0.9139 - val_loss: 0.3462 - val_acc: 0.8904
Epoch 15/30
      - 1s - loss: 0.2592 - acc: 0.9132 - val_loss: 0.4310 - val_acc: 0.8327
Epoch 16/30
      - 1s - loss: 0.2507 - acc: 0.9132 - val_loss: 0.3095 - val_acc: 0.8942
Epoch 17/30
      - 1s - loss: 0.2575 - acc: 0.9149 - val_loss: 0.3246 - val_acc: 0.8833
Epoch 18/30
      - 1s - loss: 0.2433 - acc: 0.9171 - val_loss: 0.3101 - val_acc: 0.8891
Epoch 19/30
      - 1s - loss: 0.2518 - acc: 0.9132 - val_loss: 0.3129 - val_acc: 0.9013
Epoch 20/30
      - 1s - loss: 0.2490 - acc: 0.9174 - val_loss: 0.3039 - val_acc: 0.9064
Epoch 21/30
      - 1s - loss: 0.2430 - acc: 0.9208 - val_loss: 0.3613 - val_acc: 0.8667
Epoch 22/30
      - 1s - loss: 0.2423 - acc: 0.9159 - val_loss: 0.3047 - val_acc: 0.8885
Epoch 23/30
      - 1s - loss: 0.2437 - acc: 0.9174 - val_loss: 0.2984 - val_acc: 0.8942
Epoch 24/30
      - 1s - loss: 0.2425 - acc: 0.9203 - val_loss: 0.2936 - val_acc: 0.9071
```

```
Epoch 25/30
 - 1s - loss: 0.2459 - acc: 0.9166 - val_loss: 0.3163 - val_acc: 0.8833
Epoch 26/30
 - 1s - loss: 0.2399 - acc: 0.9152 - val_loss: 0.3018 - val_acc: 0.9019
Epoch 27/30
 - 1s - loss: 0.2289 - acc: 0.9265 - val_loss: 0.2924 - val_acc: 0.8994
Epoch 28/30
 - 1s - loss: 0.2331 - acc: 0.9191 - val_loss: 0.2889 - val_acc: 0.9096
Epoch 29/30
 - 1s - loss: 0.2473 - acc: 0.9196 - val_loss: 0.3035 - val_acc: 0.9045
Epoch 30/30
 - 1s - loss: 0.2276 - acc: 0.9248 - val_loss: 0.2913 - val_acc: 0.9058
Train accuracy 0.9223014507007622 Test accuracy: 0.9057692307692308
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 28)           1288

conv1d_2 (Conv1D)            (None, 122, 16)           1360

dropout_1 (Dropout)          (None, 122, 16)           0

max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0

flatten_1 (Flatten)          (None, 976)               0

dense_1 (Dense)              (None, 64)                62528

dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,371
Trainable params: 65,371
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 50.0892 - acc: 0.8178 - val_loss: 9.8352 - val_acc: 0.8179
Epoch 2/30
 - 1s - loss: 2.5899 - acc: 0.8726 - val_loss: 0.5072 - val_acc: 0.8378
Epoch 3/30
 - 1s - loss: 0.3749 - acc: 0.8810 - val_loss: 0.4493 - val_acc: 0.8256
```

```
Epoch 4/30
 - 1s - loss: 0.3410 - acc: 0.8879 - val_loss: 0.3977 - val_acc: 0.8699
Epoch 5/30
 - 1s - loss: 0.3332 - acc: 0.8879 - val_loss: 0.4011 - val_acc: 0.8615
Epoch 6/30
 - 1s - loss: 0.3277 - acc: 0.8866 - val_loss: 0.4521 - val_acc: 0.8167
Epoch 7/30
 - 1s - loss: 0.3319 - acc: 0.8864 - val_loss: 0.3554 - val_acc: 0.8801
Epoch 8/30
 - 1s - loss: 0.3102 - acc: 0.8842 - val_loss: 0.4117 - val_acc: 0.8314
Epoch 9/30
 - 1s - loss: 0.3088 - acc: 0.8950 - val_loss: 0.3316 - val_acc: 0.8731
Epoch 10/30
 - 1s - loss: 0.3111 - acc: 0.8911 - val_loss: 0.3413 - val_acc: 0.8699
Epoch 11/30
 - 1s - loss: 0.3165 - acc: 0.8894 - val_loss: 0.7964 - val_acc: 0.6526
Epoch 12/30
 - 1s - loss: 0.3130 - acc: 0.8923 - val_loss: 0.4990 - val_acc: 0.8109
Epoch 13/30
 - 1s - loss: 0.3176 - acc: 0.8903 - val_loss: 0.4289 - val_acc: 0.8160
Epoch 14/30
 - 1s - loss: 0.3073 - acc: 0.8911 - val_loss: 0.5978 - val_acc: 0.7038
Epoch 15/30
 - 1s - loss: 0.3017 - acc: 0.8908 - val_loss: 0.3391 - val_acc: 0.8782
Epoch 16/30
 - 1s - loss: 0.3072 - acc: 0.8945 - val_loss: 0.3578 - val_acc: 0.8628
Epoch 17/30
 - 1s - loss: 0.2979 - acc: 0.8884 - val_loss: 0.3302 - val_acc: 0.8737
Epoch 18/30
 - 1s - loss: 0.3081 - acc: 0.8894 - val_loss: 0.3791 - val_acc: 0.8635
Epoch 19/30
 - 1s - loss: 0.3056 - acc: 0.8866 - val_loss: 0.3363 - val_acc: 0.8679
Epoch 20/30
 - 1s - loss: 0.2916 - acc: 0.8955 - val_loss: 0.3431 - val_acc: 0.8782
Epoch 21/30
 - 1s - loss: 0.2834 - acc: 0.8977 - val_loss: 0.4106 - val_acc: 0.8513
Epoch 22/30
 - 1s - loss: 0.2982 - acc: 0.8898 - val_loss: 0.4206 - val_acc: 0.8096
Epoch 23/30
 - 1s - loss: 0.3000 - acc: 0.8862 - val_loss: 0.3348 - val_acc: 0.8718
Epoch 24/30
 - 1s - loss: 0.2975 - acc: 0.8935 - val_loss: 0.4165 - val_acc: 0.8577
Epoch 25/30
```

```
 - 1s - loss: 0.2955 - acc: 0.8901 - val_loss: 0.3325 - val_acc: 0.8737
Epoch 26/30
 - 1s - loss: 0.2961 - acc: 0.8938 - val_loss: 0.3466 - val_acc: 0.8731
Epoch 27/30
 - 1s - loss: 0.2909 - acc: 0.8940 - val_loss: 0.4338 - val_acc: 0.8442
Epoch 28/30
 - 1s - loss: 0.2905 - acc: 0.8925 - val_loss: 0.4344 - val_acc: 0.8096
Epoch 29/30
 - 1s - loss: 0.3010 - acc: 0.8938 - val_loss: 0.3506 - val_acc: 0.8788
Epoch 30/30
 - 1s - loss: 0.2887 - acc: 0.8876 - val_loss: 0.3325 - val_acc: 0.8795
Train accuracy 0.9144332431767888 Test accuracy: 0.8794871794871795
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 24)	2328
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 24)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
Total params: 66,075
Trainable params: 66,075
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 31.6678 - acc: 0.8161 - val_loss: 7.6454 - val_acc: 0.8353
Epoch 2/25
 - 1s - loss: 2.4287 - acc: 0.8716 - val_loss: 0.5865 - val_acc: 0.8590
Epoch 3/25
 - 1s - loss: 0.4228 - acc: 0.8719 - val_loss: 0.5216 - val_acc: 0.7942
Epoch 4/25
```

```
          - 1s - loss: 0.3457 - acc: 0.8889 - val_loss: 0.4059 - val_acc: 0.8705
Epoch 5/25
          - 1s - loss: 0.3281 - acc: 0.8923 - val_loss: 0.4345 - val_acc: 0.8558
Epoch 6/25
          - 1s - loss: 0.3383 - acc: 0.8876 - val_loss: 0.4069 - val_acc: 0.8564
Epoch 7/25
          - 1s - loss: 0.3237 - acc: 0.8837 - val_loss: 0.4102 - val_acc: 0.8583
Epoch 8/25
          - 1s - loss: 0.3078 - acc: 0.8975 - val_loss: 0.3998 - val_acc: 0.8353
Epoch 9/25
          - 1s - loss: 0.3072 - acc: 0.8948 - val_loss: 0.4141 - val_acc: 0.8673
Epoch 10/25
          - 1s - loss: 0.3080 - acc: 0.8908 - val_loss: 0.5832 - val_acc: 0.8327
Epoch 11/25
          - 1s - loss: 0.3357 - acc: 0.8869 - val_loss: 0.4837 - val_acc: 0.7558
Epoch 12/25
          - 1s - loss: 0.2971 - acc: 0.8950 - val_loss: 0.3477 - val_acc: 0.8744
Epoch 13/25
          - 1s - loss: 0.3061 - acc: 0.8950 - val_loss: 0.3395 - val_acc: 0.8788
Epoch 14/25
          - 1s - loss: 0.3075 - acc: 0.8985 - val_loss: 0.4608 - val_acc: 0.8045
Epoch 15/25
          - 1s - loss: 0.3077 - acc: 0.8918 - val_loss: 0.3565 - val_acc: 0.8795
Epoch 16/25
          - 1s - loss: 0.2967 - acc: 0.8935 - val_loss: 0.3384 - val_acc: 0.8756
Epoch 17/25
          - 1s - loss: 0.2997 - acc: 0.9007 - val_loss: 0.3491 - val_acc: 0.8647
Epoch 18/25
          - 1s - loss: 0.3021 - acc: 0.8930 - val_loss: 0.3769 - val_acc: 0.8667
Epoch 19/25
          - 1s - loss: 0.3025 - acc: 0.8916 - val_loss: 0.3617 - val_acc: 0.8840
Epoch 20/25
          - 1s - loss: 0.2908 - acc: 0.8965 - val_loss: 0.6491 - val_acc: 0.7340
Epoch 21/25
          - 1s - loss: 0.2991 - acc: 0.8940 - val_loss: 0.3574 - val_acc: 0.8756
Epoch 22/25
          - 1s - loss: 0.2949 - acc: 0.8967 - val_loss: 0.3389 - val_acc: 0.8756
Epoch 23/25
          - 1s - loss: 0.2942 - acc: 0.8955 - val_loss: 0.3536 - val_acc: 0.8808
Epoch 24/25
          - 1s - loss: 0.2829 - acc: 0.8977 - val_loss: 0.4205 - val_acc: 0.8359
Epoch 25/25
          - 1s - loss: 0.2879 - acc: 0.8972 - val_loss: 0.3261 - val_acc: 0.8731
```

```
Train accuracy 0.9068109171379395 Test accuracy: 0.8730769230769231
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 58, 32)	0
flatten_1 (Flatten)	(None, 1856)	0
dense_1 (Dense)	(None, 64)	118848
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 128,291
Trainable params: 128,291
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 105.0102 - acc: 0.7686 - val_loss: 30.4189 - val_acc: 0.8494
Epoch 2/30
 - 1s - loss: 11.0520 - acc: 0.8323 - val_loss: 1.4735 - val_acc: 0.8385
Epoch 3/30
 - 1s - loss: 0.6631 - acc: 0.8495 - val_loss: 0.5519 - val_acc: 0.8064
Epoch 4/30
 - 1s - loss: 0.4259 - acc: 0.8766 - val_loss: 0.6027 - val_acc: 0.7756
Epoch 5/30
 - 1s - loss: 0.4122 - acc: 0.8739 - val_loss: 0.5253 - val_acc: 0.8179
Epoch 6/30
 - 1s - loss: 0.4033 - acc: 0.8793 - val_loss: 0.4588 - val_acc: 0.8519
Epoch 7/30
 - 1s - loss: 0.3780 - acc: 0.8778 - val_loss: 0.3967 - val_acc: 0.8744
Epoch 8/30
 - 1s - loss: 0.3839 - acc: 0.8827 - val_loss: 0.5043 - val_acc: 0.8167
Epoch 9/30
 - 1s - loss: 0.3753 - acc: 0.8817 - val_loss: 0.4157 - val_acc: 0.8641
```

```
Epoch 10/30
 - 1s - loss: 0.3996 - acc: 0.8731 - val_loss: 0.6942 - val_acc: 0.7987
Epoch 11/30
 - 1s - loss: 0.3764 - acc: 0.8859 - val_loss: 0.4520 - val_acc: 0.8186
Epoch 12/30
 - 1s - loss: 0.3849 - acc: 0.8803 - val_loss: 0.4719 - val_acc: 0.8487
Epoch 13/30
 - 1s - loss: 0.3882 - acc: 0.8761 - val_loss: 0.4055 - val_acc: 0.8577
Epoch 14/30
 - 1s - loss: 0.3581 - acc: 0.8879 - val_loss: 0.4481 - val_acc: 0.8474
Epoch 15/30
 - 1s - loss: 0.3585 - acc: 0.8869 - val_loss: 0.4134 - val_acc: 0.8628
Epoch 16/30
 - 1s - loss: 0.3972 - acc: 0.8803 - val_loss: 0.3878 - val_acc: 0.8731
Epoch 17/30
 - 1s - loss: 0.3563 - acc: 0.8903 - val_loss: 0.3714 - val_acc: 0.8699
Epoch 18/30
 - 1s - loss: 0.3531 - acc: 0.8832 - val_loss: 0.4143 - val_acc: 0.8551
Epoch 19/30
 - 1s - loss: 0.3581 - acc: 0.8827 - val_loss: 0.3882 - val_acc: 0.8615
Epoch 20/30
 - 1s - loss: 0.3579 - acc: 0.8803 - val_loss: 0.4665 - val_acc: 0.8462
Epoch 21/30
 - 1s - loss: 0.3494 - acc: 0.8876 - val_loss: 0.4147 - val_acc: 0.8590
Epoch 22/30
 - 1s - loss: 0.3519 - acc: 0.8913 - val_loss: 0.4253 - val_acc: 0.8449
Epoch 23/30
 - 1s - loss: 0.3610 - acc: 0.8837 - val_loss: 0.4454 - val_acc: 0.8673
Epoch 24/30
 - 1s - loss: 0.3505 - acc: 0.8827 - val_loss: 0.4061 - val_acc: 0.8782
Epoch 25/30
 - 1s - loss: 0.3538 - acc: 0.8857 - val_loss: 0.4609 - val_acc: 0.8109
Epoch 26/30
 - 1s - loss: 0.3385 - acc: 0.8901 - val_loss: 0.7308 - val_acc: 0.7474
Epoch 27/30
 - 1s - loss: 0.3867 - acc: 0.8795 - val_loss: 0.3670 - val_acc: 0.8776
Epoch 28/30
 - 1s - loss: 0.3850 - acc: 0.8756 - val_loss: 0.3731 - val_acc: 0.8859
Epoch 29/30
 - 1s - loss: 0.3741 - acc: 0.8886 - val_loss: 0.3999 - val_acc: 0.8756
Epoch 30/30
 - 1s - loss: 0.3397 - acc: 0.8906 - val_loss: 0.4745 - val_acc: 0.8147
Train accuracy 0.8268994344725842 Test accuracy: 0.8147435897435897
```

```
----------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
_____
conv1d_2 (Conv1D)            (None, 122, 16)           1552
_____
dropout_1 (Dropout)          (None, 122, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0
_____
flatten_1 (Flatten)          (None, 976)               0
_____
dense_1 (Dense)              (None, 32)                31264
_____
dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 34,387
Trainable params: 34,387
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 26.0367 - acc: 0.8131 - val_loss: 6.2296 - val_acc: 0.8718
Epoch 2/30
 - 1s - loss: 2.4821 - acc: 0.8894 - val_loss: 0.9262 - val_acc: 0.8641
Epoch 3/30
 - 1s - loss: 0.4832 - acc: 0.8972 - val_loss: 0.4205 - val_acc: 0.8571
Epoch 4/30
 - 1s - loss: 0.3344 - acc: 0.8953 - val_loss: 0.4143 - val_acc: 0.8724
Epoch 5/30
 - 1s - loss: 0.3270 - acc: 0.8938 - val_loss: 0.3777 - val_acc: 0.8737
Epoch 6/30
 - 1s - loss: 0.3005 - acc: 0.8999 - val_loss: 0.5679 - val_acc: 0.8167
Epoch 7/30
 - 1s - loss: 0.3297 - acc: 0.8913 - val_loss: 0.3993 - val_acc: 0.8558
Epoch 8/30
 - 1s - loss: 0.3165 - acc: 0.8918 - val_loss: 0.3969 - val_acc: 0.8782
Epoch 9/30
 - 1s - loss: 0.3082 - acc: 0.9021 - val_loss: 0.3782 - val_acc: 0.8628
Epoch 10/30
```

```
            - 1s - loss: 0.2792 - acc: 0.9039 - val_loss: 0.3471 - val_acc: 0.8769
           Epoch 11/30
            - 1s - loss: 0.2952 - acc: 0.8987 - val_loss: 0.3816 - val_acc: 0.8686
           Epoch 12/30
            - 1s - loss: 0.2875 - acc: 0.8957 - val_loss: 0.3478 - val_acc: 0.8827
           Epoch 13/30
            - 1s - loss: 0.3112 - acc: 0.9019 - val_loss: 0.3432 - val_acc: 0.8833
           Epoch 14/30
            - 1s - loss: 0.2716 - acc: 0.9036 - val_loss: 0.3451 - val_acc: 0.8641
           Epoch 15/30
            - 1s - loss: 0.2804 - acc: 0.9031 - val_loss: 0.3699 - val_acc: 0.8545
           Epoch 16/30
            - 1s - loss: 0.2701 - acc: 0.9034 - val_loss: 0.3553 - val_acc: 0.8628
           Epoch 17/30
            - 1s - loss: 0.2948 - acc: 0.8953 - val_loss: 0.3500 - val_acc: 0.8827
           Epoch 18/30
            - 1s - loss: 0.2866 - acc: 0.9016 - val_loss: 0.3536 - val_acc: 0.8750
           Epoch 19/30
            - 1s - loss: 0.2746 - acc: 0.9024 - val_loss: 0.3360 - val_acc: 0.8763
           Epoch 20/30
            - 1s - loss: 0.2926 - acc: 0.8994 - val_loss: 0.3470 - val_acc: 0.8667
           Epoch 21/30
            - 1s - loss: 0.2742 - acc: 0.9041 - val_loss: 0.3617 - val_acc: 0.8692
           Epoch 22/30
            - 1s - loss: 0.2770 - acc: 0.8987 - val_loss: 0.3180 - val_acc: 0.8763
           Epoch 23/30
            - 1s - loss: 0.2758 - acc: 0.9002 - val_loss: 0.4247 - val_acc: 0.8551
           Epoch 24/30
            - 1s - loss: 0.2842 - acc: 0.8999 - val_loss: 0.3297 - val_acc: 0.8769
           Epoch 25/30
            - 1s - loss: 0.2698 - acc: 0.9021 - val_loss: 0.3242 - val_acc: 0.8712
           Epoch 26/30
            - 1s - loss: 0.2833 - acc: 0.8925 - val_loss: 0.3726 - val_acc: 0.8628
           Epoch 27/30
            - 1s - loss: 0.2732 - acc: 0.9031 - val_loss: 0.3577 - val_acc: 0.8615
           Epoch 28/30
            - 1s - loss: 0.2826 - acc: 0.9016 - val_loss: 0.3456 - val_acc: 0.8782
           Epoch 29/30
            - 1s - loss: 0.2695 - acc: 0.9044 - val_loss: 0.3422 - val_acc: 0.8737
           Epoch 30/30
            - 1s - loss: 0.2720 - acc: 0.8965 - val_loss: 0.3253 - val_acc: 0.8846
           Train accuracy 0.8962380132776002 Test accuracy: 0.8846153846153846
           ------------------------------------------------------------------------------
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 118, 16)           2576

dropout_1 (Dropout)          (None, 118, 16)           0

max_pooling1d_1 (MaxPooling1 (None, 23, 16)            0

flatten_1 (Flatten)          (None, 368)               0

dense_1 (Dense)              (None, 64)                23616

dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 28,435
Trainable params: 28,435
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 4s - loss: 4.6078 - acc: 0.8338 - val_loss: 0.6277 - val_acc: 0.7974
Epoch 2/35
 - 3s - loss: 0.4210 - acc: 0.8618 - val_loss: 0.4797 - val_acc: 0.8269
Epoch 3/35
 - 3s - loss: 0.4187 - acc: 0.8753 - val_loss: 0.4417 - val_acc: 0.8231
Epoch 4/35
 - 3s - loss: 0.3944 - acc: 0.8721 - val_loss: 0.3875 - val_acc: 0.8808
Epoch 5/35
 - 3s - loss: 0.3899 - acc: 0.8798 - val_loss: 0.5157 - val_acc: 0.8442
Epoch 6/35
 - 3s - loss: 0.3896 - acc: 0.8810 - val_loss: 0.4246 - val_acc: 0.8679
Epoch 7/35
 - 3s - loss: 0.3733 - acc: 0.8803 - val_loss: 0.3779 - val_acc: 0.8731
Epoch 8/35
 - 3s - loss: 0.3684 - acc: 0.8839 - val_loss: 0.4468 - val_acc: 0.8615
Epoch 9/35
 - 3s - loss: 0.3786 - acc: 0.8822 - val_loss: 0.4192 - val_acc: 0.8641
Epoch 10/35
 - 3s - loss: 0.3578 - acc: 0.8822 - val_loss: 0.4157 - val_acc: 0.8788
```

```
Epoch 11/35
 - 3s - loss: 0.3573 - acc: 0.8898 - val_loss: 0.6348 - val_acc: 0.6763
Epoch 12/35
 - 3s - loss: 0.3718 - acc: 0.8785 - val_loss: 0.7686 - val_acc: 0.8404
Epoch 13/35
 - 3s - loss: 0.3662 - acc: 0.8835 - val_loss: 0.6348 - val_acc: 0.8378
Epoch 14/35
 - 3s - loss: 0.3652 - acc: 0.8832 - val_loss: 0.6029 - val_acc: 0.7135
Epoch 15/35
 - 3s - loss: 0.3479 - acc: 0.8884 - val_loss: 0.5569 - val_acc: 0.8686
Epoch 16/35
 - 3s - loss: 0.3684 - acc: 0.8913 - val_loss: 0.4259 - val_acc: 0.8673
Epoch 17/35
 - 3s - loss: 0.3432 - acc: 0.8830 - val_loss: 0.4825 - val_acc: 0.8583
Epoch 18/35
 - 3s - loss: 0.3663 - acc: 0.8876 - val_loss: 0.4726 - val_acc: 0.8481
Epoch 19/35
 - 3s - loss: 0.3526 - acc: 0.8871 - val_loss: 0.4848 - val_acc: 0.8718
Epoch 20/35
 - 3s - loss: 0.3502 - acc: 0.8894 - val_loss: 0.5696 - val_acc: 0.8667
Epoch 21/35
 - 3s - loss: 0.3401 - acc: 0.8874 - val_loss: 0.4509 - val_acc: 0.8391
Epoch 22/35
 - 3s - loss: 0.3554 - acc: 0.8857 - val_loss: 0.6387 - val_acc: 0.7218
Epoch 23/35
 - 3s - loss: 0.3584 - acc: 0.8788 - val_loss: 0.4560 - val_acc: 0.8385
Epoch 24/35
 - 3s - loss: 0.3392 - acc: 0.8886 - val_loss: 0.3733 - val_acc: 0.8590
Epoch 25/35
 - 3s - loss: 0.3528 - acc: 0.8879 - val_loss: 0.5545 - val_acc: 0.8295
Epoch 26/35
 - 3s - loss: 0.3580 - acc: 0.8876 - val_loss: 0.3970 - val_acc: 0.8833
Epoch 27/35
 - 3s - loss: 0.3539 - acc: 0.8886 - val_loss: 0.3992 - val_acc: 0.8564
Epoch 28/35
 - 3s - loss: 0.3627 - acc: 0.8916 - val_loss: 0.4535 - val_acc: 0.8391
Epoch 29/35
 - 3s - loss: 0.3539 - acc: 0.8820 - val_loss: 0.3789 - val_acc: 0.8750
Epoch 30/35
 - 3s - loss: 0.3535 - acc: 0.8898 - val_loss: 0.3765 - val_acc: 0.8660
Epoch 31/35
 - 3s - loss: 0.3603 - acc: 0.8864 - val_loss: 0.3627 - val_acc: 0.8679
Epoch 32/35
```

```
 - 3s - loss: 0.3384 - acc: 0.8881 - val_loss: 0.4178 - val_acc: 0.8622
Epoch 33/35
 - 3s - loss: 0.3582 - acc: 0.8844 - val_loss: 0.6131 - val_acc: 0.7237
Epoch 34/35
 - 3s - loss: 0.3701 - acc: 0.8847 - val_loss: 0.4470 - val_acc: 0.8538
Epoch 35/35
 - 3s - loss: 0.3568 - acc: 0.8815 - val_loss: 0.4948 - val_acc: 0.7410
Train accuracy 0.745758544381608 Test accuracy: 0.7410256410256411
-------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 126, 42)           1176

_____
conv1d_2 (Conv1D)            (None, 124, 16)           2032

_____
dropout_1 (Dropout)          (None, 124, 16)           0

_____
max_pooling1d_1 (MaxPooling1 (None, 62, 16)            0

_____
flatten_1 (Flatten)          (None, 992)               0

_____
dense_1 (Dense)              (None, 64)                63552

_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 66,955
Trainable params: 66,955
Non-trainable params: 0

_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 1s - loss: 24.3662 - acc: 0.8129 - val_loss: 9.9430 - val_acc: 0.8788
Epoch 2/30
 - 1s - loss: 5.0248 - acc: 0.8842 - val_loss: 2.0056 - val_acc: 0.8596
Epoch 3/30
 - 1s - loss: 0.9594 - acc: 0.8903 - val_loss: 0.5637 - val_acc: 0.8179
Epoch 4/30
 - 1s - loss: 0.3637 - acc: 0.8962 - val_loss: 0.4833 - val_acc: 0.8064
Epoch 5/30
 - 1s - loss: 0.3332 - acc: 0.8923 - val_loss: 0.3953 - val_acc: 0.8532
Epoch 6/30
```

```
       - 1s - loss: 0.3038 - acc: 0.8977 - val_loss: 0.3941 - val_acc: 0.8609
Epoch 7/30
       - 1s - loss: 0.3021 - acc: 0.8945 - val_loss: 0.3635 - val_acc: 0.8667
Epoch 8/30
       - 1s - loss: 0.2924 - acc: 0.8989 - val_loss: 0.4231 - val_acc: 0.8173
Epoch 9/30
       - 1s - loss: 0.2876 - acc: 0.9009 - val_loss: 0.3338 - val_acc: 0.8718
Epoch 10/30
       - 1s - loss: 0.2844 - acc: 0.8960 - val_loss: 0.3326 - val_acc: 0.8788
Epoch 11/30
       - 1s - loss: 0.2924 - acc: 0.8992 - val_loss: 0.3640 - val_acc: 0.8788
Epoch 12/30
       - 1s - loss: 0.2745 - acc: 0.9007 - val_loss: 0.3244 - val_acc: 0.8744
Epoch 13/30
       - 1s - loss: 0.2727 - acc: 0.9044 - val_loss: 0.3216 - val_acc: 0.8891
Epoch 14/30
       - 1s - loss: 0.2646 - acc: 0.9048 - val_loss: 0.3924 - val_acc: 0.8571
Epoch 15/30
       - 1s - loss: 0.2717 - acc: 0.9019 - val_loss: 0.3922 - val_acc: 0.8615
Epoch 16/30
       - 1s - loss: 0.2695 - acc: 0.9019 - val_loss: 0.3279 - val_acc: 0.8699
Epoch 17/30
       - 1s - loss: 0.2617 - acc: 0.9090 - val_loss: 0.3434 - val_acc: 0.8699
Epoch 18/30
       - 1s - loss: 0.2707 - acc: 0.9056 - val_loss: 0.3144 - val_acc: 0.8756
Epoch 19/30
       - 1s - loss: 0.2665 - acc: 0.9002 - val_loss: 0.2993 - val_acc: 0.8917
Epoch 20/30
       - 1s - loss: 0.2638 - acc: 0.9056 - val_loss: 0.3158 - val_acc: 0.8872
Epoch 21/30
       - 1s - loss: 0.2568 - acc: 0.9090 - val_loss: 0.3535 - val_acc: 0.8583
Epoch 22/30
       - 1s - loss: 0.2656 - acc: 0.8997 - val_loss: 0.3067 - val_acc: 0.8840
Epoch 23/30
       - 1s - loss: 0.2609 - acc: 0.9039 - val_loss: 0.3093 - val_acc: 0.8891
Epoch 24/30
       - 1s - loss: 0.2663 - acc: 0.9039 - val_loss: 0.5176 - val_acc: 0.8590
Epoch 25/30
       - 1s - loss: 0.2641 - acc: 0.9024 - val_loss: 0.3456 - val_acc: 0.8654
Epoch 26/30
       - 1s - loss: 0.2633 - acc: 0.9004 - val_loss: 0.4427 - val_acc: 0.8519
Epoch 27/30
       - 1s - loss: 0.2547 - acc: 0.9071 - val_loss: 0.3427 - val_acc: 0.8705
```

```
Epoch 28/30
 - 1s - loss: 0.2698 - acc: 0.9012 - val_loss: 0.3360 - val_acc: 0.8756
Epoch 29/30
 - 1s - loss: 0.2551 - acc: 0.9107 - val_loss: 0.3282 - val_acc: 0.8904
Epoch 30/30
 - 1s - loss: 0.2606 - acc: 0.9039 - val_loss: 0.3100 - val_acc: 0.8968
Train accuracy 0.9104991394148021 Test accuracy: 0.8967948717948718
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 16)	1552
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 16)	15632
dense_2 (Dense)	(None, 3)	51

```
Total params: 18,707
Trainable params: 18,707
Non-trainable params: 0


None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 3s - loss: 6.8487 - acc: 0.8296 - val_loss: 0.6860 - val_acc: 0.7808
Epoch 2/30
 - 2s - loss: 0.4185 - acc: 0.8790 - val_loss: 0.4572 - val_acc: 0.8365
Epoch 3/30
 - 2s - loss: 0.3720 - acc: 0.8766 - val_loss: 0.4745 - val_acc: 0.7897
Epoch 4/30
 - 2s - loss: 0.3571 - acc: 0.8822 - val_loss: 0.4015 - val_acc: 0.8468
Epoch 5/30
 - 2s - loss: 0.3482 - acc: 0.8894 - val_loss: 0.4722 - val_acc: 0.8333
Epoch 6/30
 - 2s - loss: 0.3460 - acc: 0.8866 - val_loss: 0.4529 - val_acc: 0.8109
```

```
Epoch 7/30
 - 2s - loss: 0.3281 - acc: 0.8864 - val_loss: 0.3721 - val_acc: 0.8622
Epoch 8/30
 - 2s - loss: 0.3257 - acc: 0.8884 - val_loss: 0.4343 - val_acc: 0.8494
Epoch 9/30
 - 2s - loss: 0.3082 - acc: 0.8967 - val_loss: 0.3569 - val_acc: 0.8609
Epoch 10/30
 - 2s - loss: 0.3090 - acc: 0.9004 - val_loss: 0.3505 - val_acc: 0.8814
Epoch 11/30
 - 2s - loss: 0.3134 - acc: 0.8928 - val_loss: 0.6904 - val_acc: 0.6654
Epoch 12/30
 - 2s - loss: 0.3176 - acc: 0.8891 - val_loss: 0.4599 - val_acc: 0.8212
Epoch 13/30
 - 2s - loss: 0.3102 - acc: 0.8894 - val_loss: 0.5355 - val_acc: 0.8244
Epoch 14/30
 - 2s - loss: 0.3239 - acc: 0.8916 - val_loss: 0.5230 - val_acc: 0.7160
Epoch 15/30
 - 2s - loss: 0.3296 - acc: 0.8923 - val_loss: 0.3519 - val_acc: 0.8718
Epoch 16/30
 - 2s - loss: 0.3235 - acc: 0.8886 - val_loss: 0.3582 - val_acc: 0.8744
Epoch 17/30
 - 2s - loss: 0.3072 - acc: 0.8847 - val_loss: 0.3428 - val_acc: 0.8744
Epoch 18/30
 - 2s - loss: 0.2937 - acc: 0.9016 - val_loss: 0.4835 - val_acc: 0.7513
Epoch 19/30
 - 2s - loss: 0.3075 - acc: 0.8930 - val_loss: 0.3450 - val_acc: 0.8692
Epoch 20/30
 - 2s - loss: 0.2921 - acc: 0.8980 - val_loss: 0.3562 - val_acc: 0.8808
Epoch 21/30
 - 2s - loss: 0.3025 - acc: 0.8965 - val_loss: 0.3748 - val_acc: 0.8718
Epoch 22/30
 - 2s - loss: 0.2992 - acc: 0.8977 - val_loss: 0.4744 - val_acc: 0.7340
Epoch 23/30
 - 2s - loss: 0.2986 - acc: 0.8943 - val_loss: 0.3356 - val_acc: 0.8769
Epoch 24/30
 - 2s - loss: 0.2976 - acc: 0.8945 - val_loss: 0.3230 - val_acc: 0.8731
Epoch 25/30
 - 2s - loss: 0.3107 - acc: 0.8903 - val_loss: 0.3468 - val_acc: 0.8731
Epoch 26/30
 - 2s - loss: 0.2977 - acc: 0.8955 - val_loss: 0.3428 - val_acc: 0.8673
Epoch 27/30
 - 2s - loss: 0.3052 - acc: 0.8925 - val_loss: 0.3361 - val_acc: 0.8776
Epoch 28/30
```

```
 - 2s - loss: 0.2877 - acc: 0.8960 - val_loss: 0.4061 - val_acc: 0.8256
Epoch 29/30
 - 2s - loss: 0.3045 - acc: 0.8962 - val_loss: 0.3892 - val_acc: 0.8673
Epoch 30/30
 - 2s - loss: 0.2993 - acc: 0.8935 - val_loss: 0.3417 - val_acc: 0.8821
Train accuracy 0.9141873616916646 Test accuracy: 0.882051282051282
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 120, 24)	2040
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 24)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
Total params: 65,531
Trainable params: 65,531
Non-trainable params: 0
```

```
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 21.0202 - acc: 0.8227 - val_loss: 4.6590 - val_acc: 0.8615
Epoch 2/25
 - 1s - loss: 1.5321 - acc: 0.8748 - val_loss: 0.5389 - val_acc: 0.8615
Epoch 3/25
 - 1s - loss: 0.4209 - acc: 0.8748 - val_loss: 0.5672 - val_acc: 0.7897
Epoch 4/25
 - 1s - loss: 0.3767 - acc: 0.8803 - val_loss: 0.5465 - val_acc: 0.7840
Epoch 5/25
 - 1s - loss: 0.3354 - acc: 0.8938 - val_loss: 0.3843 - val_acc: 0.8590
Epoch 6/25
 - 1s - loss: 0.3213 - acc: 0.8884 - val_loss: 0.3750 - val_acc: 0.8641
Epoch 7/25
```

```
        - 1s - loss: 0.3183 - acc: 0.8913 - val_loss: 0.3563 - val_acc: 0.8840
      Epoch 8/25
        - 1s - loss: 0.3126 - acc: 0.8957 - val_loss: 0.4202 - val_acc: 0.8256
      Epoch 9/25
        - 1s - loss: 0.3085 - acc: 0.8992 - val_loss: 0.3863 - val_acc: 0.8622
      Epoch 10/25
        - 1s - loss: 0.3005 - acc: 0.8957 - val_loss: 0.3665 - val_acc: 0.8788
      Epoch 11/25
        - 1s - loss: 0.2960 - acc: 0.8977 - val_loss: 0.3699 - val_acc: 0.8744
      Epoch 12/25
        - 1s - loss: 0.2954 - acc: 0.8977 - val_loss: 0.3547 - val_acc: 0.8833
      Epoch 13/25
        - 1s - loss: 0.3038 - acc: 0.8965 - val_loss: 0.3570 - val_acc: 0.8769
      Epoch 14/25
        - 1s - loss: 0.2809 - acc: 0.9031 - val_loss: 0.3825 - val_acc: 0.8699
      Epoch 15/25
        - 1s - loss: 0.3127 - acc: 0.8980 - val_loss: 0.3791 - val_acc: 0.8577
      Epoch 16/25
        - 1s - loss: 0.2917 - acc: 0.8953 - val_loss: 0.3416 - val_acc: 0.8833
      Epoch 17/25
        - 1s - loss: 0.2922 - acc: 0.9044 - val_loss: 0.3465 - val_acc: 0.8769
      Epoch 18/25
        - 1s - loss: 0.2830 - acc: 0.9024 - val_loss: 0.3396 - val_acc: 0.8853
      Epoch 19/25
        - 1s - loss: 0.2903 - acc: 0.8989 - val_loss: 0.3431 - val_acc: 0.8923
      Epoch 20/25
        - 1s - loss: 0.2831 - acc: 0.9066 - val_loss: 0.3416 - val_acc: 0.8917
      Epoch 21/25
        - 1s - loss: 0.2751 - acc: 0.9068 - val_loss: 0.3522 - val_acc: 0.8756
      Epoch 22/25
        - 1s - loss: 0.2721 - acc: 0.9078 - val_loss: 0.3434 - val_acc: 0.8821
      Epoch 23/25
        - 1s - loss: 0.2962 - acc: 0.8989 - val_loss: 0.3416 - val_acc: 0.8904
      Epoch 24/25
        - 1s - loss: 0.2802 - acc: 0.9063 - val_loss: 0.3243 - val_acc: 0.8968
      Epoch 25/25
        - 1s - loss: 0.2830 - acc: 0.9012 - val_loss: 0.3874 - val_acc: 0.8590
      Train accuracy 0.885910990902385 Test accuracy: 0.8589743589743589
      --------------------------------------------------------------------------------

      _____
      Layer (type)                Output Shape              Param #
      =================================================================
      conv1d_1 (Conv1D)           (None, 122, 32)           2048
```

```
_____
conv1d_2 (Conv1D)              (None, 120, 32)           3104
_____
dropout_1 (Dropout)            (None, 120, 32)           0
_____
max_pooling1d_1 (MaxPooling1   (None, 60, 32)            0
_____
flatten_1 (Flatten)            (None, 1920)              0
_____
dense_1 (Dense)                (None, 64)                122944
_____
dense_2 (Dense)                (None, 3)                 195
====================================================================
Total params: 128,291
Trainable params: 128,291
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 61.7890 - acc: 0.7915 - val_loss: 6.6004 - val_acc: 0.8077
Epoch 2/30
 - 1s - loss: 1.5842 - acc: 0.8402 - val_loss: 0.5764 - val_acc: 0.8462
Epoch 3/30
 - 1s - loss: 0.4809 - acc: 0.8579 - val_loss: 0.5324 - val_acc: 0.7968
Epoch 4/30
 - 1s - loss: 0.4481 - acc: 0.8719 - val_loss: 0.6561 - val_acc: 0.7788
Epoch 5/30
 - 1s - loss: 0.4334 - acc: 0.8670 - val_loss: 0.6865 - val_acc: 0.7628
Epoch 6/30
 - 1s - loss: 0.4063 - acc: 0.8753 - val_loss: 0.7110 - val_acc: 0.7814
Epoch 7/30
 - 1s - loss: 0.4491 - acc: 0.8606 - val_loss: 0.5099 - val_acc: 0.8506
Epoch 8/30
 - 1s - loss: 0.4062 - acc: 0.8790 - val_loss: 0.5762 - val_acc: 0.7897
Epoch 9/30
 - 1s - loss: 0.3978 - acc: 0.8763 - val_loss: 0.4166 - val_acc: 0.8821
Epoch 10/30
 - 1s - loss: 0.4024 - acc: 0.8721 - val_loss: 0.8304 - val_acc: 0.7654
Epoch 11/30
 - 1s - loss: 0.3987 - acc: 0.8771 - val_loss: 0.4295 - val_acc: 0.8308
Epoch 12/30
 - 1s - loss: 0.4252 - acc: 0.8702 - val_loss: 0.4347 - val_acc: 0.8558
```

```
Epoch 13/30
 - 1s - loss: 0.4065 - acc: 0.8800 - val_loss: 0.4231 - val_acc: 0.8782
Epoch 14/30
 - 1s - loss: 0.3898 - acc: 0.8788 - val_loss: 0.6307 - val_acc: 0.7724
Epoch 15/30
 - 1s - loss: 0.4170 - acc: 0.8739 - val_loss: 0.4919 - val_acc: 0.8346
Epoch 16/30
 - 1s - loss: 0.4172 - acc: 0.8746 - val_loss: 0.4077 - val_acc: 0.8705
Epoch 17/30
 - 1s - loss: 0.3861 - acc: 0.8837 - val_loss: 0.4264 - val_acc: 0.8564
Epoch 18/30
 - 1s - loss: 0.4292 - acc: 0.8712 - val_loss: 0.6185 - val_acc: 0.8519
Epoch 19/30
 - 1s - loss: 0.3859 - acc: 0.8714 - val_loss: 0.4144 - val_acc: 0.8590
Epoch 20/30
 - 1s - loss: 0.4047 - acc: 0.8773 - val_loss: 0.6096 - val_acc: 0.8192
Epoch 21/30
 - 1s - loss: 0.3787 - acc: 0.8862 - val_loss: 0.4355 - val_acc: 0.8526
Epoch 22/30
 - 1s - loss: 0.3809 - acc: 0.8817 - val_loss: 0.5824 - val_acc: 0.7987
Epoch 23/30
 - 1s - loss: 0.3838 - acc: 0.8807 - val_loss: 0.4377 - val_acc: 0.8776
Epoch 24/30
 - 1s - loss: 0.3892 - acc: 0.8788 - val_loss: 0.4788 - val_acc: 0.8000
Epoch 25/30
 - 1s - loss: 0.3607 - acc: 0.8849 - val_loss: 0.6587 - val_acc: 0.8250
Epoch 26/30
 - 1s - loss: 0.4121 - acc: 0.8726 - val_loss: 0.4022 - val_acc: 0.8705
Epoch 27/30
 - 1s - loss: 0.3647 - acc: 0.8822 - val_loss: 0.3942 - val_acc: 0.8872
Epoch 28/30
 - 1s - loss: 0.4080 - acc: 0.8712 - val_loss: 0.5171 - val_acc: 0.8641
Epoch 29/30
 - 1s - loss: 0.3676 - acc: 0.8906 - val_loss: 0.4369 - val_acc: 0.8583
Epoch 30/30
 - 1s - loss: 0.3718 - acc: 0.8812 - val_loss: 0.6097 - val_acc: 0.7814
Train accuracy 0.7809195967543644 Test accuracy: 0.7814102564102564
------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472

```
conv1d_2 (Conv1D)              (None, 118, 16)              3600
_____

dropout_1 (Dropout)            (None, 118, 16)              0
_____

max_pooling1d_1 (MaxPooling1   (None, 59, 16)               0
_____

flatten_1 (Flatten)            (None, 944)                  0
_____

dense_1 (Dense)                (None, 64)                   60480
_____

dense_2 (Dense)                (None, 3)                    195
================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 12.6782 - acc: 0.8380 - val_loss: 4.0726 - val_acc: 0.8750
Epoch 2/30
 - 1s - loss: 1.9615 - acc: 0.8994 - val_loss: 0.9147 - val_acc: 0.8763
Epoch 3/30
 - 1s - loss: 0.5114 - acc: 0.9036 - val_loss: 0.4165 - val_acc: 0.8699
Epoch 4/30
 - 1s - loss: 0.3395 - acc: 0.9009 - val_loss: 0.4036 - val_acc: 0.8692
Epoch 5/30
 - 1s - loss: 0.3053 - acc: 0.8997 - val_loss: 0.3340 - val_acc: 0.8814
Epoch 6/30
 - 1s - loss: 0.2825 - acc: 0.9132 - val_loss: 0.3573 - val_acc: 0.8859
Epoch 7/30
 - 1s - loss: 0.2803 - acc: 0.9044 - val_loss: 0.4514 - val_acc: 0.8385
Epoch 8/30
 - 1s - loss: 0.3093 - acc: 0.9031 - val_loss: 0.3445 - val_acc: 0.8865
Epoch 9/30
 - 1s - loss: 0.2711 - acc: 0.9122 - val_loss: 0.3856 - val_acc: 0.8558
Epoch 10/30
 - 1s - loss: 0.2567 - acc: 0.9122 - val_loss: 0.3200 - val_acc: 0.8910
Epoch 11/30
 - 1s - loss: 0.2620 - acc: 0.9093 - val_loss: 0.3550 - val_acc: 0.8577
Epoch 12/30
 - 1s - loss: 0.2717 - acc: 0.9085 - val_loss: 0.3601 - val_acc: 0.8763
Epoch 13/30
```

```
                  - 1s - loss: 0.2950 - acc: 0.9149 - val_loss: 0.3736 - val_acc: 0.8737
            Epoch 14/30
                  - 1s - loss: 0.2669 - acc: 0.9134 - val_loss: 0.3345 - val_acc: 0.8724
            Epoch 15/30
                  - 1s - loss: 0.2920 - acc: 0.9068 - val_loss: 0.3659 - val_acc: 0.8821
            Epoch 16/30
                  - 1s - loss: 0.2627 - acc: 0.9137 - val_loss: 0.3602 - val_acc: 0.8583
            Epoch 17/30
                  - 1s - loss: 0.2683 - acc: 0.9134 - val_loss: 0.3248 - val_acc: 0.8814
            Epoch 18/30
                  - 1s - loss: 0.2748 - acc: 0.9088 - val_loss: 0.3023 - val_acc: 0.8821
            Epoch 19/30
                  - 1s - loss: 0.2441 - acc: 0.9130 - val_loss: 0.3364 - val_acc: 0.8756
            Epoch 20/30
                  - 1s - loss: 0.2483 - acc: 0.9144 - val_loss: 0.3314 - val_acc: 0.8782
            Epoch 21/30
                  - 1s - loss: 0.2826 - acc: 0.9103 - val_loss: 0.3437 - val_acc: 0.8622
            Epoch 22/30
                  - 1s - loss: 0.2675 - acc: 0.9093 - val_loss: 0.3025 - val_acc: 0.8936
            Epoch 23/30
                  - 1s - loss: 0.2514 - acc: 0.9189 - val_loss: 0.3302 - val_acc: 0.8808
            Epoch 24/30
                  - 1s - loss: 0.2643 - acc: 0.9127 - val_loss: 0.3159 - val_acc: 0.9083
            Epoch 25/30
                  - 1s - loss: 0.2786 - acc: 0.9090 - val_loss: 0.3260 - val_acc: 0.8897
            Epoch 26/30
                  - 1s - loss: 0.2820 - acc: 0.9112 - val_loss: 0.3013 - val_acc: 0.8962
            Epoch 27/30
                  - 1s - loss: 0.2355 - acc: 0.9213 - val_loss: 0.3628 - val_acc: 0.8628
            Epoch 28/30
                  - 1s - loss: 0.2688 - acc: 0.9105 - val_loss: 0.3470 - val_acc: 0.8917
            Epoch 29/30
                  - 1s - loss: 0.2464 - acc: 0.9253 - val_loss: 0.2961 - val_acc: 0.9058
            Epoch 30/30
                  - 1s - loss: 0.2410 - acc: 0.9194 - val_loss: 0.3182 - val_acc: 0.8929
            Train accuracy 0.9055815097123187 Test accuracy: 0.8929487176430531
            --------------------------------------------------------------------------------

            _____
            Layer (type)                 Output Shape              Param #
            ================================================================
            conv1d_1 (Conv1D)            (None, 122, 32)           2048
            _____
            conv1d_2 (Conv1D)            (None, 118, 16)           2576
```

```
dropout_1 (Dropout)          (None, 118, 16)              0
_____
max_pooling1d_1 (MaxPooling1 (None, 23, 16)               0
_____
flatten_1 (Flatten)          (None, 368)                  0
_____
dense_1 (Dense)              (None, 32)                   11808
_____
dense_2 (Dense)              (None, 3)                    99
=================================================================
Total params: 16,531
Trainable params: 16,531
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 15.2014 - acc: 0.8330 - val_loss: 0.5496 - val_acc: 0.8218
Epoch 2/35
 - 1s - loss: 0.3984 - acc: 0.8670 - val_loss: 0.5108 - val_acc: 0.8019
Epoch 3/35
 - 1s - loss: 0.3681 - acc: 0.8766 - val_loss: 0.4770 - val_acc: 0.8301
Epoch 4/35
 - 1s - loss: 0.3664 - acc: 0.8798 - val_loss: 0.4257 - val_acc: 0.8750
Epoch 5/35
 - 1s - loss: 0.3493 - acc: 0.8788 - val_loss: 0.4036 - val_acc: 0.8615
Epoch 6/35
 - 1s - loss: 0.3525 - acc: 0.8812 - val_loss: 0.4690 - val_acc: 0.8205
Epoch 7/35
 - 1s - loss: 0.3368 - acc: 0.8835 - val_loss: 0.4015 - val_acc: 0.8545
Epoch 8/35
 - 1s - loss: 0.3346 - acc: 0.8886 - val_loss: 0.4878 - val_acc: 0.8436
Epoch 9/35
 - 1s - loss: 0.3356 - acc: 0.8859 - val_loss: 0.4015 - val_acc: 0.8673
Epoch 10/35
 - 1s - loss: 0.3405 - acc: 0.8820 - val_loss: 0.4059 - val_acc: 0.8756
Epoch 11/35
 - 1s - loss: 0.3262 - acc: 0.8923 - val_loss: 0.5510 - val_acc: 0.6833
Epoch 12/35
 - 1s - loss: 0.3259 - acc: 0.8844 - val_loss: 0.3901 - val_acc: 0.8622
Epoch 13/35
 - 1s - loss: 0.3216 - acc: 0.8832 - val_loss: 0.4671 - val_acc: 0.8288
```

```
Epoch 14/35
 - 1s - loss: 0.3155 - acc: 0.8911 - val_loss: 0.4631 - val_acc: 0.8064
Epoch 15/35
 - 1s - loss: 0.3169 - acc: 0.8925 - val_loss: 0.3928 - val_acc: 0.8724
Epoch 16/35
 - 1s - loss: 0.3218 - acc: 0.8896 - val_loss: 0.3874 - val_acc: 0.8795
Epoch 17/35
 - 1s - loss: 0.3164 - acc: 0.8886 - val_loss: 0.3960 - val_acc: 0.8551
Epoch 18/35
 - 1s - loss: 0.3219 - acc: 0.8871 - val_loss: 0.6011 - val_acc: 0.8006
Epoch 19/35
 - 1s - loss: 0.3109 - acc: 0.8916 - val_loss: 0.4613 - val_acc: 0.8122
Epoch 20/35
 - 1s - loss: 0.3084 - acc: 0.8898 - val_loss: 0.4155 - val_acc: 0.8513
Epoch 21/35
 - 1s - loss: 0.2989 - acc: 0.8901 - val_loss: 0.4785 - val_acc: 0.8628
Epoch 22/35
 - 1s - loss: 0.3182 - acc: 0.8930 - val_loss: 0.5503 - val_acc: 0.6897
Epoch 23/35
 - 1s - loss: 0.3180 - acc: 0.8879 - val_loss: 0.4223 - val_acc: 0.8673
Epoch 24/35
 - 1s - loss: 0.3138 - acc: 0.8896 - val_loss: 0.4771 - val_acc: 0.8019
Epoch 25/35
 - 1s - loss: 0.3243 - acc: 0.8864 - val_loss: 0.5009 - val_acc: 0.8045
Epoch 26/35
 - 1s - loss: 0.3151 - acc: 0.8901 - val_loss: 0.5228 - val_acc: 0.8141
Epoch 27/35
 - 1s - loss: 0.3203 - acc: 0.8948 - val_loss: 0.4357 - val_acc: 0.8686
Epoch 28/35
 - 1s - loss: 0.3120 - acc: 0.8923 - val_loss: 0.5932 - val_acc: 0.6981
Epoch 29/35
 - 1s - loss: 0.3107 - acc: 0.8967 - val_loss: 0.4372 - val_acc: 0.8442
Epoch 30/35
 - 1s - loss: 0.3137 - acc: 0.8930 - val_loss: 0.4843 - val_acc: 0.8051
Epoch 31/35
 - 1s - loss: 0.3230 - acc: 0.8940 - val_loss: 0.6136 - val_acc: 0.8301
Epoch 32/35
 - 1s - loss: 0.3150 - acc: 0.8921 - val_loss: 0.4210 - val_acc: 0.8506
Epoch 33/35
 - 1s - loss: 0.3175 - acc: 0.8930 - val_loss: 0.7219 - val_acc: 0.6885
Epoch 34/35
 - 1s - loss: 0.3166 - acc: 0.8903 - val_loss: 0.4040 - val_acc: 0.8776
Epoch 35/35
```

```
 - 1s - loss: 0.3145 - acc: 0.8943 - val_loss: 0.7001 - val_acc: 0.6756
Train accuracy 0.6606835505286452 Test accuracy: 0.6756410256410257
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 124, 16)	2032
dropout_1 (Dropout)	(None, 124, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 62, 16)	0
flatten_1 (Flatten)	(None, 992)	0
dense_1 (Dense)	(None, 64)	63552
dense_2 (Dense)	(None, 3)	195

```
Total params: 66,955
Trainable params: 66,955
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 1s - loss: 48.4957 - acc: 0.8156 - val_loss: 20.3294 - val_acc: 0.8071
Epoch 2/30
 - 1s - loss: 9.9924 - acc: 0.8704 - val_loss: 3.3942 - val_acc: 0.8647
Epoch 3/30
 - 1s - loss: 1.3814 - acc: 0.8761 - val_loss: 0.5942 - val_acc: 0.7891
Epoch 4/30
 - 1s - loss: 0.4082 - acc: 0.8793 - val_loss: 0.5354 - val_acc: 0.7782
Epoch 5/30
 - 1s - loss: 0.3763 - acc: 0.8815 - val_loss: 0.5306 - val_acc: 0.8147
Epoch 6/30
 - 1s - loss: 0.3421 - acc: 0.8854 - val_loss: 0.3928 - val_acc: 0.8628
Epoch 7/30
 - 1s - loss: 0.3561 - acc: 0.8805 - val_loss: 0.4062 - val_acc: 0.8609
Epoch 8/30
 - 1s - loss: 0.3229 - acc: 0.8911 - val_loss: 0.4726 - val_acc: 0.8096
Epoch 9/30
```

```
         - 1s - loss: 0.3220 - acc: 0.8955 - val_loss: 0.3894 - val_acc: 0.8603
Epoch 10/30
         - 1s - loss: 0.3192 - acc: 0.8908 - val_loss: 0.4327 - val_acc: 0.8615
Epoch 11/30
         - 1s - loss: 0.3108 - acc: 0.8906 - val_loss: 0.4154 - val_acc: 0.8346
Epoch 12/30
         - 1s - loss: 0.3093 - acc: 0.8913 - val_loss: 0.3504 - val_acc: 0.8763
Epoch 13/30
         - 1s - loss: 0.3039 - acc: 0.8980 - val_loss: 0.3497 - val_acc: 0.8788
Epoch 14/30
         - 1s - loss: 0.2922 - acc: 0.8992 - val_loss: 0.4432 - val_acc: 0.8397
Epoch 15/30
         - 1s - loss: 0.3053 - acc: 0.8948 - val_loss: 0.4355 - val_acc: 0.8429
Epoch 16/30
         - 1s - loss: 0.3052 - acc: 0.8923 - val_loss: 0.3397 - val_acc: 0.8763
Epoch 17/30
         - 1s - loss: 0.2876 - acc: 0.9012 - val_loss: 0.3372 - val_acc: 0.8750
Epoch 18/30
         - 1s - loss: 0.3014 - acc: 0.8940 - val_loss: 0.3446 - val_acc: 0.8712
Epoch 19/30
         - 1s - loss: 0.2950 - acc: 0.8916 - val_loss: 0.3614 - val_acc: 0.8756
Epoch 20/30
         - 1s - loss: 0.2956 - acc: 0.8935 - val_loss: 0.4798 - val_acc: 0.8103
Epoch 21/30
         - 1s - loss: 0.2911 - acc: 0.8985 - val_loss: 0.3685 - val_acc: 0.8615
Epoch 22/30
         - 1s - loss: 0.2913 - acc: 0.8945 - val_loss: 0.3311 - val_acc: 0.8776
Epoch 23/30
         - 1s - loss: 0.2872 - acc: 0.8921 - val_loss: 0.3530 - val_acc: 0.8776
Epoch 24/30
         - 1s - loss: 0.2843 - acc: 0.8955 - val_loss: 0.3569 - val_acc: 0.8763
Epoch 25/30
         - 1s - loss: 0.2913 - acc: 0.8960 - val_loss: 0.4266 - val_acc: 0.8596
Epoch 26/30
         - 1s - loss: 0.2945 - acc: 0.8935 - val_loss: 0.3404 - val_acc: 0.8801
Epoch 27/30
         - 1s - loss: 0.2785 - acc: 0.8997 - val_loss: 0.3292 - val_acc: 0.8814
Epoch 28/30
         - 1s - loss: 0.2992 - acc: 0.8903 - val_loss: 0.3772 - val_acc: 0.8506
Epoch 29/30
         - 1s - loss: 0.2880 - acc: 0.9007 - val_loss: 0.3541 - val_acc: 0.8737
Epoch 30/30
         - 1s - loss: 0.2917 - acc: 0.8962 - val_loss: 0.3823 - val_acc: 0.8372
```

```
Train accuracy 0.8377182198180477 Test accuracy: 0.8371794871794872
------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 16)	1552
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 16)	15632
dense_2 (Dense)	(None, 3)	51

```
Total params: 18,707
Trainable params: 18,707
Non-trainable params: 0

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 3s - loss: 6.8408 - acc: 0.8441 - val_loss: 0.7709 - val_acc: 0.7853
Epoch 2/30
 - 2s - loss: 0.4288 - acc: 0.8859 - val_loss: 0.4314 - val_acc: 0.8538
Epoch 3/30
 - 2s - loss: 0.3410 - acc: 0.8923 - val_loss: 0.4027 - val_acc: 0.8391
Epoch 4/30
 - 2s - loss: 0.3124 - acc: 0.8928 - val_loss: 0.3735 - val_acc: 0.8487
Epoch 5/30
 - 2s - loss: 0.3133 - acc: 0.8957 - val_loss: 0.3409 - val_acc: 0.8756
Epoch 6/30
 - 2s - loss: 0.3123 - acc: 0.8950 - val_loss: 0.3934 - val_acc: 0.8462
Epoch 7/30
 - 2s - loss: 0.2933 - acc: 0.8970 - val_loss: 0.3548 - val_acc: 0.8718
Epoch 8/30
 - 2s - loss: 0.3006 - acc: 0.8948 - val_loss: 0.3963 - val_acc: 0.8353
Epoch 9/30
 - 2s - loss: 0.2891 - acc: 0.9021 - val_loss: 0.3316 - val_acc: 0.8801
```

```
Epoch 10/30
 - 2s - loss: 0.2863 - acc: 0.9053 - val_loss: 0.3290 - val_acc: 0.8801
Epoch 11/30
 - 2s - loss: 0.2818 - acc: 0.9019 - val_loss: 0.5855 - val_acc: 0.7372
Epoch 12/30
 - 2s - loss: 0.2841 - acc: 0.8999 - val_loss: 0.4008 - val_acc: 0.8462
Epoch 13/30
 - 2s - loss: 0.2799 - acc: 0.8987 - val_loss: 0.4074 - val_acc: 0.8372
Epoch 14/30
 - 2s - loss: 0.2959 - acc: 0.9004 - val_loss: 0.4543 - val_acc: 0.7532
Epoch 15/30
 - 2s - loss: 0.2894 - acc: 0.9021 - val_loss: 0.3378 - val_acc: 0.8686
Epoch 16/30
 - 2s - loss: 0.2871 - acc: 0.9048 - val_loss: 0.3296 - val_acc: 0.8827
Epoch 17/30
 - 2s - loss: 0.2950 - acc: 0.8957 - val_loss: 0.3877 - val_acc: 0.8590
Epoch 18/30
 - 2s - loss: 0.2738 - acc: 0.9016 - val_loss: 0.6877 - val_acc: 0.6968
Epoch 19/30
 - 2s - loss: 0.2851 - acc: 0.8987 - val_loss: 0.3259 - val_acc: 0.8724
Epoch 20/30
 - 2s - loss: 0.2763 - acc: 0.9044 - val_loss: 0.3080 - val_acc: 0.8942
Epoch 21/30
 - 2s - loss: 0.2642 - acc: 0.9068 - val_loss: 0.4022 - val_acc: 0.8647
Epoch 22/30
 - 2s - loss: 0.2860 - acc: 0.9034 - val_loss: 0.4544 - val_acc: 0.8481
Epoch 23/30
 - 2s - loss: 0.2735 - acc: 0.9031 - val_loss: 0.3388 - val_acc: 0.8827
Epoch 24/30
 - 2s - loss: 0.2830 - acc: 0.9061 - val_loss: 0.3552 - val_acc: 0.8718
Epoch 25/30
 - 2s - loss: 0.2765 - acc: 0.9048 - val_loss: 0.3394 - val_acc: 0.8968
Epoch 26/30
 - 2s - loss: 0.2844 - acc: 0.9058 - val_loss: 0.4149 - val_acc: 0.8692
Epoch 27/30
 - 2s - loss: 0.2855 - acc: 0.9004 - val_loss: 0.4654 - val_acc: 0.8577
Epoch 28/30
 - 2s - loss: 0.2728 - acc: 0.9058 - val_loss: 0.3931 - val_acc: 0.7987
Epoch 29/30
 - 2s - loss: 0.2728 - acc: 0.9080 - val_loss: 0.3744 - val_acc: 0.8673
Epoch 30/30
 - 2s - loss: 0.2738 - acc: 0.9058 - val_loss: 0.3366 - val_acc: 0.8795
Train accuracy 0.9068109171379395 Test accuracy: 0.8794871794871795
```

```
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 28)           1792
_____
conv1d_2 (Conv1D)            (None, 120, 16)           1360
_____
dropout_1 (Dropout)          (None, 120, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 16)            0
_____
flatten_1 (Flatten)          (None, 640)               0
_____
dense_1 (Dense)              (None, 64)                41024
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 44,371
Trainable params: 44,371
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 1s - loss: 19.6197 - acc: 0.8276 - val_loss: 4.1968 - val_acc: 0.8647
Epoch 2/25
 - 1s - loss: 1.4208 - acc: 0.8817 - val_loss: 0.6038 - val_acc: 0.8667
Epoch 3/25
 - 1s - loss: 0.4762 - acc: 0.8999 - val_loss: 0.5621 - val_acc: 0.8596
Epoch 4/25
 - 1s - loss: 0.3757 - acc: 0.9112 - val_loss: 0.4712 - val_acc: 0.8494
Epoch 5/25
 - 1s - loss: 0.3585 - acc: 0.9098 - val_loss: 0.3741 - val_acc: 0.8827
Epoch 6/25
 - 1s - loss: 0.3111 - acc: 0.9120 - val_loss: 0.3474 - val_acc: 0.8865
Epoch 7/25
 - 1s - loss: 0.2956 - acc: 0.9139 - val_loss: 0.4264 - val_acc: 0.8551
Epoch 8/25
 - 1s - loss: 0.3037 - acc: 0.9164 - val_loss: 0.3518 - val_acc: 0.8821
Epoch 9/25
 - 1s - loss: 0.2649 - acc: 0.9196 - val_loss: 0.3355 - val_acc: 0.8955
Epoch 10/25
```

```
        - 1s - loss: 0.2682 - acc: 0.9154 - val_loss: 0.3038 - val_acc: 0.8904
Epoch 11/25
        - 1s - loss: 0.2726 - acc: 0.9184 - val_loss: 0.3188 - val_acc: 0.8904
Epoch 12/25
        - 1s - loss: 0.2491 - acc: 0.9194 - val_loss: 0.3127 - val_acc: 0.9013
Epoch 13/25
        - 1s - loss: 0.2382 - acc: 0.9248 - val_loss: 0.3494 - val_acc: 0.8718
Epoch 14/25
        - 1s - loss: 0.2519 - acc: 0.9240 - val_loss: 0.2891 - val_acc: 0.9224
Epoch 15/25
        - 1s - loss: 0.2301 - acc: 0.9299 - val_loss: 0.3380 - val_acc: 0.8718
Epoch 16/25
        - 1s - loss: 0.2437 - acc: 0.9223 - val_loss: 0.3008 - val_acc: 0.8904
Epoch 17/25
        - 1s - loss: 0.2334 - acc: 0.9299 - val_loss: 0.3205 - val_acc: 0.8840
Epoch 18/25
        - 1s - loss: 0.2306 - acc: 0.9292 - val_loss: 0.3043 - val_acc: 0.8962
Epoch 19/25
        - 1s - loss: 0.2283 - acc: 0.9265 - val_loss: 0.2693 - val_acc: 0.9128
Epoch 20/25
        - 1s - loss: 0.2253 - acc: 0.9299 - val_loss: 0.6581 - val_acc: 0.7718
Epoch 21/25
        - 1s - loss: 0.2252 - acc: 0.9309 - val_loss: 0.2950 - val_acc: 0.8865
Epoch 22/25
        - 1s - loss: 0.2171 - acc: 0.9302 - val_loss: 0.3195 - val_acc: 0.8917
Epoch 23/25
        - 1s - loss: 0.2135 - acc: 0.9326 - val_loss: 0.3080 - val_acc: 0.8885
Epoch 24/25
        - 1s - loss: 0.2210 - acc: 0.9326 - val_loss: 0.2618 - val_acc: 0.9141
Epoch 25/25
        - 1s - loss: 0.2162 - acc: 0.9307 - val_loss: 0.2886 - val_acc: 0.8949
Train accuracy 0.9454143103024343 Test accuracy: 0.8948717948717949
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 24)	2328
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 24)	0

```
─────────────────────────────────────────────────────────
flatten_1 (Flatten)            (None, 1440)              0
─────────────────────────────────────────────────────────
dense_1 (Dense)                (None, 64)            92224
─────────────────────────────────────────────────────────
dense_2 (Dense)                (None, 3)               195
=========================================================
Total params: 96,795
Trainable params: 96,795
Non-trainable params: 0
─────────────────────────────────────────────────────────
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 71.8882 - acc: 0.8547 - val_loss: 7.6055 - val_acc: 0.8667
Epoch 2/30
 - 1s - loss: 2.0432 - acc: 0.8871 - val_loss: 0.5594 - val_acc: 0.8667
Epoch 3/30
 - 1s - loss: 0.4075 - acc: 0.8842 - val_loss: 0.4499 - val_acc: 0.8462
Epoch 4/30
 - 1s - loss: 0.4001 - acc: 0.8827 - val_loss: 0.4643 - val_acc: 0.8308
Epoch 5/30
 - 1s - loss: 0.4089 - acc: 0.8761 - val_loss: 0.5166 - val_acc: 0.8538
Epoch 6/30
 - 1s - loss: 0.3622 - acc: 0.8862 - val_loss: 0.4662 - val_acc: 0.8571
Epoch 7/30
 - 1s - loss: 0.4059 - acc: 0.8739 - val_loss: 0.4547 - val_acc: 0.8628
Epoch 8/30
 - 1s - loss: 0.3553 - acc: 0.8901 - val_loss: 0.4175 - val_acc: 0.8590
Epoch 9/30
 - 1s - loss: 0.3639 - acc: 0.8862 - val_loss: 0.4652 - val_acc: 0.8455
Epoch 10/30
 - 1s - loss: 0.3614 - acc: 0.8874 - val_loss: 0.4193 - val_acc: 0.8660
Epoch 11/30
 - 1s - loss: 0.3356 - acc: 0.8930 - val_loss: 0.3844 - val_acc: 0.8673
Epoch 12/30
 - 1s - loss: 0.3388 - acc: 0.8874 - val_loss: 0.4057 - val_acc: 0.8526
Epoch 13/30
 - 1s - loss: 0.3480 - acc: 0.8866 - val_loss: 0.3904 - val_acc: 0.8558
Epoch 14/30
 - 1s - loss: 0.3543 - acc: 0.8876 - val_loss: 0.3866 - val_acc: 0.8712
Epoch 15/30
 - 1s - loss: 0.3593 - acc: 0.8817 - val_loss: 0.4112 - val_acc: 0.8673
```

```
Epoch 16/30
 - 1s - loss: 0.3565 - acc: 0.8921 - val_loss: 0.4245 - val_acc: 0.8481
Epoch 17/30
 - 1s - loss: 0.3471 - acc: 0.8820 - val_loss: 0.3652 - val_acc: 0.8731
Epoch 18/30
 - 1s - loss: 0.3361 - acc: 0.8938 - val_loss: 0.3773 - val_acc: 0.8635
Epoch 19/30
 - 1s - loss: 0.3320 - acc: 0.8935 - val_loss: 0.4194 - val_acc: 0.8481
Epoch 20/30
 - 1s - loss: 0.3256 - acc: 0.8953 - val_loss: 0.3582 - val_acc: 0.8744
Epoch 21/30
 - 1s - loss: 0.3373 - acc: 0.8911 - val_loss: 0.3966 - val_acc: 0.8679
Epoch 22/30
 - 1s - loss: 0.3489 - acc: 0.8894 - val_loss: 0.3934 - val_acc: 0.8641
Epoch 23/30
 - 1s - loss: 0.3545 - acc: 0.8852 - val_loss: 0.3904 - val_acc: 0.8654
Epoch 24/30
 - 1s - loss: 0.3248 - acc: 0.8891 - val_loss: 0.3690 - val_acc: 0.8808
Epoch 25/30
 - 1s - loss: 0.3286 - acc: 0.8891 - val_loss: 0.4190 - val_acc: 0.8551
Epoch 26/30
 - 1s - loss: 0.3117 - acc: 0.8955 - val_loss: 0.3770 - val_acc: 0.8628
Epoch 27/30
 - 1s - loss: 0.3462 - acc: 0.8889 - val_loss: 0.4589 - val_acc: 0.8224
Epoch 28/30
 - 1s - loss: 0.3594 - acc: 0.8785 - val_loss: 0.3720 - val_acc: 0.8731
Epoch 29/30
 - 1s - loss: 0.3309 - acc: 0.8994 - val_loss: 0.4474 - val_acc: 0.8571
Epoch 30/30
 - 1s - loss: 0.3312 - acc: 0.8884 - val_loss: 0.3679 - val_acc: 0.8679
Train accuracy 0.8925497910007376 Test accuracy: 0.867948717948718
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 32)	7200
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 32)	0

```
flatten_1 (Flatten)          (None, 1888)              0
_____
dense_1 (Dense)              (None, 64)                120896
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 129,763
Trainable params: 129,763
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 44.7396 - acc: 0.7981 - val_loss: 7.5927 - val_acc: 0.5897
Epoch 2/30
 - 1s - loss: 2.9382 - acc: 0.8397 - val_loss: 0.8895 - val_acc: 0.8090
Epoch 3/30
 - 1s - loss: 0.4927 - acc: 0.8736 - val_loss: 0.5849 - val_acc: 0.7968
Epoch 4/30
 - 1s - loss: 0.4011 - acc: 0.8874 - val_loss: 0.5888 - val_acc: 0.7840
Epoch 5/30
 - 1s - loss: 0.3659 - acc: 0.8842 - val_loss: 0.5697 - val_acc: 0.8314
Epoch 6/30
 - 1s - loss: 0.3546 - acc: 0.8889 - val_loss: 0.4015 - val_acc: 0.8679
Epoch 7/30
 - 1s - loss: 0.3575 - acc: 0.8842 - val_loss: 0.4043 - val_acc: 0.8718
Epoch 8/30
 - 1s - loss: 0.3333 - acc: 0.8901 - val_loss: 0.5026 - val_acc: 0.8167
Epoch 9/30
 - 1s - loss: 0.3438 - acc: 0.8940 - val_loss: 0.3978 - val_acc: 0.8551
Epoch 10/30
 - 1s - loss: 0.3600 - acc: 0.8830 - val_loss: 0.4375 - val_acc: 0.8564
Epoch 11/30
 - 1s - loss: 0.3314 - acc: 0.8933 - val_loss: 0.3926 - val_acc: 0.8724
Epoch 12/30
 - 1s - loss: 0.3467 - acc: 0.8889 - val_loss: 0.4332 - val_acc: 0.8603
Epoch 13/30
 - 1s - loss: 0.3157 - acc: 0.9007 - val_loss: 0.3800 - val_acc: 0.8750
Epoch 14/30
 - 1s - loss: 0.3407 - acc: 0.8933 - val_loss: 0.4281 - val_acc: 0.8577
Epoch 15/30
 - 1s - loss: 0.3360 - acc: 0.8901 - val_loss: 0.5413 - val_acc: 0.8199
Epoch 16/30
```

```
  - 1s - loss: 0.3266 - acc: 0.8938 - val_loss: 0.4195 - val_acc: 0.8590
Epoch 17/30
  - 1s - loss: 0.3319 - acc: 0.8913 - val_loss: 0.3761 - val_acc: 0.8718
Epoch 18/30
  - 1s - loss: 0.3233 - acc: 0.8918 - val_loss: 0.3957 - val_acc: 0.8551
Epoch 19/30
  - 1s - loss: 0.3252 - acc: 0.8925 - val_loss: 0.3716 - val_acc: 0.8718
Epoch 20/30
  - 1s - loss: 0.3278 - acc: 0.8945 - val_loss: 0.3599 - val_acc: 0.8679
Epoch 21/30
  - 1s - loss: 0.3084 - acc: 0.9019 - val_loss: 0.4380 - val_acc: 0.8545
Epoch 22/30
  - 1s - loss: 0.3388 - acc: 0.8894 - val_loss: 0.4653 - val_acc: 0.8538
Epoch 23/30
  - 1s - loss: 0.3218 - acc: 0.8896 - val_loss: 0.3636 - val_acc: 0.8756
Epoch 24/30
  - 1s - loss: 0.3287 - acc: 0.8940 - val_loss: 0.3865 - val_acc: 0.8692
Epoch 25/30
  - 1s - loss: 0.3202 - acc: 0.8940 - val_loss: 0.3613 - val_acc: 0.8750
Epoch 26/30
  - 1s - loss: 0.3136 - acc: 0.8982 - val_loss: 0.3797 - val_acc: 0.8763
Epoch 27/30
  - 1s - loss: 0.3064 - acc: 0.8992 - val_loss: 0.3660 - val_acc: 0.8590
Epoch 28/30
  - 1s - loss: 0.3397 - acc: 0.8925 - val_loss: 0.3835 - val_acc: 0.8603
Epoch 29/30
  - 1s - loss: 0.3513 - acc: 0.8950 - val_loss: 0.4121 - val_acc: 0.8705
Epoch 30/30
  - 1s - loss: 0.3162 - acc: 0.8989 - val_loss: 0.3925 - val_acc: 0.8622
Train accuracy 0.8605851979345955 Test accuracy: 0.8621794871794872
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0

```
_____
dense_1 (Dense)                 (None, 32)                  12320
_____
dense_2 (Dense)                 (None, 3)                   99
================================================================
Total params: 16,019
Trainable params: 16,019
Non-trainable params: 0
_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/35
 - 2s - loss: 18.5672 - acc: 0.8208 - val_loss: 0.5694 - val_acc: 0.8192
Epoch 2/35
 - 1s - loss: 0.3982 - acc: 0.8748 - val_loss: 0.4753 - val_acc: 0.8506
Epoch 3/35
 - 1s - loss: 0.3616 - acc: 0.8758 - val_loss: 0.4663 - val_acc: 0.8186
Epoch 4/35
 - 1s - loss: 0.3384 - acc: 0.8874 - val_loss: 0.4199 - val_acc: 0.8679
Epoch 5/35
 - 1s - loss: 0.3323 - acc: 0.8849 - val_loss: 0.3933 - val_acc: 0.8782
Epoch 6/35
 - 1s - loss: 0.3279 - acc: 0.8852 - val_loss: 0.4284 - val_acc: 0.8308
Epoch 7/35
 - 1s - loss: 0.3196 - acc: 0.8881 - val_loss: 0.3961 - val_acc: 0.8564
Epoch 8/35
 - 1s - loss: 0.3212 - acc: 0.8884 - val_loss: 0.4040 - val_acc: 0.8397
Epoch 9/35
 - 1s - loss: 0.3237 - acc: 0.8886 - val_loss: 0.3827 - val_acc: 0.8705
Epoch 10/35
 - 1s - loss: 0.3270 - acc: 0.8837 - val_loss: 0.4147 - val_acc: 0.8776
Epoch 11/35
 - 1s - loss: 0.3165 - acc: 0.8921 - val_loss: 0.4934 - val_acc: 0.7032
Epoch 12/35
 - 1s - loss: 0.3189 - acc: 0.8849 - val_loss: 0.3990 - val_acc: 0.8596
Epoch 13/35
 - 1s - loss: 0.3208 - acc: 0.8837 - val_loss: 0.4107 - val_acc: 0.8455
Epoch 14/35
 - 1s - loss: 0.3179 - acc: 0.8903 - val_loss: 0.4493 - val_acc: 0.8212
Epoch 15/35
 - 1s - loss: 0.3125 - acc: 0.8913 - val_loss: 0.3689 - val_acc: 0.8782
Epoch 16/35
 - 1s - loss: 0.3113 - acc: 0.8911 - val_loss: 0.3722 - val_acc: 0.8827
```

```
Epoch 17/35
 - 1s - loss: 0.3093 - acc: 0.8874 - val_loss: 0.3403 - val_acc: 0.8750
Epoch 18/35
 - 1s - loss: 0.3068 - acc: 0.8896 - val_loss: 0.4273 - val_acc: 0.8295
Epoch 19/35
 - 1s - loss: 0.3057 - acc: 0.8859 - val_loss: 0.3857 - val_acc: 0.8763
Epoch 20/35
 - 1s - loss: 0.3057 - acc: 0.8916 - val_loss: 0.4407 - val_acc: 0.8724
Epoch 21/35
 - 1s - loss: 0.2953 - acc: 0.8943 - val_loss: 0.3866 - val_acc: 0.8532
Epoch 22/35
 - 1s - loss: 0.3073 - acc: 0.8896 - val_loss: 0.4594 - val_acc: 0.7827
Epoch 23/35
 - 1s - loss: 0.3075 - acc: 0.8864 - val_loss: 0.3600 - val_acc: 0.8801
Epoch 24/35
 - 1s - loss: 0.3018 - acc: 0.8925 - val_loss: 0.3783 - val_acc: 0.8788
Epoch 25/35
 - 1s - loss: 0.2951 - acc: 0.8923 - val_loss: 0.4091 - val_acc: 0.8237
Epoch 26/35
 - 1s - loss: 0.2970 - acc: 0.8921 - val_loss: 0.3966 - val_acc: 0.8782
Epoch 27/35
 - 1s - loss: 0.3083 - acc: 0.8921 - val_loss: 0.3475 - val_acc: 0.8814
Epoch 28/35
 - 1s - loss: 0.2986 - acc: 0.8928 - val_loss: 0.4569 - val_acc: 0.7571
Epoch 29/35
 - 1s - loss: 0.2927 - acc: 0.8957 - val_loss: 0.4110 - val_acc: 0.8603
Epoch 30/35
 - 1s - loss: 0.2973 - acc: 0.8925 - val_loss: 0.3867 - val_acc: 0.8679
Epoch 31/35
 - 1s - loss: 0.2914 - acc: 0.8955 - val_loss: 0.4099 - val_acc: 0.8667
Epoch 32/35
 - 1s - loss: 0.2981 - acc: 0.8889 - val_loss: 0.4880 - val_acc: 0.8519
Epoch 33/35
 - 1s - loss: 0.2980 - acc: 0.8930 - val_loss: 0.5790 - val_acc: 0.7186
Epoch 34/35
 - 1s - loss: 0.2974 - acc: 0.8945 - val_loss: 0.4221 - val_acc: 0.8397
Epoch 35/35
 - 1s - loss: 0.2942 - acc: 0.8999 - val_loss: 0.6764 - val_acc: 0.6737
Train accuracy 0.6774034915170888 Test accuracy: 0.6737179487179488
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

```
conv1d_1 (Conv1D)              (None, 126, 42)              1176
_____
conv1d_2 (Conv1D)              (None, 122, 16)              3376
_____
dropout_1 (Dropout)            (None, 122, 16)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 61, 16)               0
_____
flatten_1 (Flatten)            (None, 976)                  0
_____
dense_1 (Dense)                (None, 64)                   62528
_____
dense_2 (Dense)                (None, 3)                    195
=================================================================
Total params: 67,275
Trainable params: 67,275
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 1s - loss: 140.7741 - acc: 0.8343 - val_loss: 82.4743 - val_acc: 0.8814
Epoch 2/30
 - 1s - loss: 51.2177 - acc: 0.8721 - val_loss: 26.5850 - val_acc: 0.8615
Epoch 3/30
 - 1s - loss: 13.9654 - acc: 0.8844 - val_loss: 5.1062 - val_acc: 0.8378
Epoch 4/30
 - 1s - loss: 1.9749 - acc: 0.8803 - val_loss: 0.6709 - val_acc: 0.7929
Epoch 5/30
 - 1s - loss: 0.4319 - acc: 0.8729 - val_loss: 0.5418 - val_acc: 0.8192
Epoch 6/30
 - 1s - loss: 0.3733 - acc: 0.8815 - val_loss: 0.3995 - val_acc: 0.8628
Epoch 7/30
 - 1s - loss: 0.3535 - acc: 0.8827 - val_loss: 0.3849 - val_acc: 0.8859
Epoch 8/30
 - 1s - loss: 0.3433 - acc: 0.8869 - val_loss: 0.5312 - val_acc: 0.8135
Epoch 9/30
 - 1s - loss: 0.3321 - acc: 0.8921 - val_loss: 0.4001 - val_acc: 0.8744
Epoch 10/30
 - 1s - loss: 0.3296 - acc: 0.8837 - val_loss: 0.3737 - val_acc: 0.8769
Epoch 11/30
 - 1s - loss: 0.3166 - acc: 0.8918 - val_loss: 0.3615 - val_acc: 0.8744
Epoch 12/30
```

```
         - 1s - loss: 0.3145 - acc: 0.8943 - val_loss: 0.3599 - val_acc: 0.8763
     Epoch 13/30
         - 1s - loss: 0.3081 - acc: 0.8948 - val_loss: 0.3588 - val_acc: 0.8750
     Epoch 14/30
         - 1s - loss: 0.3007 - acc: 0.9021 - val_loss: 0.4567 - val_acc: 0.8577
     Epoch 15/30
         - 1s - loss: 0.3107 - acc: 0.8901 - val_loss: 0.3884 - val_acc: 0.8615
     Epoch 16/30
         - 1s - loss: 0.3141 - acc: 0.8901 - val_loss: 0.3508 - val_acc: 0.8782
     Epoch 17/30
         - 1s - loss: 0.3054 - acc: 0.8970 - val_loss: 0.3519 - val_acc: 0.8641
     Epoch 18/30
         - 1s - loss: 0.3001 - acc: 0.8925 - val_loss: 0.3498 - val_acc: 0.8744
     Epoch 19/30
         - 1s - loss: 0.3014 - acc: 0.8940 - val_loss: 0.3540 - val_acc: 0.8776
     Epoch 20/30
         - 1s - loss: 0.3022 - acc: 0.8933 - val_loss: 0.4873 - val_acc: 0.7974
     Epoch 21/30
         - 1s - loss: 0.3027 - acc: 0.8943 - val_loss: 0.3572 - val_acc: 0.8705
     Epoch 22/30
         - 1s - loss: 0.3038 - acc: 0.8896 - val_loss: 0.3626 - val_acc: 0.8609
     Epoch 23/30
         - 1s - loss: 0.3135 - acc: 0.8859 - val_loss: 0.3603 - val_acc: 0.8756
     Epoch 24/30
         - 1s - loss: 0.3075 - acc: 0.8881 - val_loss: 0.4531 - val_acc: 0.8545
     Epoch 25/30
         - 1s - loss: 0.3021 - acc: 0.8925 - val_loss: 0.5416 - val_acc: 0.8378
     Epoch 26/30
         - 1s - loss: 0.3131 - acc: 0.8857 - val_loss: 0.3414 - val_acc: 0.8737
     Epoch 27/30
         - 1s - loss: 0.2906 - acc: 0.8955 - val_loss: 0.3428 - val_acc: 0.8763
     Epoch 28/30
         - 1s - loss: 0.3206 - acc: 0.8876 - val_loss: 0.3731 - val_acc: 0.8673
     Epoch 29/30
         - 1s - loss: 0.2905 - acc: 0.9004 - val_loss: 0.3712 - val_acc: 0.8750
     Epoch 30/30
         - 1s - loss: 0.3068 - acc: 0.8921 - val_loss: 0.3976 - val_acc: 0.8391
     Train accuracy 0.8396852716990411 Test accuracy: 0.8391025641025641
     ---------------------------------------------------------------------------

     _____
     Layer (type)                 Output Shape              Param #
     =================================================================
     conv1d_1 (Conv1D)            (None, 124, 32)           1472
```

```
───────────────────────────────────────────────────────────────
conv1d_2 (Conv1D)            (None, 122, 16)              1552
───────────────────────────────────────────────────────────────
dropout_1 (Dropout)          (None, 122, 16)               0
───────────────────────────────────────────────────────────────
max_pooling1d_1 (MaxPooling1 (None, 61, 16)                0
───────────────────────────────────────────────────────────────
flatten_1 (Flatten)          (None, 976)                   0
───────────────────────────────────────────────────────────────
dense_1 (Dense)              (None, 16)                  15632
───────────────────────────────────────────────────────────────
dense_2 (Dense)              (None, 3)                    51
===============================================================
Total params: 18,707
Trainable params: 18,707
Non-trainable params: 0
───────────────────────────────────────────────────────────────
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 3s - loss: 24.2597 - acc: 0.8279 - val_loss: 4.6851 - val_acc: 0.8199
Epoch 2/30
 - 2s - loss: 1.5129 - acc: 0.8886 - val_loss: 0.5973 - val_acc: 0.8455
Epoch 3/30
 - 2s - loss: 0.3934 - acc: 0.8903 - val_loss: 0.4793 - val_acc: 0.8250
Epoch 4/30
 - 2s - loss: 0.3378 - acc: 0.8921 - val_loss: 0.3897 - val_acc: 0.8686
Epoch 5/30
 - 2s - loss: 0.3233 - acc: 0.8972 - val_loss: 0.4009 - val_acc: 0.8622
Epoch 6/30
 - 2s - loss: 0.3154 - acc: 0.8894 - val_loss: 0.4496 - val_acc: 0.8224
Epoch 7/30
 - 2s - loss: 0.3046 - acc: 0.8928 - val_loss: 0.3575 - val_acc: 0.8756
Epoch 8/30
 - 2s - loss: 0.2981 - acc: 0.8921 - val_loss: 0.4184 - val_acc: 0.8282
Epoch 9/30
 - 2s - loss: 0.2924 - acc: 0.8992 - val_loss: 0.3438 - val_acc: 0.8712
Epoch 10/30
 - 2s - loss: 0.2904 - acc: 0.9016 - val_loss: 0.3317 - val_acc: 0.8853
Epoch 11/30
 - 2s - loss: 0.2759 - acc: 0.8997 - val_loss: 0.4907 - val_acc: 0.7179
Epoch 12/30
 - 2s - loss: 0.2790 - acc: 0.9002 - val_loss: 0.3979 - val_acc: 0.8391
```

```
Epoch 13/30
 - 2s - loss: 0.2802 - acc: 0.8985 - val_loss: 0.3904 - val_acc: 0.8353
Epoch 14/30
 - 2s - loss: 0.2729 - acc: 0.9014 - val_loss: 0.4390 - val_acc: 0.7782
Epoch 15/30
 - 2s - loss: 0.2784 - acc: 0.9026 - val_loss: 0.3193 - val_acc: 0.8929
Epoch 16/30
 - 2s - loss: 0.2688 - acc: 0.9061 - val_loss: 0.3233 - val_acc: 0.8929
Epoch 17/30
 - 2s - loss: 0.2709 - acc: 0.9016 - val_loss: 0.3437 - val_acc: 0.8558
Epoch 18/30
 - 2s - loss: 0.2743 - acc: 0.9026 - val_loss: 0.3509 - val_acc: 0.8821
Epoch 19/30
 - 2s - loss: 0.2663 - acc: 0.8982 - val_loss: 0.3142 - val_acc: 0.8846
Epoch 20/30
 - 2s - loss: 0.2626 - acc: 0.9051 - val_loss: 0.3088 - val_acc: 0.8821
Epoch 21/30
 - 2s - loss: 0.2559 - acc: 0.9061 - val_loss: 0.3463 - val_acc: 0.8577
Epoch 22/30
 - 2s - loss: 0.2691 - acc: 0.9024 - val_loss: 0.3654 - val_acc: 0.8776
Epoch 23/30
 - 2s - loss: 0.2649 - acc: 0.8999 - val_loss: 0.3018 - val_acc: 0.8859
Epoch 24/30
 - 2s - loss: 0.2708 - acc: 0.9029 - val_loss: 0.3108 - val_acc: 0.8853
Epoch 25/30
 - 2s - loss: 0.2648 - acc: 0.9029 - val_loss: 0.3087 - val_acc: 0.8853
Epoch 26/30
 - 2s - loss: 0.2653 - acc: 0.9016 - val_loss: 0.3106 - val_acc: 0.8833
Epoch 27/30
 - 2s - loss: 0.2678 - acc: 0.9024 - val_loss: 0.3521 - val_acc: 0.8551
Epoch 28/30
 - 2s - loss: 0.2627 - acc: 0.9026 - val_loss: 0.3547 - val_acc: 0.8583
Epoch 29/30
 - 2s - loss: 0.2644 - acc: 0.9051 - val_loss: 0.3778 - val_acc: 0.8615
Epoch 30/30
 - 2s - loss: 0.2648 - acc: 0.8972 - val_loss: 0.3198 - val_acc: 0.8840
Train accuracy 0.9018932874354562 Test accuracy: 0.8839743589743589
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 28)           1792
_____
```

```
conv1d_2 (Conv1D)              (None, 120, 24)              2040
_____
dropout_1 (Dropout)            (None, 120, 24)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 40, 24)               0
_____
flatten_1 (Flatten)            (None, 960)                  0
_____
dense_1 (Dense)                (None, 64)                   61504
_____
dense_2 (Dense)                (None, 3)                    195
=================================================================
Total params: 65,531
Trainable params: 65,531
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/25
 - 2s - loss: 84.0153 - acc: 0.8153 - val_loss: 17.4594 - val_acc: 0.8853
Epoch 2/25
 - 1s - loss: 5.7245 - acc: 0.8950 - val_loss: 1.0771 - val_acc: 0.8654
Epoch 3/25
 - 1s - loss: 0.5153 - acc: 0.8886 - val_loss: 0.4824 - val_acc: 0.8513
Epoch 4/25
 - 1s - loss: 0.3920 - acc: 0.8761 - val_loss: 0.4541 - val_acc: 0.8513
Epoch 5/25
 - 1s - loss: 0.3878 - acc: 0.8783 - val_loss: 0.4846 - val_acc: 0.8500
Epoch 6/25
 - 1s - loss: 0.3693 - acc: 0.8918 - val_loss: 0.5395 - val_acc: 0.8365
Epoch 7/25
 - 1s - loss: 0.3770 - acc: 0.8780 - val_loss: 0.4699 - val_acc: 0.8577
Epoch 8/25
 - 1s - loss: 0.3332 - acc: 0.8982 - val_loss: 0.4525 - val_acc: 0.8628
Epoch 9/25
 - 1s - loss: 0.3498 - acc: 0.8869 - val_loss: 0.4218 - val_acc: 0.8654
Epoch 10/25
 - 1s - loss: 0.3436 - acc: 0.8906 - val_loss: 0.4447 - val_acc: 0.8538
Epoch 11/25
 - 1s - loss: 0.3573 - acc: 0.8866 - val_loss: 0.4786 - val_acc: 0.8558
Epoch 12/25
 - 1s - loss: 0.3397 - acc: 0.8908 - val_loss: 0.4236 - val_acc: 0.8487
Epoch 13/25
```

```
      - 1s - loss: 0.3125 - acc: 0.9014 - val_loss: 0.4070 - val_acc: 0.8699
Epoch 14/25
      - 1s - loss: 0.3645 - acc: 0.8803 - val_loss: 0.4530 - val_acc: 0.8500
Epoch 15/25
      - 1s - loss: 0.3544 - acc: 0.8881 - val_loss: 0.4325 - val_acc: 0.8609
Epoch 16/25
      - 1s - loss: 0.3351 - acc: 0.8921 - val_loss: 0.4838 - val_acc: 0.8404
Epoch 17/25
      - 1s - loss: 0.3404 - acc: 0.8876 - val_loss: 0.4059 - val_acc: 0.8577
Epoch 18/25
      - 1s - loss: 0.3345 - acc: 0.8898 - val_loss: 0.4209 - val_acc: 0.8532
Epoch 19/25
      - 1s - loss: 0.3339 - acc: 0.8898 - val_loss: 0.4131 - val_acc: 0.8538
Epoch 20/25
      - 1s - loss: 0.3317 - acc: 0.8894 - val_loss: 0.4207 - val_acc: 0.8628
Epoch 21/25
      - 1s - loss: 0.3486 - acc: 0.8871 - val_loss: 0.4530 - val_acc: 0.8269
Epoch 22/25
      - 1s - loss: 0.3509 - acc: 0.8930 - val_loss: 0.3880 - val_acc: 0.8795
Epoch 23/25
      - 1s - loss: 0.3132 - acc: 0.8960 - val_loss: 0.4073 - val_acc: 0.8590
Epoch 24/25
      - 1s - loss: 0.3358 - acc: 0.8847 - val_loss: 0.4270 - val_acc: 0.8679
Epoch 25/25
      - 1s - loss: 0.3479 - acc: 0.8835 - val_loss: 0.4405 - val_acc: 0.8526
Train accuracy 0.8864027538726333 Test accuracy: 0.8525641025641025
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 51.4627 - acc: 0.7814 - val_loss: 38.2469 - val_acc: 0.8308
Epoch 2/30
 - 1s - loss: 28.9163 - acc: 0.8761 - val_loss: 20.5786 - val_acc: 0.8731
Epoch 3/30
 - 1s - loss: 14.7457 - acc: 0.8980 - val_loss: 9.8157 - val_acc: 0.8481
Epoch 4/30
 - 1s - loss: 6.5088 - acc: 0.9085 - val_loss: 4.0169 - val_acc: 0.8500
Epoch 5/30
 - 1s - loss: 2.4520 - acc: 0.9041 - val_loss: 1.4413 - val_acc: 0.8692
Epoch 6/30
 - 1s - loss: 0.8494 - acc: 0.9061 - val_loss: 0.6290 - val_acc: 0.8609
Epoch 7/30
 - 1s - loss: 0.4228 - acc: 0.9024 - val_loss: 0.4378 - val_acc: 0.8679
Epoch 8/30
 - 1s - loss: 0.3311 - acc: 0.9026 - val_loss: 0.4393 - val_acc: 0.8391
Epoch 9/30
 - 1s - loss: 0.3102 - acc: 0.9078 - val_loss: 0.3924 - val_acc: 0.8526
Epoch 10/30
 - 1s - loss: 0.2962 - acc: 0.9016 - val_loss: 0.3445 - val_acc: 0.8769
Epoch 11/30
 - 1s - loss: 0.2850 - acc: 0.9029 - val_loss: 0.3738 - val_acc: 0.8808
Epoch 12/30
 - 1s - loss: 0.2762 - acc: 0.9048 - val_loss: 0.3395 - val_acc: 0.8712
Epoch 13/30
 - 1s - loss: 0.2718 - acc: 0.9061 - val_loss: 0.3272 - val_acc: 0.8840
Epoch 14/30
 - 1s - loss: 0.2647 - acc: 0.9085 - val_loss: 0.3604 - val_acc: 0.8808
Epoch 15/30
 - 1s - loss: 0.2652 - acc: 0.9095 - val_loss: 0.4122 - val_acc: 0.8487
Epoch 16/30
 - 1s - loss: 0.2604 - acc: 0.9075 - val_loss: 0.3241 - val_acc: 0.8833
Epoch 17/30
 - 1s - loss: 0.2579 - acc: 0.9090 - val_loss: 0.3548 - val_acc: 0.8609
Epoch 18/30
 - 1s - loss: 0.2560 - acc: 0.9107 - val_loss: 0.3184 - val_acc: 0.8699
```

```
Epoch 19/30
 - 1s - loss: 0.2558 - acc: 0.9048 - val_loss: 0.3213 - val_acc: 0.8846
Epoch 20/30
 - 1s - loss: 0.2526 - acc: 0.9122 - val_loss: 0.3494 - val_acc: 0.8609
Epoch 21/30
 - 1s - loss: 0.2450 - acc: 0.9166 - val_loss: 0.3492 - val_acc: 0.8583
Epoch 22/30
 - 1s - loss: 0.2484 - acc: 0.9093 - val_loss: 0.3051 - val_acc: 0.9006
Epoch 23/30
 - 1s - loss: 0.2464 - acc: 0.9110 - val_loss: 0.3303 - val_acc: 0.8929
Epoch 24/30
 - 1s - loss: 0.2473 - acc: 0.9176 - val_loss: 0.3049 - val_acc: 0.9000
Epoch 25/30
 - 1s - loss: 0.2433 - acc: 0.9073 - val_loss: 0.3254 - val_acc: 0.8641
Epoch 26/30
 - 1s - loss: 0.2426 - acc: 0.9095 - val_loss: 0.3226 - val_acc: 0.8923
Epoch 27/30
 - 1s - loss: 0.2362 - acc: 0.9152 - val_loss: 0.3337 - val_acc: 0.8744
Epoch 28/30
 - 1s - loss: 0.2356 - acc: 0.9154 - val_loss: 0.3204 - val_acc: 0.8962
Epoch 29/30
 - 1s - loss: 0.2356 - acc: 0.9203 - val_loss: 0.3290 - val_acc: 0.9019
Epoch 30/30
 - 1s - loss: 0.2345 - acc: 0.9166 - val_loss: 0.3402 - val_acc: 0.8763
Train accuracy 0.8895992131792476 Test accuracy: 0.8762820512820513
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 32)	7200
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 32)	0
flatten_1 (Flatten)	(None, 1888)	0
dense_1 (Dense)	(None, 64)	120896
dense_2 (Dense)	(None, 3)	195

```
Total params: 129,763
Trainable params: 129,763
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 19.3529 - acc: 0.8237 - val_loss: 4.9012 - val_acc: 0.8487
Epoch 2/30
 - 1s - loss: 2.4061 - acc: 0.8692 - val_loss: 1.2586 - val_acc: 0.8532
Epoch 3/30
 - 1s - loss: 0.7073 - acc: 0.8916 - val_loss: 0.5626 - val_acc: 0.8365
Epoch 4/30
 - 1s - loss: 0.3935 - acc: 0.9036 - val_loss: 0.4844 - val_acc: 0.8333
Epoch 5/30
 - 1s - loss: 0.3634 - acc: 0.8886 - val_loss: 0.4799 - val_acc: 0.8635
Epoch 6/30
 - 1s - loss: 0.3163 - acc: 0.8994 - val_loss: 0.4679 - val_acc: 0.8635
Epoch 7/30
 - 1s - loss: 0.3170 - acc: 0.8999 - val_loss: 0.3867 - val_acc: 0.8782
Epoch 8/30
 - 1s - loss: 0.3073 - acc: 0.9051 - val_loss: 0.4400 - val_acc: 0.8468
Epoch 9/30
 - 1s - loss: 0.2865 - acc: 0.9073 - val_loss: 0.3495 - val_acc: 0.8615
Epoch 10/30
 - 1s - loss: 0.2901 - acc: 0.9009 - val_loss: 0.3600 - val_acc: 0.8641
Epoch 11/30
 - 1s - loss: 0.2792 - acc: 0.9024 - val_loss: 0.4725 - val_acc: 0.8212
Epoch 12/30
 - 1s - loss: 0.2877 - acc: 0.8987 - val_loss: 0.3918 - val_acc: 0.8583
Epoch 13/30
 - 1s - loss: 0.2620 - acc: 0.9100 - val_loss: 0.3371 - val_acc: 0.8705
Epoch 14/30
 - 1s - loss: 0.2693 - acc: 0.9083 - val_loss: 0.3177 - val_acc: 0.8942
Epoch 15/30
 - 1s - loss: 0.2771 - acc: 0.9051 - val_loss: 0.4239 - val_acc: 0.8590
Epoch 16/30
 - 1s - loss: 0.2644 - acc: 0.9085 - val_loss: 0.3261 - val_acc: 0.8788
Epoch 17/30
 - 1s - loss: 0.2687 - acc: 0.9134 - val_loss: 0.3557 - val_acc: 0.8782
Epoch 18/30
 - 1s - loss: 0.2625 - acc: 0.9127 - val_loss: 0.3482 - val_acc: 0.8769
Epoch 19/30
```

```
 - 1s - loss: 0.2675 - acc: 0.9044 - val_loss: 0.3083 - val_acc: 0.8974
Epoch 20/30
 - 1s - loss: 0.2587 - acc: 0.9107 - val_loss: 0.7944 - val_acc: 0.7635
Epoch 21/30
 - 1s - loss: 0.2770 - acc: 0.9098 - val_loss: 0.3281 - val_acc: 0.8699
Epoch 22/30
 - 1s - loss: 0.2651 - acc: 0.9051 - val_loss: 0.3412 - val_acc: 0.8808
Epoch 23/30
 - 1s - loss: 0.2690 - acc: 0.9073 - val_loss: 0.3541 - val_acc: 0.8744
Epoch 24/30
 - 1s - loss: 0.2608 - acc: 0.9090 - val_loss: 0.2987 - val_acc: 0.8853
Epoch 25/30
 - 1s - loss: 0.2618 - acc: 0.9103 - val_loss: 0.3241 - val_acc: 0.8763
Epoch 26/30
 - 1s - loss: 0.2568 - acc: 0.9125 - val_loss: 0.3625 - val_acc: 0.8788
Epoch 27/30
 - 1s - loss: 0.2679 - acc: 0.9073 - val_loss: 0.3223 - val_acc: 0.8763
Epoch 28/30
 - 1s - loss: 0.2507 - acc: 0.9132 - val_loss: 0.3041 - val_acc: 0.8987
Epoch 29/30
 - 1s - loss: 0.2691 - acc: 0.9142 - val_loss: 0.3184 - val_acc: 0.8929
Epoch 30/30
 - 1s - loss: 0.2552 - acc: 0.9144 - val_loss: 0.3496 - val_acc: 0.8904
Train accuracy 0.9055815097123187 Test accuracy: 0.8903846153846153
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0
dense_1 (Dense)	(None, 32)	12320
dense_2 (Dense)	(None, 3)	99

```
Total params: 16,019
```

```
Trainable params: 16,019
Non-trainable params: 0

_____

None
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
 - 2s - loss: 19.5666 - acc: 0.8281 - val_loss: 0.6750 - val_acc: 0.8346
Epoch 2/30
 - 1s - loss: 0.3865 - acc: 0.8839 - val_loss: 0.4630 - val_acc: 0.8577
Epoch 3/30
 - 1s - loss: 0.3369 - acc: 0.8871 - val_loss: 0.4484 - val_acc: 0.8365
Epoch 4/30
 - 1s - loss: 0.3088 - acc: 0.8940 - val_loss: 0.4145 - val_acc: 0.8641
Epoch 5/30
 - 1s - loss: 0.3070 - acc: 0.8930 - val_loss: 0.3788 - val_acc: 0.8788
Epoch 6/30
 - 1s - loss: 0.2969 - acc: 0.8930 - val_loss: 0.4231 - val_acc: 0.8410
Epoch 7/30
 - 1s - loss: 0.2892 - acc: 0.8977 - val_loss: 0.3814 - val_acc: 0.8654
Epoch 8/30
 - 1s - loss: 0.2868 - acc: 0.8935 - val_loss: 0.4122 - val_acc: 0.8372
Epoch 9/30
 - 1s - loss: 0.2854 - acc: 0.8987 - val_loss: 0.3642 - val_acc: 0.8718
Epoch 10/30
 - 1s - loss: 0.2852 - acc: 0.8960 - val_loss: 0.3676 - val_acc: 0.8859
Epoch 11/30
 - 1s - loss: 0.2861 - acc: 0.8965 - val_loss: 0.4356 - val_acc: 0.7532
Epoch 12/30
 - 1s - loss: 0.2842 - acc: 0.8933 - val_loss: 0.3907 - val_acc: 0.8558
Epoch 13/30
 - 1s - loss: 0.2855 - acc: 0.8911 - val_loss: 0.3778 - val_acc: 0.8513
Epoch 14/30
 - 1s - loss: 0.2739 - acc: 0.8965 - val_loss: 0.3928 - val_acc: 0.8532
Epoch 15/30
 - 1s - loss: 0.2811 - acc: 0.8960 - val_loss: 0.3470 - val_acc: 0.8782
Epoch 16/30
 - 1s - loss: 0.2791 - acc: 0.8989 - val_loss: 0.3594 - val_acc: 0.8750
Epoch 17/30
 - 1s - loss: 0.2793 - acc: 0.8916 - val_loss: 0.3863 - val_acc: 0.8532
Epoch 18/30
 - 1s - loss: 0.2782 - acc: 0.8972 - val_loss: 0.3695 - val_acc: 0.8782
Epoch 19/30
 - 1s - loss: 0.2778 - acc: 0.8957 - val_loss: 0.3445 - val_acc: 0.8814
```

```
Epoch 20/30
 - 1s - loss: 0.2711 - acc: 0.8960 - val_loss: 0.3952 - val_acc: 0.8603
Epoch 21/30
 - 1s - loss: 0.2642 - acc: 0.8997 - val_loss: 0.3618 - val_acc: 0.8571
Epoch 22/30
 - 1s - loss: 0.2710 - acc: 0.9002 - val_loss: 0.3657 - val_acc: 0.8808
Epoch 23/30
 - 1s - loss: 0.2798 - acc: 0.8879 - val_loss: 0.3476 - val_acc: 0.8776
Epoch 24/30
 - 1s - loss: 0.2710 - acc: 0.8989 - val_loss: 0.3589 - val_acc: 0.8756
Epoch 25/30
 - 1s - loss: 0.2716 - acc: 0.8950 - val_loss: 0.3376 - val_acc: 0.8872
Epoch 26/30
 - 1s - loss: 0.2745 - acc: 0.8972 - val_loss: 0.3470 - val_acc: 0.8853
Epoch 27/30
 - 1s - loss: 0.2731 - acc: 0.8977 - val_loss: 0.3329 - val_acc: 0.8833
Epoch 28/30
 - 1s - loss: 0.2671 - acc: 0.9012 - val_loss: 0.3693 - val_acc: 0.8641
Epoch 29/30
 - 1s - loss: 0.2888 - acc: 0.8982 - val_loss: 0.3461 - val_acc: 0.8846
Epoch 30/30
 - 1s - loss: 0.2699 - acc: 0.9014 - val_loss: 0.3277 - val_acc: 0.8827
Train accuracy 0.9225473321858864 Test accuracy: 0.8826923076923077
--------------------------------------------------------------------------------
```

In [12]: `best_run`

Out[12]:
```
{'Dense': 2,
 'Dense_1': 2,
 'Dropout': 0.45377377480700615,
 'choiceval': 1,
 'filters': 1,
 'filters_1': 0,
 'kernel_size': 1,
 'kernel_size_1': 0,
 'l2': 0.0019801221163149862,
 'l2_1': 0.8236255110533577,
 'lr': 0.003918784585237195,
 'lr_1': 0.002237071747066137,
 'nb_epoch': 1,
 'pool_size': 0}
```

In [21]:
```python
from hyperas.utils import eval_hyperopt_space
total_trials = dict()
total_list = []
for t, trial in enumerate(trials):
        vals = trial.get('misc').get('vals')
        z = eval_hyperopt_space(space, vals)
        total_trials['M'+str(t+1)] = z


#best Hyper params from hyperas
best_params = eval_hyperopt_space(space, best_run)
best_params
```

Out[21]:
```
{'Dense': 64,
 'Dense_1': 64,
 'Dropout': 0.45377377480700615,
 'choiceval': 'rmsprop',
 'filters': 32,
 'filters_1': 16,
 'kernel_size': 5,
 'kernel_size_1': 3,
 'l2': 0.0019801221163149862,
 'l2_1': 0.8236255110533577,
 'lr': 0.003918784585237195,
 'lr_1': 0.002237071747066137,
 'nb_epoch': 30,
 'pool_size': 2}
```

In [3]:
```python
from keras.regularizers import l2
```

In [71]:
```python
##model from hyperas
def keras_fmin_fnct(space,verbose=1):
    np.random.seed(0)
    tf.set_random_seed(0)
    sess = tf.Session(graph=tf.get_default_graph())
    K.set_session(sess)
    # Initiliazing the sequential model
    model = Sequential()
    model.add(Conv1D(filters=space['filters'], kernel_size=space['kernel_size'],activation='relu',
                    kernel_initializer='he_uniform',
                    kernel_regularizer=l2(space['l2']),input_shape=(128,9)))
    model.add(Conv1D(filters=space['filters_1'], kernel_size=space['kernel_size_1'],
                activation='relu',kernel_regularizer=l2(space['l2_1']),kernel_initializer='he_uniform'))
    model.add(Dropout(space['Dropout']))
    model.add(MaxPooling1D(pool_size=space['pool_size']))
    model.add(Flatten())
    model.add(Dense(space['Dense'], activation='relu'))
    model.add(Dense(3, activation='softmax'))
    adam = keras.optimizers.Adam(lr=space['lr'])
    rmsprop = keras.optimizers.RMSprop(lr=space['lr_1'])
    choiceval = space['choiceval']
    if choiceval == 'adam':
        optim = adam
    else:
        optim = rmsprop
    print(model.summary())
    model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
    result = model.fit(X_train_s, Y_train_s,
                    batch_size=space['Dense_1'],
                    nb_epoch=space['nb_epoch'],
                    verbose=verbose,
                    validation_data=(X_val_s, Y_val_s))
    #K.clear_session()
    return model,result
```

In [28]:
```python
best_model,result = keras_fmin_fnct(best_params)
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_3 (Conv1D)            (None, 124, 32)           1472
_____
conv1d_4 (Conv1D)            (None, 122, 16)           1552
_____
dropout_2 (Dropout)          (None, 122, 16)           0
_____
max_pooling1d_2 (MaxPooling1 (None, 61, 16)            0
_____
flatten_2 (Flatten)          (None, 976)               0
_____
dense_3 (Dense)              (None, 64)                62528
_____
dense_4 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None

/glob/intel-python/versions/2018u2/intelpython3/lib/python3.6/site-packages/ipykernel_launcher.py:31: UserWar
ning: The `nb_epoch` argument in `fit` has been renamed `epochs`.
```

```
Train on 4067 samples, validate on 1560 samples
Epoch 1/30
4067/4067 [==============================] - 1s 350us/step - loss: 10.6708 - acc: 0.8375 - val_loss: 3.0312 -
val_acc: 0.8923
Epoch 2/30
4067/4067 [==============================] - 1s 184us/step - loss: 1.2846 - acc: 0.8960 - val_loss: 0.6160 -
val_acc: 0.8788
Epoch 3/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.4912 - acc: 0.8943 - val_loss: 0.4795 -
val_acc: 0.8628
Epoch 4/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.3866 - acc: 0.9053 - val_loss: 0.4627 -
val_acc: 0.8506
Epoch 5/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.3421 - acc: 0.9098 - val_loss: 0.4827 -
val_acc: 0.8724
Epoch 6/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.3151 - acc: 0.9166 - val_loss: 0.3515 -
val_acc: 0.8968
Epoch 7/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.3091 - acc: 0.9154 - val_loss: 0.3364 -
val_acc: 0.8853
Epoch 8/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.2749 - acc: 0.9312 - val_loss: 0.4064 -
val_acc: 0.8718
Epoch 9/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.2743 - acc: 0.9272 - val_loss: 0.3227 -
val_acc: 0.9122
Epoch 10/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.2576 - acc: 0.9292 - val_loss: 0.2934 -
val_acc: 0.9083
Epoch 11/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.2791 - acc: 0.9302 - val_loss: 0.3982 -
val_acc: 0.8712
Epoch 12/30
4067/4067 [==============================] - 1s 185us/step - loss: 0.2315 - acc: 0.9346 - val_loss: 0.3192 -
val_acc: 0.9186
Epoch 13/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.2301 - acc: 0.9410 - val_loss: 0.3427 -
val_acc: 0.8821
Epoch 14/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.2294 - acc: 0.9368 - val_loss: 0.2628 -
val_acc: 0.9327
```

```
Epoch 15/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.2371 - acc: 0.9353 - val_loss: 0.2884 -
val_acc: 0.9071
Epoch 16/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.2146 - acc: 0.9449 - val_loss: 0.3369 -
val_acc: 0.8865
Epoch 17/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.2065 - acc: 0.9447 - val_loss: 0.2776 -
val_acc: 0.9019
Epoch 18/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.2056 - acc: 0.9420 - val_loss: 0.3021 -
val_acc: 0.8891
Epoch 19/30
4067/4067 [==============================] - 1s 185us/step - loss: 0.2223 - acc: 0.9398 - val_loss: 0.2380 -
val_acc: 0.9205
Epoch 20/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.1979 - acc: 0.9442 - val_loss: 2.4294 -
val_acc: 0.6051
Epoch 21/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.2421 - acc: 0.9432 - val_loss: 0.2461 -
val_acc: 0.9109
Epoch 22/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.1836 - acc: 0.9498 - val_loss: 0.2768 -
val_acc: 0.9115
Epoch 23/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.1963 - acc: 0.9457 - val_loss: 0.2667 -
val_acc: 0.9077
Epoch 24/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.1863 - acc: 0.9462 - val_loss: 0.2308 -
val_acc: 0.9128
Epoch 25/30
4067/4067 [==============================] - 1s 184us/step - loss: 0.1844 - acc: 0.9462 - val_loss: 0.2726 -
val_acc: 0.9038
Epoch 26/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.1754 - acc: 0.9525 - val_loss: 0.2099 -
val_acc: 0.9417
Epoch 27/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.1793 - acc: 0.9511 - val_loss: 0.2814 -
val_acc: 0.9077
Epoch 28/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.1665 - acc: 0.9555 - val_loss: 0.2140 -
val_acc: 0.9378
Epoch 29/30
```

```
4067/4067 [==============================] - 1s 183us/step - loss: 0.1705 - acc: 0.9575 - val_loss: 0.2413 -
val_acc: 0.9359
Epoch 30/30
4067/4067 [==============================] - 1s 183us/step - loss: 0.1712 - acc: 0.9577 - val_loss: 0.2297 -
val_acc: 0.9391
```

In [32]:
```python
_,acc_val = best_model.evaluate(X_val_s,Y_val_s,verbose=0)
_,acc_train = best_model.evaluate(X_train_s,Y_train_s,verbose=0)
print('Train_accuracy',acc_train,'test_accuracy',acc_val)
```

```
Train_accuracy 0.9628718957462503 test_accuracy 0.9391025641025641
```

i can observe that 23rd model is also giving good scores in runtime so will try once wit that params.

In [38]:
```python
runtime_param = total_trials['M23']
runtime_param
```

Out[38]:
```
{'Dense': 64,
 'Dense_1': 64,
 'Dropout': 0.45377377480700615,
 'choiceval': 'rmsprop',
 'filters': 32,
 'filters_1': 16,
 'kernel_size': 5,
 'kernel_size_1': 3,
 'l2': 0.0019801221163149862,
 'l2_1': 0.8236255110533577,
 'lr': 0.003918784585237195,
 'lr_1': 0.002237071747066137,
 'nb_epoch': 30,
 'pool_size': 2}
```

In [63]:
```python
runtime_param['nb_epoch'] = 150
```

In [64]:
```python
runtime_best_model,result = keras_fmin_fnct(runtime_param)
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472

conv1d_2 (Conv1D)            (None, 122, 16)           1552

dropout_1 (Dropout)          (None, 122, 16)           0

max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0

flatten_1 (Flatten)          (None, 976)               0

dense_1 (Dense)              (None, 64)                62528

dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None

/glob/intel-python/versions/2018u2/intelpython3/lib/python3.6/site-packages/ipykernel_launcher.py:31: UserWar
ning: The `nb_epoch` argument in `fit` has been renamed `epochs`.
```

```
Train on 4067 samples, validate on 1560 samples
Epoch 1/150
4067/4067 [==============================] - 1s 344us/step - loss: 10.6708 - acc: 0.8375 - val_loss: 3.0312 -
val_acc: 0.8923
Epoch 2/150
4067/4067 [==============================] - 1s 186us/step - loss: 1.2846 - acc: 0.8960 - val_loss: 0.6160 -
val_acc: 0.8788
Epoch 3/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.4912 - acc: 0.8943 - val_loss: 0.4795 -
val_acc: 0.8628
Epoch 4/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.3866 - acc: 0.9053 - val_loss: 0.4627 -
val_acc: 0.8506
Epoch 5/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.3421 - acc: 0.9098 - val_loss: 0.4827 -
val_acc: 0.8724
Epoch 6/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.3151 - acc: 0.9166 - val_loss: 0.3515 -
val_acc: 0.8968
Epoch 7/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.3091 - acc: 0.9154 - val_loss: 0.3364 -
val_acc: 0.8853
Epoch 8/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2749 - acc: 0.9312 - val_loss: 0.4064 -
val_acc: 0.8718
Epoch 9/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2743 - acc: 0.9272 - val_loss: 0.3227 -
val_acc: 0.9122
Epoch 10/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.2576 - acc: 0.9292 - val_loss: 0.2934 -
val_acc: 0.9083
Epoch 11/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2791 - acc: 0.9302 - val_loss: 0.3982 -
val_acc: 0.8712
Epoch 12/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2315 - acc: 0.9346 - val_loss: 0.3192 -
val_acc: 0.9186
Epoch 13/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2301 - acc: 0.9410 - val_loss: 0.3427 -
val_acc: 0.8821
Epoch 14/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2294 - acc: 0.9368 - val_loss: 0.2628 -
val_acc: 0.9327
```

```
Epoch 15/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2371 - acc: 0.9353 - val_loss: 0.2884 -
val_acc: 0.9071
Epoch 16/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2146 - acc: 0.9449 - val_loss: 0.3369 -
val_acc: 0.8865
Epoch 17/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2065 - acc: 0.9447 - val_loss: 0.2776 -
val_acc: 0.9019
Epoch 18/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.2056 - acc: 0.9420 - val_loss: 0.3021 -
val_acc: 0.8891
Epoch 19/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2223 - acc: 0.9398 - val_loss: 0.2380 -
val_acc: 0.9205
Epoch 20/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1979 - acc: 0.9442 - val_loss: 2.4294 -
val_acc: 0.6051
Epoch 21/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.2421 - acc: 0.9432 - val_loss: 0.2461 -
val_acc: 0.9109
Epoch 22/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1836 - acc: 0.9498 - val_loss: 0.2768 -
val_acc: 0.9115
Epoch 23/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1963 - acc: 0.9457 - val_loss: 0.2667 -
val_acc: 0.9077
Epoch 24/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1863 - acc: 0.9462 - val_loss: 0.2308 -
val_acc: 0.9128
Epoch 25/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1844 - acc: 0.9462 - val_loss: 0.2726 -
val_acc: 0.9038
Epoch 26/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1754 - acc: 0.9525 - val_loss: 0.2099 -
val_acc: 0.9417
Epoch 27/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1793 - acc: 0.9511 - val_loss: 0.2814 -
val_acc: 0.9077
Epoch 28/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1665 - acc: 0.9555 - val_loss: 0.2140 -
val_acc: 0.9378
Epoch 29/150
```

```
4067/4067 [==============================] - 1s 183us/step - loss: 0.1705 - acc: 0.9575 - val_loss: 0.2413 -
val_acc: 0.9359
Epoch 30/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1712 - acc: 0.9577 - val_loss: 0.2297 -
val_acc: 0.9391
Epoch 31/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1698 - acc: 0.9565 - val_loss: 0.2055 -
val_acc: 0.9417
Epoch 32/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1621 - acc: 0.9580 - val_loss: 0.2441 -
val_acc: 0.9109
Epoch 33/150
4067/4067 [==============================] - 1s 196us/step - loss: 0.1537 - acc: 0.9557 - val_loss: 0.4118 -
val_acc: 0.8808
Epoch 34/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1592 - acc: 0.9552 - val_loss: 0.2546 -
val_acc: 0.9109
Epoch 35/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1598 - acc: 0.9570 - val_loss: 0.2582 -
val_acc: 0.9244
Epoch 36/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1561 - acc: 0.9570 - val_loss: 0.2554 -
val_acc: 0.9128
Epoch 37/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1612 - acc: 0.9555 - val_loss: 0.2365 -
val_acc: 0.9250
Epoch 38/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1535 - acc: 0.9577 - val_loss: 0.2300 -
val_acc: 0.9179
Epoch 39/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1490 - acc: 0.9562 - val_loss: 0.2189 -
val_acc: 0.9417
Epoch 40/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1476 - acc: 0.9604 - val_loss: 0.2207 -
val_acc: 0.9346
Epoch 41/150
4067/4067 [==============================] - 1s 182us/step - loss: 0.1772 - acc: 0.9577 - val_loss: 0.2618 -
val_acc: 0.9071
Epoch 42/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1421 - acc: 0.9609 - val_loss: 0.2477 -
val_acc: 0.9410
Epoch 43/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1492 - acc: 0.9639 - val_loss: 0.2982 -
```

```
val_acc: 0.9032
Epoch 44/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1643 - acc: 0.9575 - val_loss: 0.2250 -
val_acc: 0.9359
Epoch 45/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1510 - acc: 0.9643 - val_loss: 0.2813 -
val_acc: 0.9122
Epoch 46/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1519 - acc: 0.9639 - val_loss: 0.2296 -
val_acc: 0.9474
Epoch 47/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1437 - acc: 0.9621 - val_loss: 0.2104 -
val_acc: 0.9468
Epoch 48/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1351 - acc: 0.9636 - val_loss: 0.3534 -
val_acc: 0.8942
Epoch 49/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1476 - acc: 0.9621 - val_loss: 0.2574 -
val_acc: 0.9135
Epoch 50/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1399 - acc: 0.9634 - val_loss: 0.2293 -
val_acc: 0.9378
Epoch 51/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1425 - acc: 0.9599 - val_loss: 0.2763 -
val_acc: 0.9090
Epoch 52/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1390 - acc: 0.9641 - val_loss: 0.2954 -
val_acc: 0.9083
Epoch 53/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1492 - acc: 0.9636 - val_loss: 0.2367 -
val_acc: 0.9199
Epoch 54/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1344 - acc: 0.9656 - val_loss: 0.2476 -
val_acc: 0.9256
Epoch 55/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1410 - acc: 0.9648 - val_loss: 0.3849 -
val_acc: 0.8846
Epoch 56/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1417 - acc: 0.9636 - val_loss: 0.2411 -
val_acc: 0.9340
Epoch 57/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1436 - acc: 0.9624 - val_loss: 0.3697 -
val_acc: 0.9147
```

```
Epoch 58/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1390 - acc: 0.9675 - val_loss: 0.2298 -
val_acc: 0.9442
Epoch 59/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1400 - acc: 0.9658 - val_loss: 0.2142 -
val_acc: 0.9545
Epoch 60/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1312 - acc: 0.9666 - val_loss: 0.2589 -
val_acc: 0.9276
Epoch 61/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1295 - acc: 0.9668 - val_loss: 0.3615 -
val_acc: 0.8885
Epoch 62/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1288 - acc: 0.9673 - val_loss: 0.2591 -
val_acc: 0.9256
Epoch 63/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1601 - acc: 0.9658 - val_loss: 0.2101 -
val_acc: 0.9526
Epoch 64/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1275 - acc: 0.9702 - val_loss: 0.3392 -
val_acc: 0.8987
Epoch 65/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1365 - acc: 0.9648 - val_loss: 0.3122 -
val_acc: 0.9038
Epoch 66/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1385 - acc: 0.9671 - val_loss: 0.4001 -
val_acc: 0.8904
Epoch 67/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1444 - acc: 0.9683 - val_loss: 0.2269 -
val_acc: 0.9353
Epoch 68/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1374 - acc: 0.9661 - val_loss: 0.3215 -
val_acc: 0.9032
Epoch 69/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1310 - acc: 0.9712 - val_loss: 0.3101 -
val_acc: 0.9064
Epoch 70/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1302 - acc: 0.9666 - val_loss: 0.2763 -
val_acc: 0.9173
Epoch 71/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1283 - acc: 0.9698 - val_loss: 0.3334 -
val_acc: 0.9038
Epoch 72/150
```

```
4067/4067 [==============================] - 1s 183us/step - loss: 0.1256 - acc: 0.9705 - val_loss: 0.3798 -
val_acc: 0.8821
Epoch 73/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1311 - acc: 0.9668 - val_loss: 0.3486 -
val_acc: 0.8981
Epoch 74/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1244 - acc: 0.9715 - val_loss: 0.4297 -
val_acc: 0.8776
Epoch 75/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1321 - acc: 0.9671 - val_loss: 0.2557 -
val_acc: 0.9218
Epoch 76/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1217 - acc: 0.9700 - val_loss: 0.2208 -
val_acc: 0.9404
Epoch 77/150
4067/4067 [==============================] - 1s 182us/step - loss: 0.1246 - acc: 0.9720 - val_loss: 0.2340 -
val_acc: 0.9417
Epoch 78/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1424 - acc: 0.9705 - val_loss: 0.2994 -
val_acc: 0.9064
Epoch 79/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1402 - acc: 0.9688 - val_loss: 0.2305 -
val_acc: 0.9333
Epoch 80/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1284 - acc: 0.9722 - val_loss: 0.2668 -
val_acc: 0.9212
Epoch 81/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1396 - acc: 0.9693 - val_loss: 0.3135 -
val_acc: 0.9109
Epoch 82/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1281 - acc: 0.9700 - val_loss: 0.2462 -
val_acc: 0.9353
Epoch 83/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1311 - acc: 0.9705 - val_loss: 0.2575 -
val_acc: 0.9205
Epoch 84/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1373 - acc: 0.9680 - val_loss: 0.2305 -
val_acc: 0.9449
Epoch 85/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1213 - acc: 0.9722 - val_loss: 0.2131 -
val_acc: 0.9532
Epoch 86/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1316 - acc: 0.9707 - val_loss: 0.2447 -
```

```
val_acc: 0.9314
Epoch 87/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1110 - acc: 0.9730 - val_loss: 0.2427 -
val_acc: 0.9372
Epoch 88/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1190 - acc: 0.9712 - val_loss: 0.2731 -
val_acc: 0.9250
Epoch 89/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1252 - acc: 0.9717 - val_loss: 0.2310 -
val_acc: 0.9436
Epoch 90/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1225 - acc: 0.9702 - val_loss: 0.2172 -
val_acc: 0.9532
Epoch 91/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1260 - acc: 0.9725 - val_loss: 0.2889 -
val_acc: 0.9179
Epoch 92/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1554 - acc: 0.9651 - val_loss: 0.2373 -
val_acc: 0.9462
Epoch 93/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1225 - acc: 0.9761 - val_loss: 0.2510 -
val_acc: 0.9340
Epoch 94/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1249 - acc: 0.9712 - val_loss: 0.2228 -
val_acc: 0.9526
Epoch 95/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1170 - acc: 0.9727 - val_loss: 0.3167 -
val_acc: 0.9205
Epoch 96/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.1245 - acc: 0.9742 - val_loss: 0.2997 -
val_acc: 0.9237
Epoch 97/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1176 - acc: 0.9717 - val_loss: 0.2330 -
val_acc: 0.9365
Epoch 98/150
4067/4067 [==============================] - 1s 182us/step - loss: 0.1084 - acc: 0.9737 - val_loss: 0.2235 -
val_acc: 0.9449
Epoch 99/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1301 - acc: 0.9715 - val_loss: 0.2373 -
val_acc: 0.9487
Epoch 100/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1204 - acc: 0.9678 - val_loss: 0.2362 -
val_acc: 0.9333
```

```
Epoch 101/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1241 - acc: 0.9715 - val_loss: 0.2289 -
val_acc: 0.9494
Epoch 102/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1080 - acc: 0.9771 - val_loss: 0.2370 -
val_acc: 0.9449
Epoch 103/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1394 - acc: 0.9678 - val_loss: 0.3265 -
val_acc: 0.9071
Epoch 104/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1248 - acc: 0.9757 - val_loss: 0.2884 -
val_acc: 0.9154
Epoch 105/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.1148 - acc: 0.9734 - val_loss: 0.2845 -
val_acc: 0.9205
Epoch 106/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1267 - acc: 0.9705 - val_loss: 0.2627 -
val_acc: 0.9353
Epoch 107/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1139 - acc: 0.9749 - val_loss: 0.2368 -
val_acc: 0.9449
Epoch 108/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1211 - acc: 0.9688 - val_loss: 0.2644 -
val_acc: 0.9269
Epoch 109/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1279 - acc: 0.9715 - val_loss: 0.2368 -
val_acc: 0.9462
Epoch 110/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1206 - acc: 0.9710 - val_loss: 0.2238 -
val_acc: 0.9346
Epoch 111/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1085 - acc: 0.9766 - val_loss: 0.2590 -
val_acc: 0.9359
Epoch 112/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1028 - acc: 0.9779 - val_loss: 0.2303 -
val_acc: 0.9404
Epoch 113/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1205 - acc: 0.9734 - val_loss: 0.2659 -
val_acc: 0.9231
Epoch 114/150
4067/4067 [==============================] - 1s 192us/step - loss: 0.1214 - acc: 0.9732 - val_loss: 0.2675 -
val_acc: 0.9288
Epoch 115/150
```

```
4067/4067 [==============================] - 1s 183us/step - loss: 0.1396 - acc: 0.9754 - val_loss: 0.2180 -
val_acc: 0.9481
Epoch 116/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1134 - acc: 0.9734 - val_loss: 0.2532 -
val_acc: 0.9327
Epoch 117/150
4067/4067 [==============================] - 1s 182us/step - loss: 0.1283 - acc: 0.9744 - val_loss: 0.2144 -
val_acc: 0.9558
Epoch 118/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1112 - acc: 0.9761 - val_loss: 0.2478 -
val_acc: 0.9314
Epoch 119/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1104 - acc: 0.9730 - val_loss: 0.2215 -
val_acc: 0.9506
Epoch 120/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1208 - acc: 0.9749 - val_loss: 0.3212 -
val_acc: 0.9141
Epoch 121/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1047 - acc: 0.9786 - val_loss: 0.2165 -
val_acc: 0.9500
Epoch 122/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.1258 - acc: 0.9761 - val_loss: 0.2484 -
val_acc: 0.9429
Epoch 123/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1092 - acc: 0.9761 - val_loss: 0.2362 -
val_acc: 0.9410
Epoch 124/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1156 - acc: 0.9771 - val_loss: 0.2684 -
val_acc: 0.9410
Epoch 125/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.1174 - acc: 0.9725 - val_loss: 0.2645 -
val_acc: 0.9333
Epoch 126/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1259 - acc: 0.9749 - val_loss: 0.2623 -
val_acc: 0.9372
Epoch 127/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1037 - acc: 0.9774 - val_loss: 0.2289 -
val_acc: 0.9474
Epoch 128/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1121 - acc: 0.9757 - val_loss: 0.2813 -
val_acc: 0.9321
Epoch 129/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1411 - acc: 0.9734 - val_loss: 0.3860 -
```

```
val_acc: 0.9077
Epoch 130/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1013 - acc: 0.9811 - val_loss: 0.2585 -
val_acc: 0.9487
Epoch 131/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1160 - acc: 0.9764 - val_loss: 0.2923 -
val_acc: 0.9288
Epoch 132/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1540 - acc: 0.9705 - val_loss: 0.2367 -
val_acc: 0.9506
Epoch 133/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.1229 - acc: 0.9747 - val_loss: 0.2756 -
val_acc: 0.9346
Epoch 134/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1112 - acc: 0.9779 - val_loss: 0.2657 -
val_acc: 0.9436
Epoch 135/150
4067/4067 [==============================] - 1s 182us/step - loss: 0.1277 - acc: 0.9757 - val_loss: 0.3435 -
val_acc: 0.9179
Epoch 136/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1165 - acc: 0.9769 - val_loss: 0.2628 -
val_acc: 0.9423
Epoch 137/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1170 - acc: 0.9784 - val_loss: 0.2763 -
val_acc: 0.9353
Epoch 138/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1261 - acc: 0.9747 - val_loss: 0.2810 -
val_acc: 0.9359
Epoch 139/150
4067/4067 [==============================] - 1s 184us/step - loss: 0.1050 - acc: 0.9764 - val_loss: 0.4305 -
val_acc: 0.9173
Epoch 140/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1088 - acc: 0.9774 - val_loss: 0.3077 -
val_acc: 0.9212
Epoch 141/150
4067/4067 [==============================] - 1s 182us/step - loss: 0.1082 - acc: 0.9749 - val_loss: 0.2747 -
val_acc: 0.9237
Epoch 142/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1251 - acc: 0.9727 - val_loss: 0.2616 -
val_acc: 0.9269
Epoch 143/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1217 - acc: 0.9759 - val_loss: 0.2994 -
val_acc: 0.9224
```

```
Epoch 144/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1080 - acc: 0.9801 - val_loss: 0.5078 -
val_acc: 0.8667
Epoch 145/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1048 - acc: 0.9798 - val_loss: 0.2911 -
val_acc: 0.9282
Epoch 146/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1175 - acc: 0.9779 - val_loss: 0.3130 -
val_acc: 0.9199
Epoch 147/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1047 - acc: 0.9798 - val_loss: 0.3355 -
val_acc: 0.9141
Epoch 148/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1140 - acc: 0.9766 - val_loss: 0.2574 -
val_acc: 0.9449
Epoch 149/150
4067/4067 [==============================] - 1s 183us/step - loss: 0.1539 - acc: 0.9720 - val_loss: 0.3084 -
val_acc: 0.9231
Epoch 150/150
4067/4067 [==============================] - 1s 185us/step - loss: 0.1189 - acc: 0.9744 - val_loss: 0.2738 -
val_acc: 0.9321
```
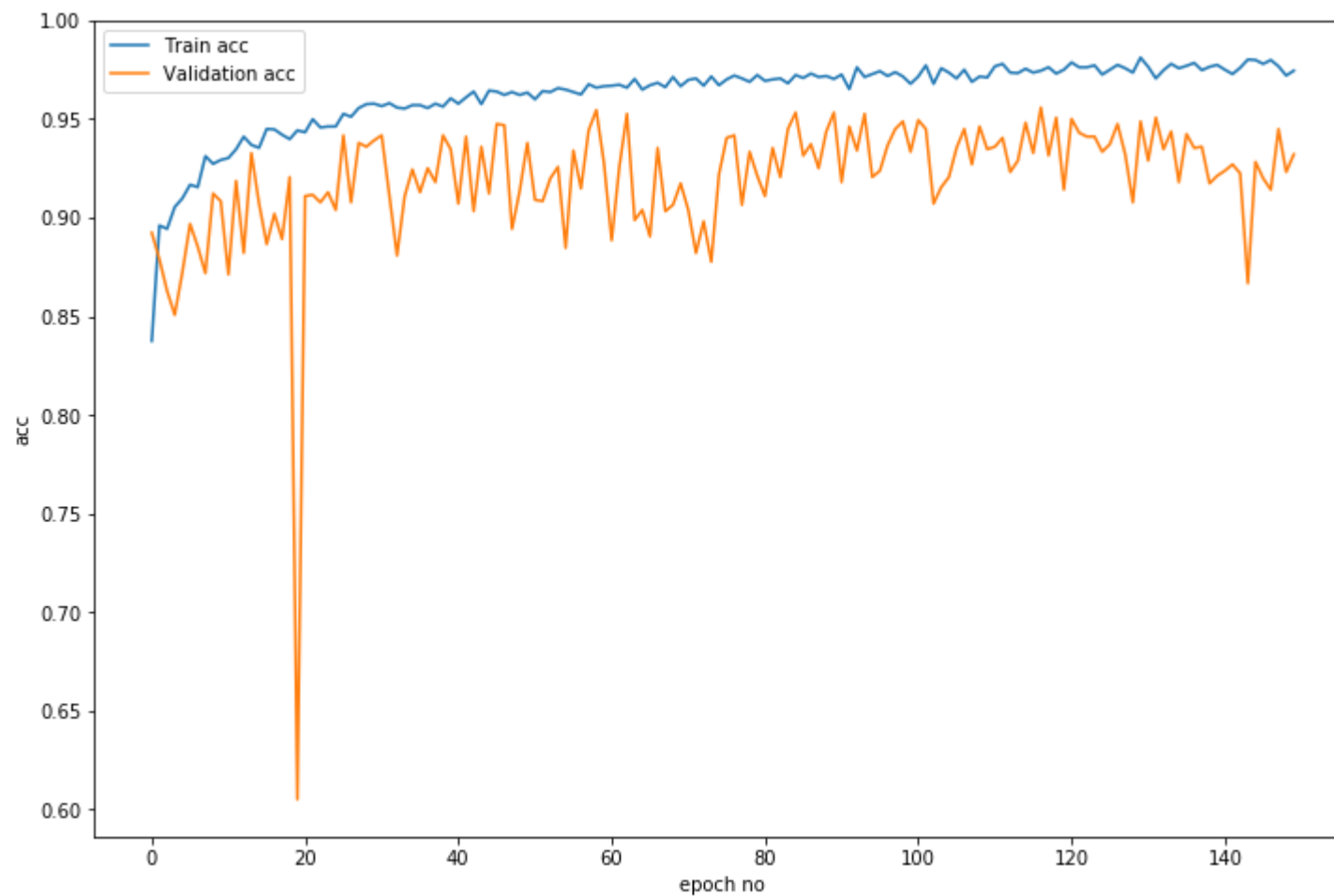
In [66]:
```python
plt.figure(figsize=(12,8))
plt.plot(result.history['loss'],label='Train loss')
plt.plot(result.history['val_loss'],label = 'Validation Loss')
plt.xlabel('epoch no')
plt.ylabel('loss')
plt.legend()
plt.show()
```
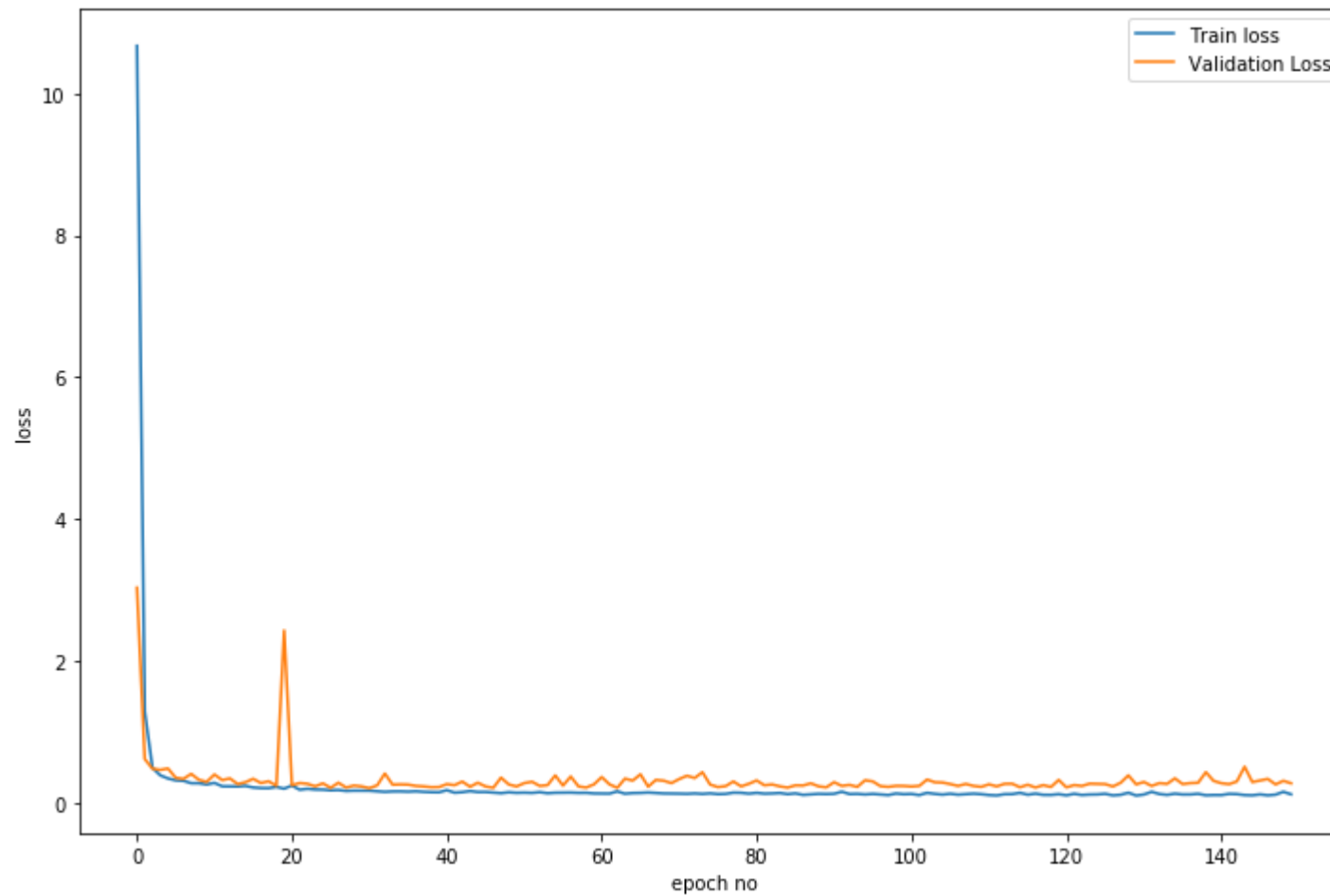
In [67]:
```python
plt.figure(figsize=(14,8))
plt.plot(result.history['loss'],label='Train loss')
plt.plot(result.history['val_loss'],label = 'Validation Loss')
plt.ylim(0,1)
plt.xlabel('epoch no')
plt.ylabel('loss')
plt.legend()
plt.show()
```
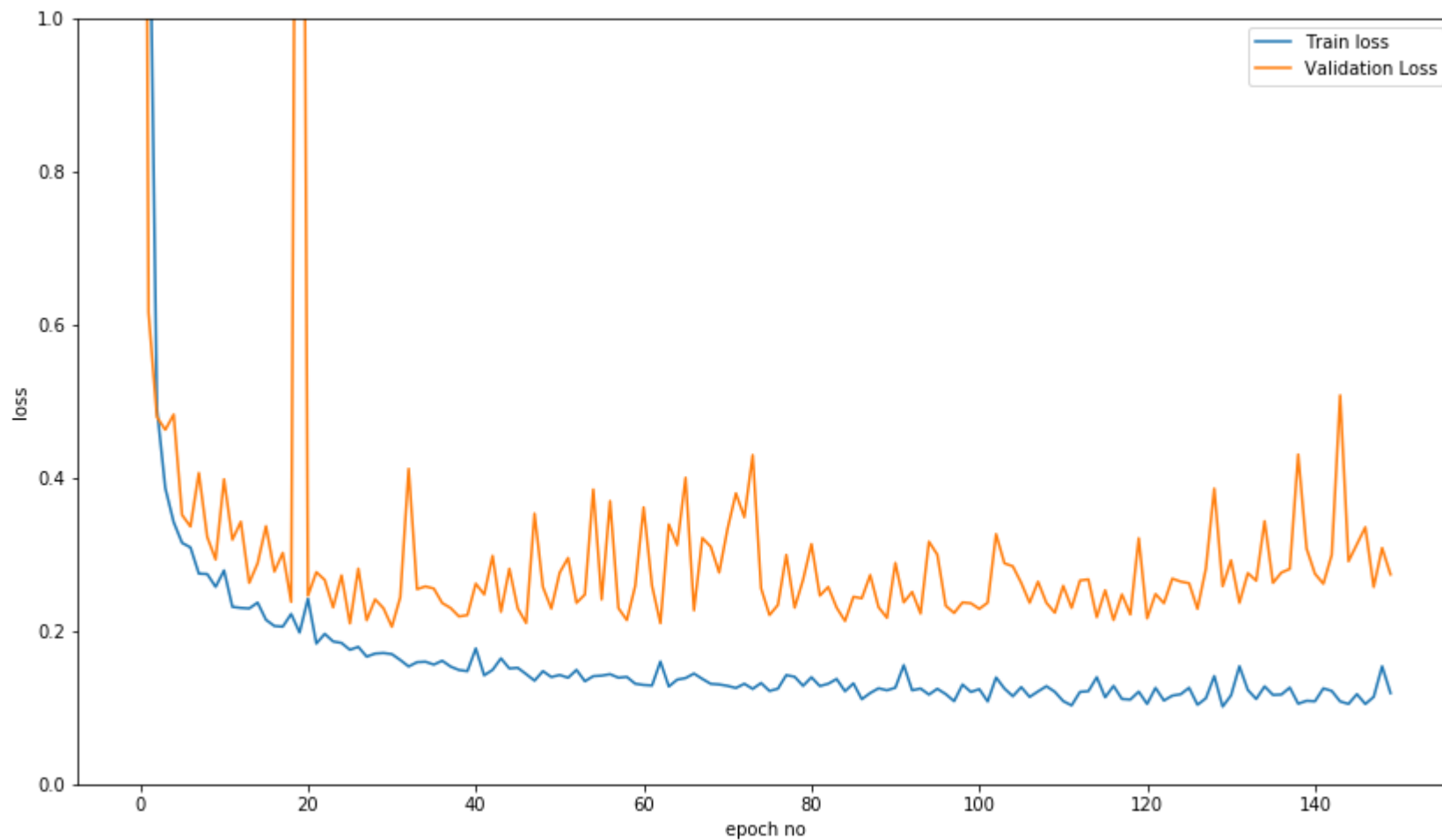
In [68]:
```python
plt.figure(figsize=(12,8))
plt.plot(result.history['acc'],label='Train acc')
plt.plot(result.history['val_acc'],label = 'Validation acc')
plt.xlabel('epoch no')
plt.ylabel('acc')
plt.legend()
plt.show()
```

```
In [69]: plt.figure(figsize=(12,8))
         plt.plot(result.history['acc'],label='Train acc')
         plt.plot(result.history['val_acc'],label = 'Validation acc')
         plt.xlabel('epoch no')
         plt.ylabel('acc')
         plt.ylim(0.90,1)
         plt.legend()
         plt.show()
```
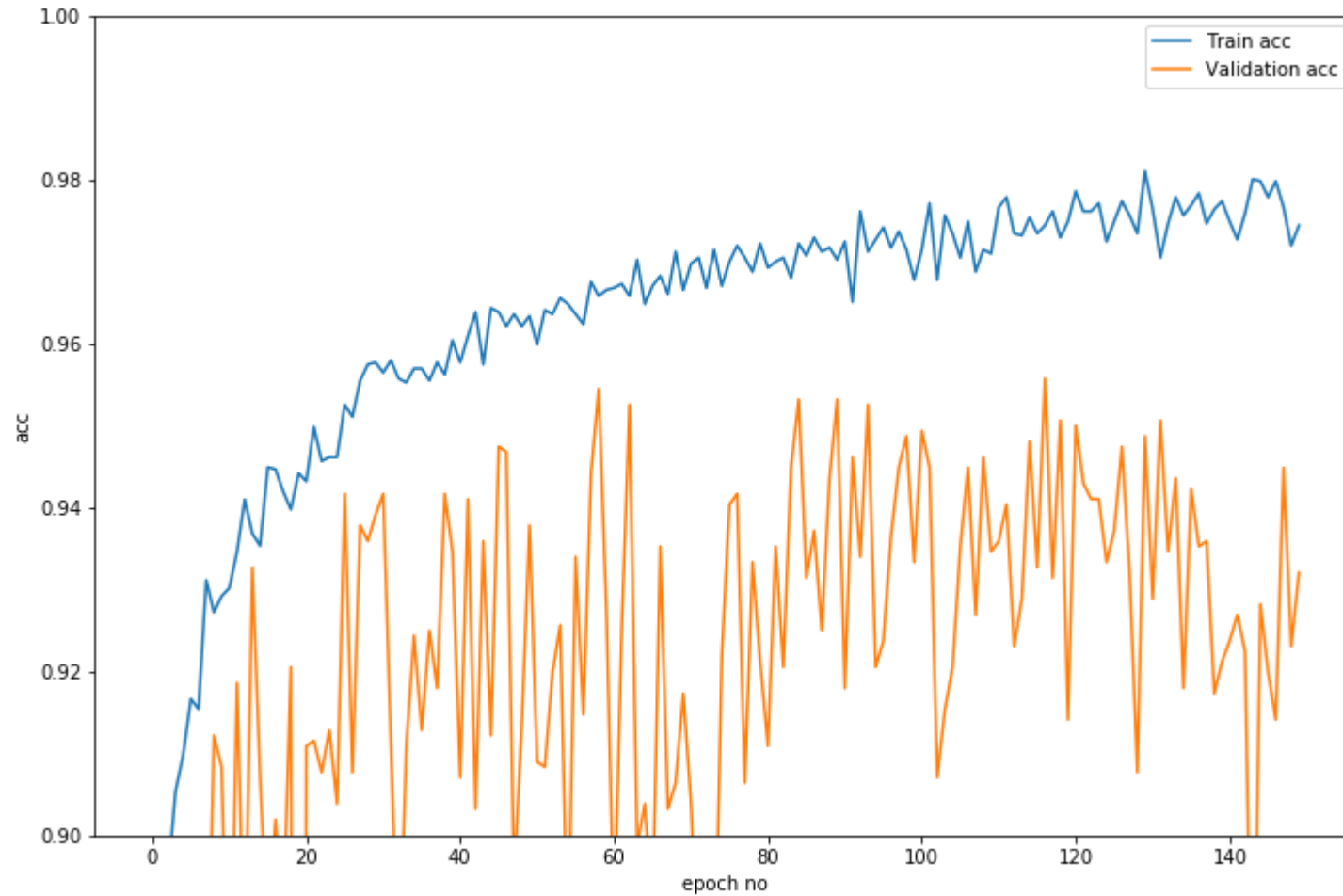

around 57-59 score is giving good accuracy wit less overfitting

In [77]:
```python
runtime_param['nb_epoch'] = 59
best_model,result = keras_fmin_fnct(runtime_param)
```

```
Exception ignored in: <bound method BaseSession._Callable.__del__ of <tensorflow.python.client.session.BaseSe
ssion._Callable object at 0x148471f420b8>>
Traceback (most recent call last):
  File "/glob/intel-python/versions/2018u2/intelpython3/lib/python3.6/site-packages/tensorflow/python/client/
session.py", line 1398, in __del__
    self._session._session, self._handle, status)
  File "/glob/intel-python/versions/2018u2/intelpython3/lib/python3.6/site-packages/tensorflow/python/framewo
rk/errors_impl.py", line 519, in __exit__
    c_api.TF_GetCode(self.status.status))
tensorflow.python.framework.errors_impl.InvalidArgumentError: No such callable handle: 149842480
/glob/intel-python/versions/2018u2/intelpython3/lib/python3.6/site-packages/ipykernel_launcher.py:31: UserWar
ning: The `nb_epoch` argument in `fit` has been renamed `epochs`.
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472

conv1d_2 (Conv1D)            (None, 122, 16)           1552

dropout_1 (Dropout)          (None, 122, 16)           0

max_pooling1d_1 (MaxPooling1 (None, 61, 16)            0

flatten_1 (Flatten)          (None, 976)               0

dense_1 (Dense)              (None, 64)                62528

dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,747
Trainable params: 65,747
Non-trainable params: 0
_____
None
Train on 4067 samples, validate on 1560 samples
Epoch 1/59
4067/4067 [==============================] - 2s 383us/step - loss: 10.6708 - acc: 0.8375 - val_loss: 3.0312 -
val_acc: 0.8923
Epoch 2/59
4067/4067 [==============================] - 1s 184us/step - loss: 1.2846 - acc: 0.8960 - val_loss: 0.6160 -
val_acc: 0.8788
Epoch 3/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.4912 - acc: 0.8943 - val_loss: 0.4795 -
val_acc: 0.8628
Epoch 4/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.3866 - acc: 0.9053 - val_loss: 0.4627 -
val_acc: 0.8506
Epoch 5/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.3421 - acc: 0.9098 - val_loss: 0.4827 -
val_acc: 0.8724
Epoch 6/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.3151 - acc: 0.9166 - val_loss: 0.3515 -
val_acc: 0.8968
Epoch 7/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.3091 - acc: 0.9154 - val_loss: 0.3364 -
```

```
                    val_acc: 0.8853
                    Epoch 8/59
                    4067/4067 [==============================] - 1s 183us/step - loss: 0.2749 - acc: 0.9312 - val_loss: 0.4064 -
                    val_acc: 0.8718
                    Epoch 9/59
                    4067/4067 [==============================] - 1s 184us/step - loss: 0.2743 - acc: 0.9272 - val_loss: 0.3227 -
                    val_acc: 0.9122
                    Epoch 10/59
                    4067/4067 [==============================] - 1s 183us/step - loss: 0.2576 - acc: 0.9292 - val_loss: 0.2934 -
                    val_acc: 0.9083
                    Epoch 11/59
                    4067/4067 [==============================] - 1s 184us/step - loss: 0.2791 - acc: 0.9302 - val_loss: 0.3982 -
                    val_acc: 0.8712
                    Epoch 12/59
                    4067/4067 [==============================] - 1s 184us/step - loss: 0.2315 - acc: 0.9346 - val_loss: 0.3192 -
                    val_acc: 0.9186
                    Epoch 13/59
                    4067/4067 [==============================] - 1s 183us/step - loss: 0.2301 - acc: 0.9410 - val_loss: 0.3427 -
                    val_acc: 0.8821
                    Epoch 14/59
                    4067/4067 [==============================] - 1s 183us/step - loss: 0.2294 - acc: 0.9368 - val_loss: 0.2628 -
                    val_acc: 0.9327
                    Epoch 15/59
                    4067/4067 [==============================] - 1s 183us/step - loss: 0.2371 - acc: 0.9353 - val_loss: 0.2884 -
                    val_acc: 0.9071
                    Epoch 16/59
                    4067/4067 [==============================] - 1s 183us/step - loss: 0.2146 - acc: 0.9449 - val_loss: 0.3369 -
                    val_acc: 0.8865
                    Epoch 17/59
                    4067/4067 [==============================] - 1s 184us/step - loss: 0.2065 - acc: 0.9447 - val_loss: 0.2776 -
                    val_acc: 0.9019
                    Epoch 18/59
                    4067/4067 [==============================] - 1s 184us/step - loss: 0.2056 - acc: 0.9420 - val_loss: 0.3021 -
                    val_acc: 0.8891
                    Epoch 19/59
                    4067/4067 [==============================] - 1s 186us/step - loss: 0.2223 - acc: 0.9398 - val_loss: 0.2380 -
                    val_acc: 0.9205
                    Epoch 20/59
                    4067/4067 [==============================] - 1s 184us/step - loss: 0.1979 - acc: 0.9442 - val_loss: 2.4294 -
                    val_acc: 0.6051
                    Epoch 21/59
                    4067/4067 [==============================] - 1s 184us/step - loss: 0.2421 - acc: 0.9432 - val_loss: 0.2461 -
                    val_acc: 0.9109
```

```
Epoch 22/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1836 - acc: 0.9498 - val_loss: 0.2768 -
val_acc: 0.9115
Epoch 23/59
4067/4067 [==============================] - 1s 187us/step - loss: 0.1963 - acc: 0.9457 - val_loss: 0.2667 -
val_acc: 0.9077
Epoch 24/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1863 - acc: 0.9462 - val_loss: 0.2308 -
val_acc: 0.9128
Epoch 25/59
4067/4067 [==============================] - 1s 186us/step - loss: 0.1844 - acc: 0.9462 - val_loss: 0.2726 -
val_acc: 0.9038
Epoch 26/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1754 - acc: 0.9525 - val_loss: 0.2099 -
val_acc: 0.9417
Epoch 27/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1793 - acc: 0.9511 - val_loss: 0.2814 -
val_acc: 0.9077
Epoch 28/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1665 - acc: 0.9555 - val_loss: 0.2140 -
val_acc: 0.9378
Epoch 29/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1705 - acc: 0.9575 - val_loss: 0.2413 -
val_acc: 0.9359
Epoch 30/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1712 - acc: 0.9577 - val_loss: 0.2297 -
val_acc: 0.9391
Epoch 31/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1698 - acc: 0.9565 - val_loss: 0.2055 -
val_acc: 0.9417
Epoch 32/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1621 - acc: 0.9580 - val_loss: 0.2441 -
val_acc: 0.9109
Epoch 33/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1537 - acc: 0.9557 - val_loss: 0.4118 -
val_acc: 0.8808
Epoch 34/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1592 - acc: 0.9552 - val_loss: 0.2546 -
val_acc: 0.9109
Epoch 35/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1598 - acc: 0.9570 - val_loss: 0.2582 -
val_acc: 0.9244
Epoch 36/59
```

```
4067/4067 [==============================] - 1s 195us/step - loss: 0.1561 - acc: 0.9570 - val_loss: 0.2554 -
val_acc: 0.9128
Epoch 37/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1612 - acc: 0.9555 - val_loss: 0.2365 -
val_acc: 0.9250
Epoch 38/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1535 - acc: 0.9577 - val_loss: 0.2300 -
val_acc: 0.9179
Epoch 39/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1490 - acc: 0.9562 - val_loss: 0.2189 -
val_acc: 0.9417
Epoch 40/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1476 - acc: 0.9604 - val_loss: 0.2207 -
val_acc: 0.9346
Epoch 41/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1772 - acc: 0.9577 - val_loss: 0.2618 -
val_acc: 0.9071
Epoch 42/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1421 - acc: 0.9609 - val_loss: 0.2477 -
val_acc: 0.9410
Epoch 43/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1492 - acc: 0.9639 - val_loss: 0.2982 -
val_acc: 0.9032
Epoch 44/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1643 - acc: 0.9575 - val_loss: 0.2250 -
val_acc: 0.9359
Epoch 45/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1510 - acc: 0.9643 - val_loss: 0.2813 -
val_acc: 0.9122
Epoch 46/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1519 - acc: 0.9639 - val_loss: 0.2296 -
val_acc: 0.9474
Epoch 47/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1437 - acc: 0.9621 - val_loss: 0.2104 -
val_acc: 0.9468
Epoch 48/59
4067/4067 [==============================] - 1s 187us/step - loss: 0.1351 - acc: 0.9636 - val_loss: 0.3534 -
val_acc: 0.8942
Epoch 49/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1476 - acc: 0.9621 - val_loss: 0.2574 -
val_acc: 0.9135
Epoch 50/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1399 - acc: 0.9634 - val_loss: 0.2293 -
```

```
val_acc: 0.9378
Epoch 51/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1425 - acc: 0.9599 - val_loss: 0.2763 -
val_acc: 0.9090
Epoch 52/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1390 - acc: 0.9641 - val_loss: 0.2954 -
val_acc: 0.9083
Epoch 53/59
4067/4067 [==============================] - 1s 184us/step - loss: 0.1492 - acc: 0.9636 - val_loss: 0.2367 -
val_acc: 0.9199
Epoch 54/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1344 - acc: 0.9656 - val_loss: 0.2476 -
val_acc: 0.9256
Epoch 55/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1410 - acc: 0.9648 - val_loss: 0.3849 -
val_acc: 0.8846
Epoch 56/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1417 - acc: 0.9636 - val_loss: 0.2411 -
val_acc: 0.9340
Epoch 57/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1436 - acc: 0.9624 - val_loss: 0.3697 -
val_acc: 0.9147
Epoch 58/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1390 - acc: 0.9675 - val_loss: 0.2298 -
val_acc: 0.9442
Epoch 59/59
4067/4067 [==============================] - 1s 183us/step - loss: 0.1400 - acc: 0.9658 - val_loss: 0.2142 -
val_acc: 0.9545
```

In [78]:
```python
_,acc_val = best_model.evaluate(X_val_s,Y_val_s,verbose=0)
_,acc_train = best_model.evaluate(X_train_s,Y_train_s,verbose=0)
print('Train_accuracy',acc_train,'test_accuracy',acc_val)
```

```
Train_accuracy 0.9741824440619621 test_accuracy 0.9544871794871795
```

In [81]:
```python
# Confusion Matrix
# Activities are the class labels
# It is a 3 class classification
from sklearn import metrics
ACTIVITIES = {
    0: 'SITTING',
    1: 'STANDING',
    2: 'LAYING',
}

# Utility function to print the confusion matrix
def confusion_matrix_cnn(Y_true, Y_pred):
    Y_true = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_true, axis=1)])
    Y_pred = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_pred, axis=1)])

    #return pd.crosstab(Y_true, Y_pred, rownames=['True'], colnames=['Pred'])
    return metrics.confusion_matrix(Y_true, Y_pred)

# Confusion Matrix
print(confusion_matrix_cnn(Y_val_s, best_model.predict(X_val_s)))
```
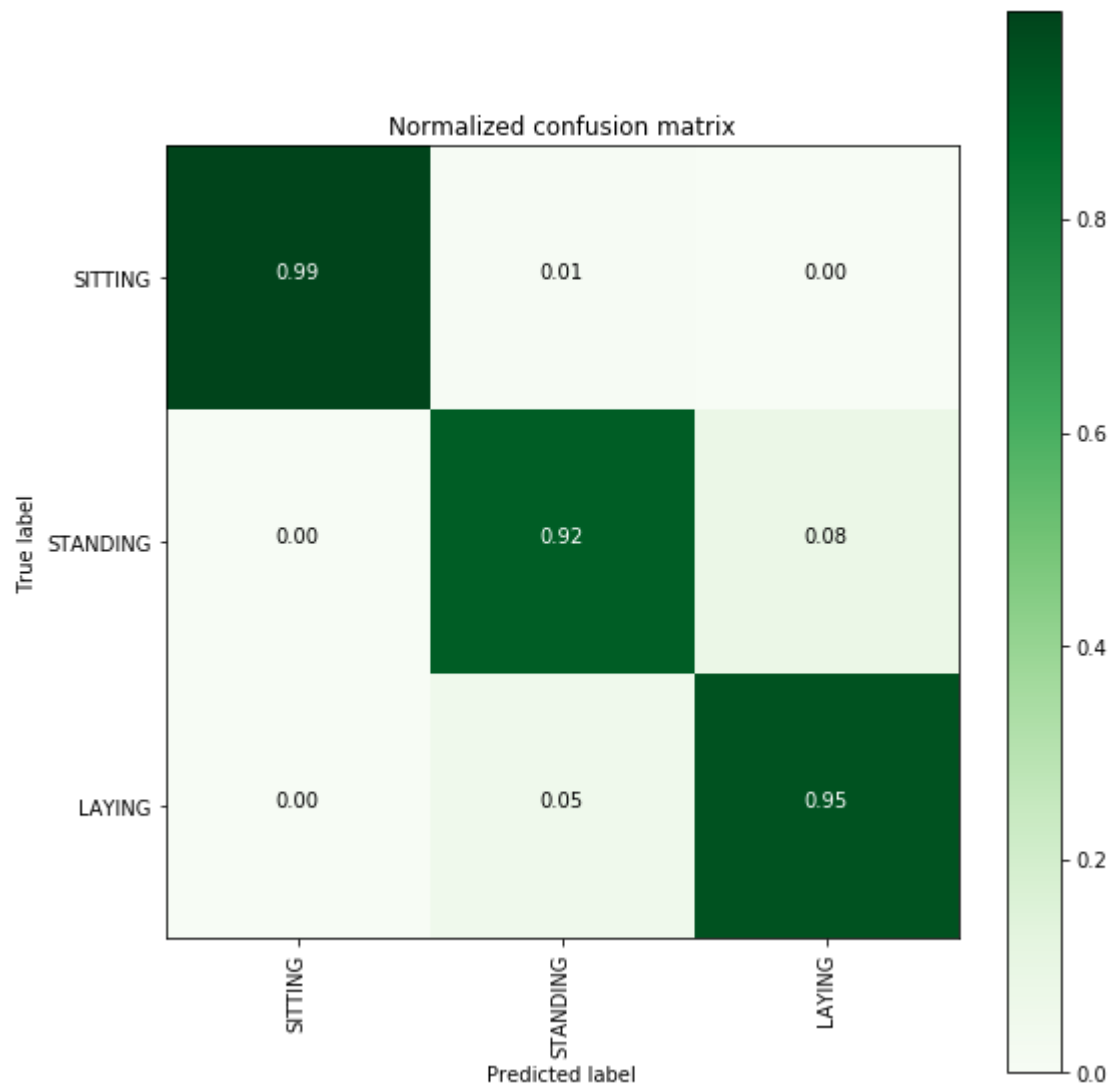
```
[[534   3   0]
 [  0 450  41]
 [  0  27 505]]
```

```
In [83]: plt.figure(figsize=(8,8))
         cm = confusion_matrix_cnn(Y_val_s, best_model.predict(X_val_s))
         plot_confusion_matrix(cm, classes=['SITTING','STANDING','LAYING'], normalize=True, title='Normalized confusio
         n matrix', cmap = plt.cm.Greens)
         plt.show()
```

<matplotlib.figure.Figure at 0x148471fbee10>

Normalized confusion matrix

it was better than confusion metric with all data. We improved our model for classiying static activities alot than previous approc models.

```
In [84]:  ##saving model
          best_model.save('final_model_static.h5')
```

Classification of Dynamic activities :

In [151]:
```python
##data preparation
def data_scaled_dynamic():
    """
    Obtain the dataset from multiple files.
    Returns: X_train, X_test, y_train, y_test
    """
    # Data directory
    DATADIR = 'UCI_HAR_Dataset'
    # Raw data signals
    # Signals are from Accelerometer and Gyroscope
    # The signals are in x,y,z directions
    # Sensor signals are filtered to have only body acceleration
    # excluding the acceleration due to gravity
    # Triaxial acceleration from the accelerometer is total acceleration
    SIGNALS = [
        "body_acc_x",
        "body_acc_y",
        "body_acc_z",
        "body_gyro_x",
        "body_gyro_y",
        "body_gyro_z",
        "total_acc_x",
        "total_acc_y",
        "total_acc_z"
        ]
    from sklearn.base import BaseEstimator, TransformerMixin
    class scaling_tseries_data(BaseEstimator, TransformerMixin):
        from sklearn.preprocessing import StandardScaler
        def __init__(self):
            self.scale = None

        def transform(self, X):
            temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
            temp_X1 = self.scale.transform(temp_X1)
            return temp_X1.reshape(X.shape)

        def fit(self, X):
            # remove overlaping
            remove = int(X.shape[1] / 2)
            temp_X = X[:, -remove:, :]
            # flatten data
            temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
```

```python
            scale = StandardScaler()
            scale.fit(temp_X)
            pickle.dump(scale,open('Scale_dynamic.p','wb'))
            self.scale = scale
            return self

    # Utility function to read the data from csv file
    def _read_csv(filename):
        return pd.read_csv(filename, delim_whitespace=True, header=None)


    # Utility function to load the load
    def load_signals(subset):
        signals_data = []

        for signal in SIGNALS:
            filename = f'UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
            signals_data.append( _read_csv(filename).as_matrix())

        # Transpose is used to change the dimensionality of the output,
        # aggregating the signals by combination of sample/timestep.
        # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
        return np.transpose(signals_data, (1, 2, 0))

    def load_y(subset):
        """
        The objective that we are trying to predict is a integer, from 1 to 6,
        that represents a human activity. We return a binary representation of
        every sample objective as a 6 bits vector using One Hot Encoding
        (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
        """
        filename = f'UCI_HAR_Dataset/{subset}/y_{subset}.txt'
        y = _read_csv(filename)[0]
        y_subset = y<=3
        y = y[y_subset]
        return pd.get_dummies(y).as_matrix(),y_subset

    Y_train_d,y_train_sub = load_y('train')
    Y_val_d,y_test_sub = load_y('test')
    X_train_d, X_val_d = load_signals('train'), load_signals('test')
    X_train_d = X_train_d[y_train_sub]
    X_val_d = X_val_d[y_test_sub]

    ###Scling data
```

```
        Scale = scaling_tseries_data()
        Scale.fit(X_train_d)
        X_train_d = Scale.transform(X_train_d)
        X_val_d = Scale.transform(X_val_d)

        return X_train_d, Y_train_d, X_val_d,  Y_val_d
```

In [152]:
```
X_train_d, Y_train_d, X_val_d,  Y_val_d = data_scaled_dynamic()
```

In [153]:
```
print('Train X shape',X_train_d.shape,'Test X shape',X_val_d.shape)
print('Train Y shape',Y_train_d.shape,'Test Y shape',Y_val_d.shape)
```

```
Train X shape (3285, 128, 9) Test X shape (1387, 128, 9)
Train Y shape (3285, 3) Test Y shape (1387, 3)
```

Baseline Model

```
In [96]: np.random.seed(0)
         tf.set_random_seed(0)
         sess = tf.Session(graph=tf.get_default_graph())
         K.set_session(sess)
         model = Sequential()
         model.add(Conv1D(filters=64, kernel_size=7, activation='relu',kernel_initializer='he_uniform',input_shape=(12
         8,9)))
         model.add(Conv1D(filters=32, kernel_size=3, activation='relu',kernel_initializer='he_uniform'))
         model.add(Dropout(0.6))
         model.add(MaxPooling1D(pool_size=3))
         model.add(Flatten())
         model.add(Dense(30, activation='relu'))
         model.add(Dense(3, activation='softmax'))
         model.summary()
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 64)           4096

conv1d_2 (Conv1D)            (None, 120, 32)           6176

dropout_1 (Dropout)          (None, 120, 32)           0

max_pooling1d_1 (MaxPooling1 (None, 40, 32)            0

flatten_1 (Flatten)          (None, 1280)              0

dense_1 (Dense)              (None, 30)                38430

dense_2 (Dense)              (None, 3)                 93
=================================================================
Total params: 48,795
Trainable params: 48,795
Non-trainable params: 0
_____
```

In [97]:
```python
import math
adam = keras.optimizers.Adam(lr=0.004)
model.compile(loss='categorical_crossentropy', optimizer=adam, metrics=['accuracy'])
model.fit(X_train_s,Y_train_s, epochs=100, batch_size=16,validation_data=(X_val_s, Y_val_s), verbose=1)
K.clear_session()
```

```
Train on 4067 samples, validate on 1560 samples
Epoch 1/100
4067/4067 [==============================] - 3s 646us/step - loss: 0.3741 - acc: 0.8835 - val_loss: 0.2909 -
val_acc: 0.8885
Epoch 2/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2112 - acc: 0.9179 - val_loss: 0.3365 -
val_acc: 0.8718
Epoch 3/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2055 - acc: 0.9179 - val_loss: 0.2613 -
val_acc: 0.8981
Epoch 4/100
4067/4067 [==============================] - 2s 471us/step - loss: 0.1922 - acc: 0.9240 - val_loss: 0.2663 -
val_acc: 0.8814
Epoch 5/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2058 - acc: 0.9292 - val_loss: 0.1815 -
val_acc: 0.9224
Epoch 6/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1774 - acc: 0.9336 - val_loss: 0.2734 -
val_acc: 0.8814
Epoch 7/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1617 - acc: 0.9405 - val_loss: 0.2008 -
val_acc: 0.9038
Epoch 8/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1881 - acc: 0.9363 - val_loss: 0.2781 -
val_acc: 0.8763
Epoch 9/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.2020 - acc: 0.9385 - val_loss: 0.2372 -
val_acc: 0.8917
Epoch 10/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1497 - acc: 0.9476 - val_loss: 0.1934 -
val_acc: 0.9186
Epoch 11/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2372 - acc: 0.9294 - val_loss: 0.2185 -
val_acc: 0.9051
Epoch 12/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2053 - acc: 0.9348 - val_loss: 0.1926 -
val_acc: 0.9071
Epoch 13/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2254 - acc: 0.9223 - val_loss: 0.2202 -
val_acc: 0.8878
Epoch 14/100
4067/4067 [==============================] - 2s 482us/step - loss: 0.1488 - acc: 0.9410 - val_loss: 0.1968 -
val_acc: 0.9019
```

```
Epoch 15/100
4067/4067 [==============================] - 2s 473us/step - loss: 0.1156 - acc: 0.9548 - val_loss: 0.2031 -
val_acc: 0.9327
Epoch 16/100
4067/4067 [==============================] - 2s 474us/step - loss: 0.1348 - acc: 0.9523 - val_loss: 0.2138 -
val_acc: 0.9231
Epoch 17/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2656 - acc: 0.9393 - val_loss: 0.1896 -
val_acc: 0.9346
Epoch 18/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.4346 - acc: 0.9171 - val_loss: 0.4111 -
val_acc: 0.9192
Epoch 19/100
4067/4067 [==============================] - 2s 467us/step - loss: 0.2026 - acc: 0.9385 - val_loss: 0.2235 -
val_acc: 0.9218
Epoch 20/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.1679 - acc: 0.9511 - val_loss: 0.2388 -
val_acc: 0.9173
Epoch 21/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.1626 - acc: 0.9525 - val_loss: 0.2714 -
val_acc: 0.9231
Epoch 22/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1852 - acc: 0.9452 - val_loss: 0.5511 -
val_acc: 0.8962
Epoch 23/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.2965 - acc: 0.9233 - val_loss: 0.5497 -
val_acc: 0.8769
Epoch 24/100
4067/4067 [==============================] - 2s 475us/step - loss: 0.2631 - acc: 0.9358 - val_loss: 0.4660 -
val_acc: 0.9173
Epoch 25/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2342 - acc: 0.9432 - val_loss: 0.3215 -
val_acc: 0.9353
Epoch 26/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.3714 - acc: 0.9257 - val_loss: 0.4106 -
val_acc: 0.9192
Epoch 27/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.3692 - acc: 0.9312 - val_loss: 0.3672 -
val_acc: 0.8942
Epoch 28/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.3338 - acc: 0.9380 - val_loss: 0.2591 -
val_acc: 0.9237
Epoch 29/100
```

```
4067/4067 [==============================] - 2s 469us/step - loss: 0.3166 - acc: 0.9462 - val_loss: 0.2539 -
val_acc: 0.9237
Epoch 30/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.3306 - acc: 0.9437 - val_loss: 0.2518 -
val_acc: 0.9115
Epoch 31/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.3000 - acc: 0.9466 - val_loss: 0.2865 -
val_acc: 0.9077
Epoch 32/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2992 - acc: 0.9459 - val_loss: 0.2693 -
val_acc: 0.9154
Epoch 33/100
4067/4067 [==============================] - 2s 476us/step - loss: 0.3235 - acc: 0.9430 - val_loss: 0.2308 -
val_acc: 0.9301
Epoch 34/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2924 - acc: 0.9516 - val_loss: 0.3129 -
val_acc: 0.9321
Epoch 35/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.2561 - acc: 0.9439 - val_loss: 0.3511 -
val_acc: 0.9122
Epoch 36/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1771 - acc: 0.9587 - val_loss: 0.2372 -
val_acc: 0.9199
Epoch 37/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1556 - acc: 0.9653 - val_loss: 0.2733 -
val_acc: 0.9365
Epoch 38/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1674 - acc: 0.9643 - val_loss: 0.3179 -
val_acc: 0.9308
Epoch 39/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1850 - acc: 0.9619 - val_loss: 0.3449 -
val_acc: 0.9205
Epoch 40/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2294 - acc: 0.9565 - val_loss: 1.1749 -
val_acc: 0.8558
Epoch 41/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.8426 - acc: 0.8618 - val_loss: 0.6446 -
val_acc: 0.9096
Epoch 42/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.3695 - acc: 0.9095 - val_loss: 0.5939 -
val_acc: 0.8949
Epoch 43/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2976 - acc: 0.8957 - val_loss: 0.3787 -
```

```
val_acc: 0.8878
Epoch 44/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.3169 - acc: 0.8842 - val_loss: 0.5096 -
val_acc: 0.8756
Epoch 45/100
4067/4067 [==============================] - 2s 481us/step - loss: 0.2832 - acc: 0.9299 - val_loss: 0.5141 -
val_acc: 0.9231
Epoch 46/100
4067/4067 [==============================] - 2s 473us/step - loss: 0.2590 - acc: 0.9253 - val_loss: 0.3977 -
val_acc: 0.9224
Epoch 47/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.2411 - acc: 0.9058 - val_loss: 0.3055 -
val_acc: 0.8942
Epoch 48/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2444 - acc: 0.9339 - val_loss: 0.3800 -
val_acc: 0.9224
Epoch 49/100
4067/4067 [==============================] - 2s 471us/step - loss: 0.2571 - acc: 0.9398 - val_loss: 0.3745 -
val_acc: 0.9308
Epoch 50/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.2081 - acc: 0.9329 - val_loss: 0.3633 -
val_acc: 0.9199
Epoch 51/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.1975 - acc: 0.9459 - val_loss: 0.4758 -
val_acc: 0.9365
Epoch 52/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.1934 - acc: 0.9506 - val_loss: 0.3417 -
val_acc: 0.9237
Epoch 53/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1805 - acc: 0.9560 - val_loss: 0.4377 -
val_acc: 0.9353
Epoch 54/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1955 - acc: 0.9422 - val_loss: 0.3526 -
val_acc: 0.9378
Epoch 55/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.2695 - acc: 0.9420 - val_loss: 0.4296 -
val_acc: 0.9263
Epoch 56/100
4067/4067 [==============================] - 2s 472us/step - loss: 0.2427 - acc: 0.9545 - val_loss: 0.5022 -
val_acc: 0.9295
Epoch 57/100
4067/4067 [==============================] - 2s 472us/step - loss: 0.2529 - acc: 0.9486 - val_loss: 0.3581 -
val_acc: 0.9244
```

```
Epoch 58/100
4067/4067 [==============================] - 2s 472us/step - loss: 0.2147 - acc: 0.9469 - val_loss: 0.3759 -
val_acc: 0.9212
Epoch 59/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2057 - acc: 0.9599 - val_loss: 0.3434 -
val_acc: 0.9429
Epoch 60/100
4067/4067 [==============================] - 2s 469us/step - loss: 1.0452 - acc: 0.8975 - val_loss: 6.0890 -
val_acc: 0.5833
Epoch 61/100
4067/4067 [==============================] - 2s 470us/step - loss: 5.7147 - acc: 0.6027 - val_loss: 5.9525 -
val_acc: 0.6026
Epoch 62/100
4067/4067 [==============================] - 2s 469us/step - loss: 5.6650 - acc: 0.6078 - val_loss: 5.7521 -
val_acc: 0.6077
Epoch 63/100
4067/4067 [==============================] - 2s 469us/step - loss: 5.6250 - acc: 0.6164 - val_loss: 5.7895 -
val_acc: 0.6090
Epoch 64/100
4067/4067 [==============================] - 2s 468us/step - loss: 5.5582 - acc: 0.6191 - val_loss: 5.7602 -
val_acc: 0.6013
Epoch 65/100
4067/4067 [==============================] - 2s 469us/step - loss: 5.2745 - acc: 0.6410 - val_loss: 0.4785 -
val_acc: 0.9340
Epoch 66/100
4067/4067 [==============================] - 2s 472us/step - loss: 0.2632 - acc: 0.9388 - val_loss: 0.5110 -
val_acc: 0.9372
Epoch 67/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2281 - acc: 0.9550 - val_loss: 0.4420 -
val_acc: 0.9404
Epoch 68/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.4060 - acc: 0.9353 - val_loss: 0.4028 -
val_acc: 0.9064
Epoch 69/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.4286 - acc: 0.9071 - val_loss: 0.5253 -
val_acc: 0.9013
Epoch 70/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.3854 - acc: 0.9142 - val_loss: 0.5623 -
val_acc: 0.9006
Epoch 71/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.3436 - acc: 0.9415 - val_loss: 0.4089 -
val_acc: 0.9224
Epoch 72/100
```

```
4067/4067 [==============================] - 2s 469us/step - loss: 0.2453 - acc: 0.9491 - val_loss: 0.3462 -
val_acc: 0.9237
Epoch 73/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.1925 - acc: 0.9501 - val_loss: 0.3247 -
val_acc: 0.9128
Epoch 74/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.1871 - acc: 0.9567 - val_loss: 0.4141 -
val_acc: 0.9353
Epoch 75/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.2512 - acc: 0.9444 - val_loss: 0.3955 -
val_acc: 0.9212
Epoch 76/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.2315 - acc: 0.9481 - val_loss: 0.5539 -
val_acc: 0.9103
Epoch 77/100
4067/4067 [==============================] - 2s 483us/step - loss: 0.2328 - acc: 0.9594 - val_loss: 0.4957 -
val_acc: 0.9269
Epoch 78/100
4067/4067 [==============================] - 2s 471us/step - loss: 0.2192 - acc: 0.9619 - val_loss: 0.5239 -
val_acc: 0.9250
Epoch 79/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.2219 - acc: 0.9584 - val_loss: 0.4986 -
val_acc: 0.9372
Epoch 80/100
4067/4067 [==============================] - 2s 471us/step - loss: 0.2892 - acc: 0.9324 - val_loss: 0.4853 -
val_acc: 0.8904
Epoch 81/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.2685 - acc: 0.9223 - val_loss: 0.6160 -
val_acc: 0.9167
Epoch 82/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.2445 - acc: 0.9385 - val_loss: 0.4613 -
val_acc: 0.9051
Epoch 83/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.2005 - acc: 0.9459 - val_loss: 0.4366 -
val_acc: 0.9006
Epoch 84/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2433 - acc: 0.9417 - val_loss: 0.5138 -
val_acc: 0.9141
Epoch 85/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.2071 - acc: 0.9275 - val_loss: 0.4254 -
val_acc: 0.8929
Epoch 86/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1931 - acc: 0.9511 - val_loss: 0.4990 -
```

```
val_acc: 0.9205
Epoch 87/100
4067/4067 [==============================] - 2s 471us/step - loss: 0.1786 - acc: 0.9629 - val_loss: 0.4127 -
val_acc: 0.9160
Epoch 88/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1616 - acc: 0.9648 - val_loss: 0.4734 -
val_acc: 0.9205
Epoch 89/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.1567 - acc: 0.9592 - val_loss: 0.4669 -
val_acc: 0.9256
Epoch 90/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.1951 - acc: 0.9636 - val_loss: 0.4250 -
val_acc: 0.9192
Epoch 91/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.1813 - acc: 0.9646 - val_loss: 0.3796 -
val_acc: 0.9423
Epoch 92/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.1771 - acc: 0.9629 - val_loss: 0.3891 -
val_acc: 0.9353
Epoch 93/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.3397 - acc: 0.9570 - val_loss: 4.7079 -
val_acc: 0.6622
Epoch 94/100
4067/4067 [==============================] - 2s 468us/step - loss: 3.7788 - acc: 0.7037 - val_loss: 4.1848 -
val_acc: 0.6423
Epoch 95/100
4067/4067 [==============================] - 2s 468us/step - loss: 4.0658 - acc: 0.6922 - val_loss: 4.7790 -
val_acc: 0.6321
Epoch 96/100
4067/4067 [==============================] - 2s 475us/step - loss: 3.0969 - acc: 0.7335 - val_loss: 0.5272 -
val_acc: 0.9032
Epoch 97/100
4067/4067 [==============================] - 2s 467us/step - loss: 0.4589 - acc: 0.9171 - val_loss: 0.4549 -
val_acc: 0.8974
Epoch 98/100
4067/4067 [==============================] - 2s 470us/step - loss: 0.3379 - acc: 0.9169 - val_loss: 0.4321 -
val_acc: 0.9218
Epoch 99/100
4067/4067 [==============================] - 2s 468us/step - loss: 0.3399 - acc: 0.9184 - val_loss: 0.4533 -
val_acc: 0.9192
Epoch 100/100
4067/4067 [==============================] - 2s 469us/step - loss: 0.2668 - acc: 0.9341 - val_loss: 0.4545 -
val_acc: 0.9173
```

```python
In [7]: def model_cnn(X_train_d, Y_train_d, X_val_d, Y_val_d):
            np.random.seed(0)
            tf.set_random_seed(0)
            sess = tf.Session(graph=tf.get_default_graph())
            K.set_session(sess)
            # Initiliazing the sequential model
            model = Sequential()

            model.add(Conv1D(filters={{choice([28,32,42])}}, kernel_size={{choice([3,5,7])}},activation='relu',kernel
        _initializer='he_uniform',
                        kernel_regularizer=l2({{uniform(0,3)}}),input_shape=(128,9)))

            model.add(Conv1D(filters={{choice([16,24,32])}}, kernel_size={{choice([3,5,7])}},
                            activation='relu',kernel_regularizer=l2({{uniform(0,2)}}),kernel_initializer='he_unifor
        m'))
            model.add(Dropout({{uniform(0.45,0.7)}}))
            model.add(MaxPooling1D(pool_size={{choice([2,3,5])}}))
            model.add(Flatten())
            model.add(Dense({{choice([16,32,64])}}, activation='relu'))
            model.add(Dense(3, activation='softmax'))

            adam = keras.optimizers.Adam(lr={{uniform(0.00065,0.004)}})
            rmsprop = keras.optimizers.RMSprop(lr={{uniform(0.00065,0.004)}})

            choiceval = {{choice(['adam', 'rmsprop'])}}

            if choiceval == 'adam':
                optim = adam
            else:
                optim = rmsprop

            print(model.summary())

            model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)

            result = model.fit(X_train_d, Y_train_d,
                        batch_size={{choice([16,32,64])}},
                        nb_epoch={{choice([35,40,55])}},
                        verbose=2,
                        validation_data=(X_val_d, Y_val_d))

            score, acc = model.evaluate(X_val_d, Y_val_d, verbose=0)
```

```python
        score1, acc1 = model.evaluate(X_train_d, Y_train_d, verbose=0)
        print('Train accuracy',acc1,'Test accuracy:', acc)
        print('------------------------------------------------------------------------')
        K.clear_session()
        return {'loss': -acc, 'status': STATUS_OK,'train_acc':acc1}
```

In [8]:
```python
import pickle
best_run, best_model, space = pickle.load(open('/home/u20112/final_result_cnn5.p','rb'))
trials = pickle.load(open('/home/u20112/trials_cnn5.p','rb'))
```

```
In [10]:  X_train_d, Y_train_d, X_val_d, Y_val_d = data_scaled_dynamic()
          trials = Trials()
          best_run, best_model, space = optim.minimize(model=model_cnn,
                                           data=data_scaled_dynamic,
                                           algo=tpe.suggest,
                                           max_evals=120,rseed = 0,
                                           trials=trials,notebook_name='Human Activity Detection',
                                           return_space = True)
```

```
>>> Imports:
#coding=utf-8

try:
    import os
except:
    pass

try:
    import numpy as np
except:
    pass

try:
    import tensorflow as tf
except:
    pass

try:
    import random as rn
except:
    pass

try:
    from keras import backend as K
except:
    pass

try:
    import pickle
except:
    pass

try:
    import keras
except:
    pass

try:
    from keras.models import Sequential
except:
    pass
```

```
try:
    from keras.layers import LSTM
except:
    pass

try:
    from keras.layers.core import Dense, Dropout
except:
    pass

try:
    from hyperopt import Trials, STATUS_OK, tpe
except:
    pass

try:
    from hyperas import optim
except:
    pass

try:
    from hyperas.distributions import choice, uniform
except:
    pass

try:
    import pandas as pd
except:
    pass

try:
    from matplotlib import pyplot
except:
    pass

try:
    from sklearn.preprocessing import StandardScaler
except:
    pass

try:
    from keras.models import Sequential
except:
```

```
        pass

    try:
        from keras.layers import Flatten
    except:
        pass

    try:
        from keras.regularizers import l2
    except:
        pass

    try:
        from keras.layers.convolutional import Conv1D
    except:
        pass

    try:
        from keras.layers.convolutional import MaxPooling1D
    except:
        pass

    try:
        from keras.utils import to_categorical
    except:
        pass

    try:
        from sklearn.base import BaseEstimator, TransformerMixin
    except:
        pass

    try:
        from sklearn.preprocessing import StandardScaler
    except:
        pass

>>> Hyperas search space:

def get_space():
    return {
        'filters': hp.choice('filters', [28,32,42]),
        'kernel_size': hp.choice('kernel_size', [3,5,7]),
```

```
                'l2': hp.uniform('l2', 0,3),
                'filters_1': hp.choice('filters_1', [16,24,32]),
                'kernel_size_1': hp.choice('kernel_size_1', [3,5,7]),
                'l2_1': hp.uniform('l2_1', 0,2),
                'Dropout': hp.uniform('Dropout', 0.45,0.7),
                'pool_size': hp.choice('pool_size', [2,3,5]),
                'Dense': hp.choice('Dense', [16,32,64]),
                'lr': hp.uniform('lr', 0.00065,0.004),
                'lr_1': hp.uniform('lr_1', 0.00065,0.004),
                'choiceval': hp.choice('choiceval', ['adam', 'rmsprop']),
                'Dense_1': hp.choice('Dense_1', [16,32,64]),
                'nb_epoch': hp.choice('nb_epoch', [35,40,55]),
            }
```

```
>>> Data
    1:
    2: """
    3: Obtain the dataset from multiple files.
    4: Returns: X_train, X_test, y_train, y_test
    5: """
    6: # Data directory
    7: DATADIR = 'UCI_HAR_Dataset'
    8: # Raw data signals
    9: # Signals are from Accelerometer and Gyroscope
   10: # The signals are in x,y,z directions
   11: # Sensor signals are filtered to have only body acceleration
   12: # excluding the acceleration due to gravity
   13: # Triaxial acceleration from the accelerometer is total acceleration
   14: SIGNALS = [
   15:     "body_acc_x",
   16:     "body_acc_y",
   17:     "body_acc_z",
   18:     "body_gyro_x",
   19:     "body_gyro_y",
   20:     "body_gyro_z",
   21:     "total_acc_x",
   22:     "total_acc_y",
   23:     "total_acc_z"
   24:     ]
   25: from sklearn.base import BaseEstimator, TransformerMixin
   26: class scaling_tseries_data(BaseEstimator, TransformerMixin):
   27:     from sklearn.preprocessing import StandardScaler
   28:     def __init__(self):
```

```
29:            self.scale = None
30:
31:        def transform(self, X):
32:            temp_X1 = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
33:            temp_X1 = self.scale.transform(temp_X1)
34:            return temp_X1.reshape(X.shape)
35:
36:        def fit(self, X):
37:            # remove overlaping
38:            remove = int(X.shape[1] / 2)
39:            temp_X = X[:, -remove:, :]
40:            # flatten data
41:            temp_X = temp_X.reshape((temp_X.shape[0] * temp_X.shape[1], temp_X.shape[2]))
42:            scale = StandardScaler()
43:            scale.fit(temp_X)
44:            self.scale = scale
45:            return self
46:
47: # Utility function to read the data from csv file
48: def _read_csv(filename):
49:     return pd.read_csv(filename, delim_whitespace=True, header=None)
50:
51: # Utility function to load the load
52: def load_signals(subset):
53:     signals_data = []
54:
55:     for signal in SIGNALS:
56:         filename = f'HAR/UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
57:         signals_data.append( _read_csv(filename).as_matrix())
58:
59:     # Transpose is used to change the dimensionality of the output,
60:     # aggregating the signals by combination of sample/timestep.
61:     # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
62:     return np.transpose(signals_data, (1, 2, 0))
63:
64: def load_y(subset):
65:     """
66:     The objective that we are trying to predict is a integer, from 1 to 6,
67:     that represents a human activity. We return a binary representation of
68:     every sample objective as a 6 bits vector using One Hot Encoding
69:     (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
70:     """
71:     filename = f'HAR/UCI_HAR_Dataset/{subset}/y_{subset}.txt'
```

```
72:     y = _read_csv(filename)[0]
73:     y_subset = y<=3
74:     y = y[y_subset]
75:     return pd.get_dummies(y).as_matrix(),y_subset
76:
77: Y_train_d,y_train_sub = load_y('train')
78: Y_val_d,y_test_sub = load_y('test')
79: X_train_d, X_val_d = load_signals('train'), load_signals('test')
80: X_train_d = X_train_d[y_train_sub]
81: X_val_d = X_val_d[y_test_sub]
82:
83: ###Scling data
84: Scale = scaling_tseries_data()
85: Scale.fit(X_train_d)
86: X_train_d = Scale.transform(X_train_d)
87: X_val_d = Scale.transform(X_val_d)
88:
89:
90:
91:
>>> Resulting replaced keras model:

  1: def keras_fmin_fnct(space):
  2:
  3:     np.random.seed(0)
  4:     tf.set_random_seed(0)
  5:     sess = tf.Session(graph=tf.get_default_graph())
  6:     K.set_session(sess)
  7:     # Initiliazing the sequential model
  8:     model = Sequential()
  9:
 10:     model.add(Conv1D(filters=space['filters'], kernel_size=space['kernel_size'],activation='relu',kerne
l_initializer='he_uniform',
 11:                 kernel_regularizer=l2(space['l2']),input_shape=(128,9)))
 12:
 13:     model.add(Conv1D(filters=space['filters_1'], kernel_size=space['kernel_size_1'],
 14:                 activation='relu',kernel_regularizer=l2(space['l2_1']),kernel_initializer='he_unif
orm'))
 15:     model.add(Dropout(space['Dropout']))
 16:     model.add(MaxPooling1D(pool_size=space['pool_size']))
 17:     model.add(Flatten())
 18:     model.add(Dense(space['Dense'], activation='relu'))
 19:     model.add(Dense(3, activation='softmax'))
```

```
20:
21:        adam = keras.optimizers.Adam(lr=space['lr'])
22:        rmsprop = keras.optimizers.RMSprop(lr=space['lr_1'])
23:
24:        choiceval = space['choiceval']
25:
26:        if choiceval == 'adam':
27:            optim = adam
28:        else:
29:            optim = rmsprop
30:
31:        print(model.summary())
32:
33:        model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
34:
35:        result = model.fit(X_train_d, Y_train_d,
36:                   batch_size=space['Dense_1'],
37:                   nb_epoch=space['nb_epoch'],
38:                   verbose=2,
39:                   validation_data=(X_val_d, Y_val_d))
40:
41:        score, acc = model.evaluate(X_val_d, Y_val_d, verbose=0)
42:        score1, acc1 = model.evaluate(X_train_d, Y_train_d, verbose=0)
43:        print('Train accuracy',acc1,'Test accuracy:', acc)
44:        print('-----------------------------------------------------------------------------------------')
45:        K.clear_session()
46:        return {'loss': -acc, 'status': STATUS_OK,'train_acc':acc1}
47:
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 120, 32)	5152
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 32)	0
flatten_1 (Flatten)	(None, 1920)	0
dense_1 (Dense)	(None, 64)	122944

```
dense_2 (Dense)                  (None, 3)                      195
=================================================================
Total params: 129,763
Trainable params: 129,763
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 51.9484 - acc: 0.5416 - val_loss: 9.5868 - val_acc: 0.4787
Epoch 2/55
 - 2s - loss: 3.2914 - acc: 0.7802 - val_loss: 0.9161 - val_acc: 0.7924
Epoch 3/55
 - 2s - loss: 0.5815 - acc: 0.8798 - val_loss: 0.6775 - val_acc: 0.8580
Epoch 4/55
 - 2s - loss: 0.4724 - acc: 0.9020 - val_loss: 0.5544 - val_acc: 0.9056
Epoch 5/55
 - 2s - loss: 0.4092 - acc: 0.9181 - val_loss: 0.8361 - val_acc: 0.7376
Epoch 6/55
 - 2s - loss: 0.3511 - acc: 0.9339 - val_loss: 0.6569 - val_acc: 0.8003
Epoch 7/55
 - 2s - loss: 0.3429 - acc: 0.9339 - val_loss: 0.6318 - val_acc: 0.8089
Epoch 8/55
 - 2s - loss: 0.3054 - acc: 0.9470 - val_loss: 0.4889 - val_acc: 0.9092
Epoch 9/55
 - 2s - loss: 0.3004 - acc: 0.9489 - val_loss: 0.4607 - val_acc: 0.8976
Epoch 10/55
 - 2s - loss: 0.3015 - acc: 0.9476 - val_loss: 0.4787 - val_acc: 0.8875
Epoch 11/55
 - 2s - loss: 0.2931 - acc: 0.9461 - val_loss: 0.5086 - val_acc: 0.8983
Epoch 12/55
 - 2s - loss: 0.2855 - acc: 0.9495 - val_loss: 0.3845 - val_acc: 0.9315
Epoch 13/55
 - 2s - loss: 0.2777 - acc: 0.9522 - val_loss: 1.4048 - val_acc: 0.5487
Epoch 14/55
 - 2s - loss: 0.2851 - acc: 0.9522 - val_loss: 0.5284 - val_acc: 0.8998
Epoch 15/55
 - 2s - loss: 0.2665 - acc: 0.9559 - val_loss: 0.4386 - val_acc: 0.9041
Epoch 16/55
 - 2s - loss: 0.2828 - acc: 0.9495 - val_loss: 0.3800 - val_acc: 0.9257
Epoch 17/55
 - 2s - loss: 0.2655 - acc: 0.9516 - val_loss: 0.5363 - val_acc: 0.8991
Epoch 18/55
```

```
         - 2s - loss: 0.2663 - acc: 0.9562 - val_loss: 0.8334 - val_acc: 0.7650
        Epoch 19/55
         - 2s - loss: 0.2544 - acc: 0.9549 - val_loss: 0.6028 - val_acc: 0.8688
        Epoch 20/55
         - 2s - loss: 0.2510 - acc: 0.9626 - val_loss: 0.4384 - val_acc: 0.8933
        Epoch 21/55
         - 2s - loss: 0.2559 - acc: 0.9577 - val_loss: 0.5845 - val_acc: 0.8493
        Epoch 22/55
         - 2s - loss: 0.2706 - acc: 0.9525 - val_loss: 0.4535 - val_acc: 0.9012
        Epoch 23/55
         - 2s - loss: 0.2573 - acc: 0.9619 - val_loss: 0.4798 - val_acc: 0.8890
        Epoch 24/55
         - 2s - loss: 0.2718 - acc: 0.9534 - val_loss: 0.4694 - val_acc: 0.9257
        Epoch 25/55
         - 2s - loss: 0.2564 - acc: 0.9610 - val_loss: 0.4463 - val_acc: 0.8962
        Epoch 26/55
         - 2s - loss: 0.2522 - acc: 0.9577 - val_loss: 0.4676 - val_acc: 0.8782
        Epoch 27/55
         - 2s - loss: 0.2605 - acc: 0.9525 - val_loss: 0.4467 - val_acc: 0.8955
        Epoch 28/55
         - 2s - loss: 0.2633 - acc: 0.9543 - val_loss: 0.4774 - val_acc: 0.9092
        Epoch 29/55
         - 2s - loss: 0.2319 - acc: 0.9638 - val_loss: 0.3979 - val_acc: 0.9056
        Epoch 30/55
         - 2s - loss: 0.2639 - acc: 0.9537 - val_loss: 0.7861 - val_acc: 0.7376
        Epoch 31/55
         - 2s - loss: 0.2537 - acc: 0.9574 - val_loss: 0.3909 - val_acc: 0.9164
        Epoch 32/55
         - 2s - loss: 0.2272 - acc: 0.9623 - val_loss: 0.5666 - val_acc: 0.8767
        Epoch 33/55
         - 2s - loss: 0.2679 - acc: 0.9546 - val_loss: 0.4222 - val_acc: 0.9005
        Epoch 34/55
         - 2s - loss: 0.2445 - acc: 0.9613 - val_loss: 0.4334 - val_acc: 0.8875
        Epoch 35/55
         - 2s - loss: 0.2531 - acc: 0.9559 - val_loss: 0.3939 - val_acc: 0.8983
        Epoch 36/55
         - 2s - loss: 0.2813 - acc: 0.9522 - val_loss: 0.4539 - val_acc: 0.9019
        Epoch 37/55
         - 2s - loss: 0.2535 - acc: 0.9626 - val_loss: 0.4491 - val_acc: 0.9005
        Epoch 38/55
         - 2s - loss: 0.2157 - acc: 0.9702 - val_loss: 0.4433 - val_acc: 0.9207
        Epoch 39/55
         - 2s - loss: 0.2420 - acc: 0.9571 - val_loss: 0.6679 - val_acc: 0.8320
```

```
Epoch 40/55
 - 2s - loss: 0.2670 - acc: 0.9595 - val_loss: 0.4645 - val_acc: 0.8947
Epoch 41/55
 - 2s - loss: 0.2520 - acc: 0.9580 - val_loss: 0.4990 - val_acc: 0.9012
Epoch 42/55
 - 2s - loss: 0.2416 - acc: 0.9656 - val_loss: 0.6509 - val_acc: 0.8190
Epoch 43/55
 - 2s - loss: 0.2564 - acc: 0.9531 - val_loss: 0.5576 - val_acc: 0.8825
Epoch 44/55
 - 2s - loss: 0.2685 - acc: 0.9556 - val_loss: 0.5112 - val_acc: 0.8940
Epoch 45/55
 - 2s - loss: 0.2315 - acc: 0.9616 - val_loss: 0.5890 - val_acc: 0.8515
Epoch 46/55
 - 2s - loss: 0.2734 - acc: 0.9610 - val_loss: 0.5982 - val_acc: 0.8688
Epoch 47/55
 - 2s - loss: 0.2443 - acc: 0.9577 - val_loss: 0.4412 - val_acc: 0.9113
Epoch 48/55
 - 2s - loss: 0.2417 - acc: 0.9604 - val_loss: 0.3964 - val_acc: 0.9048
Epoch 49/55
 - 2s - loss: 0.2642 - acc: 0.9586 - val_loss: 1.3943 - val_acc: 0.6431
Epoch 50/55
 - 2s - loss: 0.2430 - acc: 0.9601 - val_loss: 0.4900 - val_acc: 0.8861
Epoch 51/55
 - 2s - loss: 0.2345 - acc: 0.9571 - val_loss: 0.5912 - val_acc: 0.8226
Epoch 52/55
 - 2s - loss: 0.2417 - acc: 0.9586 - val_loss: 0.4408 - val_acc: 0.9041
Epoch 53/55
 - 2s - loss: 0.2210 - acc: 0.9632 - val_loss: 0.3287 - val_acc: 0.9380
Epoch 54/55
 - 2s - loss: 0.2558 - acc: 0.9540 - val_loss: 0.5351 - val_acc: 0.8983
Epoch 55/55
 - 2s - loss: 0.2214 - acc: 0.9626 - val_loss: 0.4687 - val_acc: 0.8940
Train accuracy 0.9899543378995433 Test accuracy: 0.8940158615717375
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
=======================	===================	=========
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 120, 24)	2040
dropout_1 (Dropout)	(None, 120, 24)	0

```
max_pooling1d_1 (MaxPooling1 (None, 40, 24)              0
_____
flatten_1 (Flatten)          (None, 960)                 0
_____
dense_1 (Dense)              (None, 64)                  61504
_____
dense_2 (Dense)              (None, 3)                   195
=================================================================
Total params: 65,531
Trainable params: 65,531
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 125.5755 - acc: 0.5626 - val_loss: 43.7067 - val_acc: 0.5984
Epoch 2/35
 - 1s - loss: 19.3718 - acc: 0.7744 - val_loss: 5.9414 - val_acc: 0.6590
Epoch 3/35
 - 1s - loss: 2.6292 - acc: 0.8438 - val_loss: 1.4250 - val_acc: 0.7008
Epoch 4/35
 - 1s - loss: 0.8312 - acc: 0.8475 - val_loss: 0.9140 - val_acc: 0.8234
Epoch 5/35
 - 1s - loss: 0.5784 - acc: 0.9078 - val_loss: 0.8409 - val_acc: 0.8262
Epoch 6/35
 - 1s - loss: 0.5222 - acc: 0.9120 - val_loss: 0.8383 - val_acc: 0.7823
Epoch 7/35
 - 1s - loss: 0.5027 - acc: 0.9129 - val_loss: 0.7426 - val_acc: 0.7844
Epoch 8/35
 - 1s - loss: 0.4734 - acc: 0.9184 - val_loss: 0.7192 - val_acc: 0.8435
Epoch 9/35
 - 1s - loss: 0.4529 - acc: 0.9282 - val_loss: 0.6721 - val_acc: 0.8760
Epoch 10/35
 - 1s - loss: 0.4548 - acc: 0.9212 - val_loss: 0.6644 - val_acc: 0.8407
Epoch 11/35
 - 1s - loss: 0.3786 - acc: 0.9464 - val_loss: 0.6792 - val_acc: 0.8443
Epoch 12/35
 - 1s - loss: 0.4288 - acc: 0.9193 - val_loss: 0.6608 - val_acc: 0.8270
Epoch 13/35
 - 1s - loss: 0.3800 - acc: 0.9394 - val_loss: 0.6904 - val_acc: 0.7758
Epoch 14/35
 - 1s - loss: 0.3476 - acc: 0.9467 - val_loss: 0.5656 - val_acc: 0.8926
Epoch 15/35
```

```
          - 1s - loss: 0.3388 - acc: 0.9516 - val_loss: 0.5756 - val_acc: 0.8601
        Epoch 16/35
          - 1s - loss: 0.3382 - acc: 0.9486 - val_loss: 0.5478 - val_acc: 0.8846
        Epoch 17/35
          - 1s - loss: 0.3839 - acc: 0.9355 - val_loss: 0.5753 - val_acc: 0.8861
        Epoch 18/35
          - 1s - loss: 0.3675 - acc: 0.9394 - val_loss: 0.5744 - val_acc: 0.8738
        Epoch 19/35
          - 1s - loss: 0.3014 - acc: 0.9574 - val_loss: 0.5293 - val_acc: 0.8868
        Epoch 20/35
          - 1s - loss: 0.3499 - acc: 0.9416 - val_loss: 0.5377 - val_acc: 0.8464
        Epoch 21/35
          - 1s - loss: 0.3017 - acc: 0.9559 - val_loss: 0.5265 - val_acc: 0.8911
        Epoch 22/35
          - 1s - loss: 0.3035 - acc: 0.9549 - val_loss: 0.5609 - val_acc: 0.8320
        Epoch 23/35
          - 1s - loss: 0.2899 - acc: 0.9580 - val_loss: 0.5945 - val_acc: 0.8226
        Epoch 24/35
          - 1s - loss: 0.2917 - acc: 0.9601 - val_loss: 0.5205 - val_acc: 0.8760
        Epoch 25/35
          - 1s - loss: 0.2708 - acc: 0.9702 - val_loss: 0.5120 - val_acc: 0.8601
        Epoch 26/35
          - 1s - loss: 0.3296 - acc: 0.9394 - val_loss: 0.4779 - val_acc: 0.9106
        Epoch 27/35
          - 1s - loss: 0.3039 - acc: 0.9492 - val_loss: 0.5098 - val_acc: 0.8810
        Epoch 28/35
          - 1s - loss: 0.2615 - acc: 0.9662 - val_loss: 0.4525 - val_acc: 0.8926
        Epoch 29/35
          - 1s - loss: 0.2797 - acc: 0.9601 - val_loss: 0.4426 - val_acc: 0.9106
        Epoch 30/35
          - 1s - loss: 0.3082 - acc: 0.9486 - val_loss: 0.4373 - val_acc: 0.9200
        Epoch 31/35
          - 1s - loss: 0.3073 - acc: 0.9549 - val_loss: 0.4364 - val_acc: 0.9027
        Epoch 32/35
          - 1s - loss: 0.2814 - acc: 0.9522 - val_loss: 0.4718 - val_acc: 0.9193
        Epoch 33/35
          - 1s - loss: 0.2525 - acc: 0.9708 - val_loss: 0.4593 - val_acc: 0.8969
        Epoch 34/35
          - 1s - loss: 0.2614 - acc: 0.9610 - val_loss: 0.5758 - val_acc: 0.8262
        Epoch 35/35
          - 1s - loss: 0.2837 - acc: 0.9534 - val_loss: 0.5137 - val_acc: 0.8882
        Train accuracy 0.9558599695585996 Test accuracy: 0.8882480173035328
        -----------------------------------------------------------------------------
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 126, 32)           896
_____
conv1d_2 (Conv1D)            (None, 122, 16)           2576
_____
dropout_1 (Dropout)          (None, 122, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 16)            0
_____
flatten_1 (Flatten)          (None, 640)               0
_____
dense_1 (Dense)              (None, 32)                20512
_____
dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 24,083
Trainable params: 24,083
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 28.2762 - acc: 0.5674 - val_loss: 16.6344 - val_acc: 0.8061
Epoch 2/55
 - 1s - loss: 10.5629 - acc: 0.9349 - val_loss: 6.4170 - val_acc: 0.8774
Epoch 3/55
 - 1s - loss: 3.9662 - acc: 0.9766 - val_loss: 2.5336 - val_acc: 0.9387
Epoch 4/55
 - 1s - loss: 1.5043 - acc: 0.9820 - val_loss: 1.1191 - val_acc: 0.9358
Epoch 5/55
 - 1s - loss: 0.6249 - acc: 0.9857 - val_loss: 0.6355 - val_acc: 0.9337
Epoch 6/55
 - 1s - loss: 0.3448 - acc: 0.9866 - val_loss: 0.4590 - val_acc: 0.9560
Epoch 7/55
 - 1s - loss: 0.2718 - acc: 0.9817 - val_loss: 0.4147 - val_acc: 0.9466
Epoch 8/55
 - 1s - loss: 0.2108 - acc: 0.9912 - val_loss: 0.4151 - val_acc: 0.9120
Epoch 9/55
 - 1s - loss: 0.2157 - acc: 0.9836 - val_loss: 0.3483 - val_acc: 0.9567
Epoch 10/55
 - 1s - loss: 0.1956 - acc: 0.9900 - val_loss: 0.3472 - val_acc: 0.9402
```

```
Epoch 11/55
 - 1s - loss: 0.1772 - acc: 0.9884 - val_loss: 0.3741 - val_acc: 0.9293
Epoch 12/55
 - 1s - loss: 0.1610 - acc: 0.9936 - val_loss: 0.3708 - val_acc: 0.9012
Epoch 13/55
 - 1s - loss: 0.1490 - acc: 0.9927 - val_loss: 0.3412 - val_acc: 0.9351
Epoch 14/55
 - 1s - loss: 0.2224 - acc: 0.9741 - val_loss: 0.2930 - val_acc: 0.9553
Epoch 15/55
 - 1s - loss: 0.1672 - acc: 0.9890 - val_loss: 0.3166 - val_acc: 0.9279
Epoch 16/55
 - 1s - loss: 0.1442 - acc: 0.9939 - val_loss: 0.3278 - val_acc: 0.9120
Epoch 17/55
 - 1s - loss: 0.1519 - acc: 0.9906 - val_loss: 0.2629 - val_acc: 0.9495
Epoch 18/55
 - 1s - loss: 0.1212 - acc: 0.9951 - val_loss: 0.2826 - val_acc: 0.9394
Epoch 19/55
 - 1s - loss: 0.1379 - acc: 0.9884 - val_loss: 0.2611 - val_acc: 0.9690
Epoch 20/55
 - 1s - loss: 0.1511 - acc: 0.9893 - val_loss: 0.2523 - val_acc: 0.9560
Epoch 21/55
 - 1s - loss: 0.1236 - acc: 0.9930 - val_loss: 0.2726 - val_acc: 0.9539
Epoch 22/55
 - 1s - loss: 0.1247 - acc: 0.9915 - val_loss: 0.2587 - val_acc: 0.9466
Epoch 23/55
 - 1s - loss: 0.1257 - acc: 0.9912 - val_loss: 0.2535 - val_acc: 0.9495
Epoch 24/55
 - 1s - loss: 0.1862 - acc: 0.9708 - val_loss: 0.3748 - val_acc: 0.9423
Epoch 25/55
 - 1s - loss: 0.1690 - acc: 0.9942 - val_loss: 0.3203 - val_acc: 0.9077
Epoch 26/55
 - 1s - loss: 0.1076 - acc: 0.9973 - val_loss: 0.2334 - val_acc: 0.9531
Epoch 27/55
 - 1s - loss: 0.0982 - acc: 0.9951 - val_loss: 0.2766 - val_acc: 0.9315
Epoch 28/55
 - 1s - loss: 0.1034 - acc: 0.9948 - val_loss: 0.2400 - val_acc: 0.9430
Epoch 29/55
 - 1s - loss: 0.0908 - acc: 0.9957 - val_loss: 0.4010 - val_acc: 0.8738
Epoch 30/55
 - 1s - loss: 0.1261 - acc: 0.9833 - val_loss: 0.3960 - val_acc: 0.9005
Epoch 31/55
 - 1s - loss: 0.1247 - acc: 0.9936 - val_loss: 0.2078 - val_acc: 0.9690
Epoch 32/55
```

```
           - 1s - loss: 0.0972 - acc: 0.9933 - val_loss: 0.2316 - val_acc: 0.9466
        Epoch 33/55
           - 1s - loss: 0.1963 - acc: 0.9799 - val_loss: 0.2433 - val_acc: 0.9510
        Epoch 34/55
           - 1s - loss: 0.1033 - acc: 0.9963 - val_loss: 0.2144 - val_acc: 0.9611
        Epoch 35/55
           - 1s - loss: 0.0859 - acc: 0.9954 - val_loss: 0.2469 - val_acc: 0.9409
        Epoch 36/55
           - 1s - loss: 0.0948 - acc: 0.9948 - val_loss: 0.3332 - val_acc: 0.8904
        Epoch 37/55
           - 1s - loss: 0.0858 - acc: 0.9960 - val_loss: 0.2169 - val_acc: 0.9539
        Epoch 38/55
           - 1s - loss: 0.1139 - acc: 0.9909 - val_loss: 0.1983 - val_acc: 0.9603
        Epoch 39/55
           - 1s - loss: 0.0899 - acc: 0.9948 - val_loss: 0.2630 - val_acc: 0.9250
        Epoch 40/55
           - 1s - loss: 0.0864 - acc: 0.9960 - val_loss: 0.2412 - val_acc: 0.9351
        Epoch 41/55
           - 1s - loss: 0.0808 - acc: 0.9951 - val_loss: 0.2144 - val_acc: 0.9539
        Epoch 42/55
           - 1s - loss: 0.0970 - acc: 0.9900 - val_loss: 0.2625 - val_acc: 0.9301
        Epoch 43/55
           - 1s - loss: 0.1001 - acc: 0.9915 - val_loss: 0.2295 - val_acc: 0.9387
        Epoch 44/55
           - 1s - loss: 0.0720 - acc: 0.9970 - val_loss: 0.1722 - val_acc: 0.9690
        Epoch 45/55
           - 1s - loss: 0.0997 - acc: 0.9906 - val_loss: 0.2253 - val_acc: 0.9575
        Epoch 46/55
           - 1s - loss: 0.0838 - acc: 0.9954 - val_loss: 0.1903 - val_acc: 0.9553
        Epoch 47/55
           - 1s - loss: 0.0783 - acc: 0.9948 - val_loss: 0.2360 - val_acc: 0.9524
        Epoch 48/55
           - 1s - loss: 0.0697 - acc: 0.9979 - val_loss: 0.2800 - val_acc: 0.9185
        Epoch 49/55
           - 1s - loss: 0.0744 - acc: 0.9945 - val_loss: 0.2005 - val_acc: 0.9466
        Epoch 50/55
           - 1s - loss: 0.0651 - acc: 0.9979 - val_loss: 0.2347 - val_acc: 0.9293
        Epoch 51/55
           - 1s - loss: 0.0949 - acc: 0.9887 - val_loss: 0.2967 - val_acc: 0.9156
        Epoch 52/55
           - 1s - loss: 0.0851 - acc: 0.9976 - val_loss: 0.1890 - val_acc: 0.9531
        Epoch 53/55
           - 1s - loss: 0.0767 - acc: 0.9948 - val_loss: 0.1632 - val_acc: 0.9632
```

```
Epoch 54/55
 - 1s - loss: 0.0791 - acc: 0.9954 - val_loss: 0.1930 - val_acc: 0.9611
Epoch 55/55
 - 1s - loss: 0.0789 - acc: 0.9942 - val_loss: 0.1825 - val_acc: 0.9582
Train accuracy 0.995738203957382 Test accuracy: 0.9581831290555155
------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 64)	93760
dense_2 (Dense)	(None, 3)	195

```
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 51.6618 - acc: 0.5431 - val_loss: 40.7232 - val_acc: 0.5955
Epoch 2/40
 - 1s - loss: 32.8604 - acc: 0.7686 - val_loss: 25.9306 - val_acc: 0.6712
Epoch 3/40
 - 1s - loss: 20.3436 - acc: 0.8706 - val_loss: 15.9952 - val_acc: 0.5999
Epoch 4/40
 - 1s - loss: 12.0085 - acc: 0.9075 - val_loss: 9.0286 - val_acc: 0.8666
Epoch 5/40
 - 1s - loss: 6.6221 - acc: 0.9245 - val_loss: 4.9597 - val_acc: 0.7916
Epoch 6/40
 - 1s - loss: 3.4546 - acc: 0.9346 - val_loss: 2.7363 - val_acc: 0.7815
Epoch 7/40
 - 1s - loss: 1.7466 - acc: 0.9434 - val_loss: 1.4336 - val_acc: 0.8580
```

```
Epoch 8/40
 - 1s - loss: 0.9204 - acc: 0.9549 - val_loss: 0.8829 - val_acc: 0.8861
Epoch 9/40
 - 1s - loss: 0.5880 - acc: 0.9553 - val_loss: 0.7144 - val_acc: 0.8991
Epoch 10/40
 - 1s - loss: 0.4375 - acc: 0.9680 - val_loss: 0.5876 - val_acc: 0.8947
Epoch 11/40
 - 1s - loss: 0.3712 - acc: 0.9619 - val_loss: 0.5163 - val_acc: 0.9113
Epoch 12/40
 - 1s - loss: 0.3171 - acc: 0.9729 - val_loss: 0.4638 - val_acc: 0.9236
Epoch 13/40
 - 1s - loss: 0.2821 - acc: 0.9711 - val_loss: 1.1270 - val_acc: 0.6294
Epoch 14/40
 - 1s - loss: 0.2649 - acc: 0.9747 - val_loss: 0.4786 - val_acc: 0.8782
Epoch 15/40
 - 1s - loss: 0.2617 - acc: 0.9689 - val_loss: 0.3976 - val_acc: 0.9200
Epoch 16/40
 - 1s - loss: 0.2247 - acc: 0.9763 - val_loss: 0.3359 - val_acc: 0.9510
Epoch 17/40
 - 1s - loss: 0.2190 - acc: 0.9744 - val_loss: 0.3165 - val_acc: 0.9524
Epoch 18/40
 - 1s - loss: 0.1988 - acc: 0.9790 - val_loss: 0.3194 - val_acc: 0.9495
Epoch 19/40
 - 1s - loss: 0.2010 - acc: 0.9763 - val_loss: 0.3082 - val_acc: 0.9546
Epoch 20/40
 - 1s - loss: 0.1852 - acc: 0.9811 - val_loss: 0.3149 - val_acc: 0.9344
Epoch 21/40
 - 1s - loss: 0.1836 - acc: 0.9799 - val_loss: 0.3461 - val_acc: 0.8998
Epoch 22/40
 - 1s - loss: 0.1620 - acc: 0.9839 - val_loss: 0.2855 - val_acc: 0.9409
Epoch 23/40
 - 1s - loss: 0.1668 - acc: 0.9820 - val_loss: 0.2734 - val_acc: 0.9503
Epoch 24/40
 - 1s - loss: 0.1611 - acc: 0.9808 - val_loss: 0.2603 - val_acc: 0.9560
Epoch 25/40
 - 1s - loss: 0.1541 - acc: 0.9836 - val_loss: 0.2332 - val_acc: 0.9567
Epoch 26/40
 - 1s - loss: 0.1675 - acc: 0.9766 - val_loss: 0.2634 - val_acc: 0.9510
Epoch 27/40
 - 1s - loss: 0.1511 - acc: 0.9817 - val_loss: 0.3468 - val_acc: 0.9164
Epoch 28/40
 - 1s - loss: 0.1444 - acc: 0.9845 - val_loss: 0.2191 - val_acc: 0.9575
Epoch 29/40
```

```
        - 1s - loss: 0.1707 - acc: 0.9744 - val_loss: 0.2158 - val_acc: 0.9683
       Epoch 30/40
        - 1s - loss: 0.1474 - acc: 0.9808 - val_loss: 0.2148 - val_acc: 0.9524
       Epoch 31/40
        - 1s - loss: 0.1343 - acc: 0.9814 - val_loss: 0.2195 - val_acc: 0.9697
       Epoch 32/40
        - 1s - loss: 0.1603 - acc: 0.9756 - val_loss: 0.3197 - val_acc: 0.9229
       Epoch 33/40
        - 1s - loss: 0.1201 - acc: 0.9887 - val_loss: 0.2058 - val_acc: 0.9654
       Epoch 34/40
        - 1s - loss: 0.1369 - acc: 0.9845 - val_loss: 0.1893 - val_acc: 0.9676
       Epoch 35/40
        - 1s - loss: 0.1479 - acc: 0.9756 - val_loss: 0.2163 - val_acc: 0.9488
       Epoch 36/40
        - 1s - loss: 0.1385 - acc: 0.9775 - val_loss: 0.2342 - val_acc: 0.9676
       Epoch 37/40
        - 1s - loss: 0.1219 - acc: 0.9863 - val_loss: 0.2329 - val_acc: 0.9430
       Epoch 38/40
        - 1s - loss: 0.1376 - acc: 0.9793 - val_loss: 0.2594 - val_acc: 0.9510
       Epoch 39/40
        - 1s - loss: 0.1038 - acc: 0.9912 - val_loss: 0.2235 - val_acc: 0.9560
       Epoch 40/40
        - 1s - loss: 0.1486 - acc: 0.9769 - val_loss: 0.1948 - val_acc: 0.9683
       Train accuracy 0.9990867579908675 Test accuracy: 0.9682768565248738
       -------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 118, 16)	4720
dropout_1 (Dropout)	(None, 118, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 16)	0
flatten_1 (Flatten)	(None, 624)	0
dense_1 (Dense)	(None, 32)	20000
dense_2 (Dense)	(None, 3)	99

```
Total params: 26,751
```

```
Trainable params: 26,751
Non-trainable params: 0
```
_____

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 21.9190 - acc: 0.7589 - val_loss: 1.3465 - val_acc: 0.8544
Epoch 2/40
 - 1s - loss: 0.5407 - acc: 0.9157 - val_loss: 0.5788 - val_acc: 0.8536
Epoch 3/40
 - 1s - loss: 0.3383 - acc: 0.9434 - val_loss: 0.5668 - val_acc: 0.8580
Epoch 4/40
 - 1s - loss: 0.2782 - acc: 0.9546 - val_loss: 0.4676 - val_acc: 0.8890
Epoch 5/40
 - 1s - loss: 0.2664 - acc: 0.9546 - val_loss: 0.4415 - val_acc: 0.9128
Epoch 6/40
 - 1s - loss: 0.2351 - acc: 0.9623 - val_loss: 0.5409 - val_acc: 0.8457
Epoch 7/40
 - 1s - loss: 0.2201 - acc: 0.9632 - val_loss: 0.3675 - val_acc: 0.9077
Epoch 8/40
 - 1s - loss: 0.1888 - acc: 0.9696 - val_loss: 0.8028 - val_acc: 0.7030
Epoch 9/40
 - 1s - loss: 0.1969 - acc: 0.9680 - val_loss: 0.3532 - val_acc: 0.9308
Epoch 10/40
 - 1s - loss: 0.1872 - acc: 0.9693 - val_loss: 0.3576 - val_acc: 0.8911
Epoch 11/40
 - 1s - loss: 0.1808 - acc: 0.9696 - val_loss: 0.3077 - val_acc: 0.9344
Epoch 12/40
 - 1s - loss: 0.1712 - acc: 0.9756 - val_loss: 0.3154 - val_acc: 0.9351
Epoch 13/40
 - 1s - loss: 0.1779 - acc: 0.9717 - val_loss: 0.4534 - val_acc: 0.8616
Epoch 14/40
 - 1s - loss: 0.1760 - acc: 0.9753 - val_loss: 0.3493 - val_acc: 0.9358
Epoch 15/40
 - 1s - loss: 0.1565 - acc: 0.9756 - val_loss: 0.2595 - val_acc: 0.9503
Epoch 16/40
 - 1s - loss: 0.1656 - acc: 0.9769 - val_loss: 0.2797 - val_acc: 0.9329
Epoch 17/40
 - 1s - loss: 0.1566 - acc: 0.9766 - val_loss: 0.8777 - val_acc: 0.7152
Epoch 18/40
 - 1s - loss: 0.1488 - acc: 0.9793 - val_loss: 0.2892 - val_acc: 0.9301
Epoch 19/40
 - 1s - loss: 0.1585 - acc: 0.9753 - val_loss: 0.2901 - val_acc: 0.9344
```

```
Epoch 20/40
 - 1s - loss: 0.1504 - acc: 0.9799 - val_loss: 0.3182 - val_acc: 0.9495
Epoch 21/40
 - 1s - loss: 0.1551 - acc: 0.9790 - val_loss: 0.8581 - val_acc: 0.7347
Epoch 22/40
 - 1s - loss: 0.1487 - acc: 0.9775 - val_loss: 0.2690 - val_acc: 0.9301
Epoch 23/40
 - 1s - loss: 0.1638 - acc: 0.9750 - val_loss: 0.2135 - val_acc: 0.9640
Epoch 24/40
 - 2s - loss: 0.1583 - acc: 0.9787 - val_loss: 0.2214 - val_acc: 0.9495
Epoch 25/40
 - 2s - loss: 0.1475 - acc: 0.9763 - val_loss: 0.2524 - val_acc: 0.9452
Epoch 26/40
 - 1s - loss: 0.1490 - acc: 0.9802 - val_loss: 0.2289 - val_acc: 0.9394
Epoch 27/40
 - 1s - loss: 0.1483 - acc: 0.9769 - val_loss: 0.2979 - val_acc: 0.9488
Epoch 28/40
 - 1s - loss: 0.1449 - acc: 0.9817 - val_loss: 0.2277 - val_acc: 0.9575
Epoch 29/40
 - 1s - loss: 0.1327 - acc: 0.9830 - val_loss: 0.1941 - val_acc: 0.9582
Epoch 30/40
 - 2s - loss: 0.1662 - acc: 0.9760 - val_loss: 0.1870 - val_acc: 0.9596
Epoch 31/40
 - 1s - loss: 0.1432 - acc: 0.9793 - val_loss: 0.2426 - val_acc: 0.9366
Epoch 32/40
 - 1s - loss: 0.1273 - acc: 0.9811 - val_loss: 0.2175 - val_acc: 0.9553
Epoch 33/40
 - 1s - loss: 0.1469 - acc: 0.9814 - val_loss: 0.2442 - val_acc: 0.9510
Epoch 34/40
 - 1s - loss: 0.1374 - acc: 0.9799 - val_loss: 0.2585 - val_acc: 0.9546
Epoch 35/40
 - 2s - loss: 0.1335 - acc: 0.9805 - val_loss: 0.2048 - val_acc: 0.9567
Epoch 36/40
 - 1s - loss: 0.1380 - acc: 0.9790 - val_loss: 0.2130 - val_acc: 0.9495
Epoch 37/40
 - 1s - loss: 0.1322 - acc: 0.9799 - val_loss: 0.8820 - val_acc: 0.7224
Epoch 38/40
 - 1s - loss: 0.1330 - acc: 0.9820 - val_loss: 0.1879 - val_acc: 0.9704
Epoch 39/40
 - 1s - loss: 0.1466 - acc: 0.9772 - val_loss: 1.3834 - val_acc: 0.6294
Epoch 40/40
 - 1s - loss: 0.1500 - acc: 0.9763 - val_loss: 0.2762 - val_acc: 0.9488
Train accuracy 0.995738203957382 Test accuracy: 0.9488103821196827
```

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Layer (type)                 Output Shape              Param #
================================================================
conv1d_1 (Conv1D)            (None, 124, 42)           1932
_____

conv1d_2 (Conv1D)            (None, 118, 24)           7080
_____

dropout_1 (Dropout)          (None, 118, 24)           0
_____

max_pooling1d_1 (MaxPooling1 (None, 39, 24)           0
_____

flatten_1 (Flatten)          (None, 936)               0
_____

dense_1 (Dense)              (None, 32)                29984
_____

dense_2 (Dense)              (None, 3)                 99
================================================================
Total params: 39,095
Trainable params: 39,095
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 52.5636 - acc: 0.7559 - val_loss: 1.0339 - val_acc: 0.6294
Epoch 2/55
 - 2s - loss: 0.5715 - acc: 0.8767 - val_loss: 0.6873 - val_acc: 0.7938
Epoch 3/55
 - 2s - loss: 0.4493 - acc: 0.9117 - val_loss: 0.6357 - val_acc: 0.8587
Epoch 4/55
 - 2s - loss: 0.3747 - acc: 0.9297 - val_loss: 0.5079 - val_acc: 0.8919
Epoch 5/55
 - 2s - loss: 0.3641 - acc: 0.9306 - val_loss: 0.4944 - val_acc: 0.9019
Epoch 6/55
 - 2s - loss: 0.3472 - acc: 0.9394 - val_loss: 0.7986 - val_acc: 0.8010
Epoch 7/55
 - 2s - loss: 0.3374 - acc: 0.9434 - val_loss: 0.8779 - val_acc: 0.7686
Epoch 8/55
 - 2s - loss: 0.3151 - acc: 0.9470 - val_loss: 0.5562 - val_acc: 0.8652
Epoch 9/55
 - 2s - loss: 0.3252 - acc: 0.9434 - val_loss: 0.5070 - val_acc: 0.8991
Epoch 10/55
```

```
               - 2s - loss: 0.3068 - acc: 0.9519 - val_loss: 0.4363 - val_acc: 0.8897
          Epoch 11/55
               - 2s - loss: 0.3167 - acc: 0.9464 - val_loss: 0.3636 - val_acc: 0.9337
          Epoch 12/55
               - 2s - loss: 0.2938 - acc: 0.9549 - val_loss: 0.3725 - val_acc: 0.9178
          Epoch 13/55
               - 2s - loss: 0.2903 - acc: 0.9546 - val_loss: 0.3852 - val_acc: 0.9394
          Epoch 14/55
               - 2s - loss: 0.2777 - acc: 0.9580 - val_loss: 0.4562 - val_acc: 0.9120
          Epoch 15/55
               - 2s - loss: 0.2710 - acc: 0.9626 - val_loss: 0.6434 - val_acc: 0.8176
          Epoch 16/55
               - 2s - loss: 0.2814 - acc: 0.9607 - val_loss: 0.6420 - val_acc: 0.7988
          Epoch 17/55
               - 2s - loss: 0.2830 - acc: 0.9592 - val_loss: 0.9929 - val_acc: 0.7210
          Epoch 18/55
               - 2s - loss: 0.2720 - acc: 0.9629 - val_loss: 0.7271 - val_acc: 0.7671
          Epoch 19/55
               - 2s - loss: 0.2874 - acc: 0.9583 - val_loss: 0.3698 - val_acc: 0.9409
          Epoch 20/55
               - 2s - loss: 0.2883 - acc: 0.9559 - val_loss: 0.9324 - val_acc: 0.7505
          Epoch 21/55
               - 2s - loss: 0.2734 - acc: 0.9616 - val_loss: 0.4358 - val_acc: 0.8825
          Epoch 22/55
               - 2s - loss: 0.2721 - acc: 0.9589 - val_loss: 1.2508 - val_acc: 0.7743
          Epoch 23/55
               - 2s - loss: 0.2634 - acc: 0.9610 - val_loss: 0.5189 - val_acc: 0.8702
          Epoch 24/55
               - 2s - loss: 0.2913 - acc: 0.9592 - val_loss: 0.2939 - val_acc: 0.9459
          Epoch 25/55
               - 2s - loss: 0.2831 - acc: 0.9525 - val_loss: 0.4293 - val_acc: 0.9113
          Epoch 26/55
               - 2s - loss: 0.2620 - acc: 0.9641 - val_loss: 0.3098 - val_acc: 0.9351
          Epoch 27/55
               - 2s - loss: 0.2703 - acc: 0.9589 - val_loss: 0.3576 - val_acc: 0.9156
          Epoch 28/55
               - 2s - loss: 0.2686 - acc: 0.9610 - val_loss: 0.3386 - val_acc: 0.9229
          Epoch 29/55
               - 2s - loss: 0.2553 - acc: 0.9659 - val_loss: 0.3240 - val_acc: 0.9301
          Epoch 30/55
               - 2s - loss: 0.2633 - acc: 0.9638 - val_loss: 0.3620 - val_acc: 0.9128
          Epoch 31/55
               - 2s - loss: 0.2777 - acc: 0.9601 - val_loss: 0.3609 - val_acc: 0.9041
```

```
Epoch 32/55
 - 2s - loss: 0.2902 - acc: 0.9562 - val_loss: 0.4645 - val_acc: 0.9034
Epoch 33/55
 - 2s - loss: 0.2551 - acc: 0.9641 - val_loss: 0.2906 - val_acc: 0.9438
Epoch 34/55
 - 2s - loss: 0.2972 - acc: 0.9568 - val_loss: 0.3937 - val_acc: 0.8962
Epoch 35/55
 - 2s - loss: 0.2799 - acc: 0.9562 - val_loss: 0.6142 - val_acc: 0.8421
Epoch 36/55
 - 2s - loss: 0.2663 - acc: 0.9601 - val_loss: 0.4002 - val_acc: 0.9315
Epoch 37/55
 - 2s - loss: 0.2489 - acc: 0.9638 - val_loss: 0.4220 - val_acc: 0.8976
Epoch 38/55
 - 2s - loss: 0.2854 - acc: 0.9589 - val_loss: 0.3728 - val_acc: 0.9056
Epoch 39/55
 - 2s - loss: 0.2644 - acc: 0.9589 - val_loss: 1.0101 - val_acc: 0.6994
Epoch 40/55
 - 2s - loss: 0.2724 - acc: 0.9546 - val_loss: 0.3500 - val_acc: 0.9308
Epoch 41/55
 - 2s - loss: 0.2548 - acc: 0.9610 - val_loss: 0.3670 - val_acc: 0.9149
Epoch 42/55
 - 2s - loss: 0.2737 - acc: 0.9613 - val_loss: 0.3554 - val_acc: 0.9358
Epoch 43/55
 - 2s - loss: 0.2458 - acc: 0.9610 - val_loss: 0.2616 - val_acc: 0.9560
Epoch 44/55
 - 2s - loss: 0.2626 - acc: 0.9574 - val_loss: 0.3573 - val_acc: 0.9322
Epoch 45/55
 - 2s - loss: 0.2367 - acc: 0.9671 - val_loss: 0.3610 - val_acc: 0.9322
Epoch 46/55
 - 2s - loss: 0.2694 - acc: 0.9662 - val_loss: 0.4521 - val_acc: 0.8738
Epoch 47/55
 - 2s - loss: 0.2515 - acc: 0.9610 - val_loss: 0.4352 - val_acc: 0.8846
Epoch 48/55
 - 2s - loss: 0.2537 - acc: 0.9574 - val_loss: 0.3574 - val_acc: 0.9344
Epoch 49/55
 - 2s - loss: 0.2528 - acc: 0.9644 - val_loss: 1.1213 - val_acc: 0.6107
Epoch 50/55
 - 2s - loss: 0.2698 - acc: 0.9559 - val_loss: 0.3919 - val_acc: 0.9120
Epoch 51/55
 - 2s - loss: 0.2465 - acc: 0.9668 - val_loss: 0.4081 - val_acc: 0.9084
Epoch 52/55
 - 2s - loss: 0.2499 - acc: 0.9626 - val_loss: 0.3204 - val_acc: 0.9337
Epoch 53/55
```

```
 - 2s - loss: 0.2365 - acc: 0.9680 - val_loss: 0.6229 - val_acc: 0.8522
Epoch 54/55
 - 2s - loss: 0.2391 - acc: 0.9607 - val_loss: 0.7255 - val_acc: 0.7931
Epoch 55/55
 - 2s - loss: 0.2501 - acc: 0.9650 - val_loss: 0.3252 - val_acc: 0.9250
Train accuracy 0.9875190258751902 Test accuracy: 0.9250180245133381
------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 118, 32)	4512
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 32)	0
flatten_1 (Flatten)	(None, 1248)	0
dense_1 (Dense)	(None, 64)	79936
dense_2 (Dense)	(None, 3)	195

```
Total params: 86,435
Trainable params: 86,435
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 8.7280 - acc: 0.6971 - val_loss: 0.7152 - val_acc: 0.8536
Epoch 2/55
 - 2s - loss: 0.5778 - acc: 0.8651 - val_loss: 0.7288 - val_acc: 0.7469
Epoch 3/55
 - 2s - loss: 0.4836 - acc: 0.8932 - val_loss: 0.5946 - val_acc: 0.8594
Epoch 4/55
 - 2s - loss: 0.4406 - acc: 0.9142 - val_loss: 0.6556 - val_acc: 0.8284
Epoch 5/55
 - 2s - loss: 0.4581 - acc: 0.9218 - val_loss: 0.5723 - val_acc: 0.8587
Epoch 6/55
 - 2s - loss: 0.4255 - acc: 0.9227 - val_loss: 0.5282 - val_acc: 0.8673
Epoch 7/55
```

```
          - 2s - loss: 0.4130 - acc: 0.9279 - val_loss: 0.8265 - val_acc: 0.7549
        Epoch 8/55
          - 2s - loss: 0.3894 - acc: 0.9330 - val_loss: 1.0518 - val_acc: 0.6777
        Epoch 9/55
          - 2s - loss: 0.3946 - acc: 0.9291 - val_loss: 0.5045 - val_acc: 0.9135
        Epoch 10/55
          - 2s - loss: 0.3791 - acc: 0.9315 - val_loss: 0.5421 - val_acc: 0.8911
        Epoch 11/55
          - 2s - loss: 0.3765 - acc: 0.9367 - val_loss: 0.4627 - val_acc: 0.9113
        Epoch 12/55
          - 2s - loss: 0.3931 - acc: 0.9382 - val_loss: 0.6028 - val_acc: 0.8976
        Epoch 13/55
          - 2s - loss: 0.3693 - acc: 0.9385 - val_loss: 0.5311 - val_acc: 0.9077
        Epoch 14/55
          - 2s - loss: 0.3639 - acc: 0.9419 - val_loss: 0.5526 - val_acc: 0.8515
        Epoch 15/55
          - 2s - loss: 0.3452 - acc: 0.9434 - val_loss: 0.7504 - val_acc: 0.7606
        Epoch 16/55
          - 2s - loss: 0.3733 - acc: 0.9388 - val_loss: 0.5266 - val_acc: 0.8724
        Epoch 17/55
          - 2s - loss: 0.3560 - acc: 0.9446 - val_loss: 0.7940 - val_acc: 0.7844
        Epoch 18/55
          - 2s - loss: 0.3578 - acc: 0.9400 - val_loss: 1.0112 - val_acc: 0.6756
        Epoch 19/55
          - 2s - loss: 0.3708 - acc: 0.9409 - val_loss: 0.4420 - val_acc: 0.9308
        Epoch 20/55
          - 2s - loss: 0.3557 - acc: 0.9373 - val_loss: 0.4187 - val_acc: 0.9329
        Epoch 21/55
          - 2s - loss: 0.3465 - acc: 0.9440 - val_loss: 0.5257 - val_acc: 0.8580
        Epoch 22/55
          - 2s - loss: 0.3521 - acc: 0.9412 - val_loss: 0.5139 - val_acc: 0.9077
        Epoch 23/55
          - 2s - loss: 0.3591 - acc: 0.9446 - val_loss: 0.4956 - val_acc: 0.9164
        Epoch 24/55
          - 2s - loss: 0.3607 - acc: 0.9379 - val_loss: 0.6208 - val_acc: 0.8205
        Epoch 25/55
          - 2s - loss: 0.3583 - acc: 0.9440 - val_loss: 0.5110 - val_acc: 0.9221
        Epoch 26/55
          - 2s - loss: 0.3514 - acc: 0.9464 - val_loss: 0.4019 - val_acc: 0.9200
        Epoch 27/55
          - 2s - loss: 0.3589 - acc: 0.9428 - val_loss: 0.4475 - val_acc: 0.9322
        Epoch 28/55
          - 2s - loss: 0.3501 - acc: 0.9434 - val_loss: 0.4365 - val_acc: 0.9012
```

```
Epoch 29/55
 - 2s - loss: 0.3257 - acc: 0.9476 - val_loss: 0.4408 - val_acc: 0.9084
Epoch 30/55
 - 2s - loss: 0.3408 - acc: 0.9434 - val_loss: 0.5070 - val_acc: 0.8349
Epoch 31/55
 - 2s - loss: 0.3441 - acc: 0.9458 - val_loss: 0.4351 - val_acc: 0.8926
Epoch 32/55
 - 2s - loss: 0.3517 - acc: 0.9431 - val_loss: 0.4317 - val_acc: 0.9019
Epoch 33/55
 - 2s - loss: 0.3481 - acc: 0.9449 - val_loss: 1.7227 - val_acc: 0.5768
Epoch 34/55
 - 2s - loss: 0.3526 - acc: 0.9458 - val_loss: 0.8041 - val_acc: 0.7967
Epoch 35/55
 - 2s - loss: 0.3561 - acc: 0.9446 - val_loss: 0.6262 - val_acc: 0.8356
Epoch 36/55
 - 2s - loss: 0.3374 - acc: 0.9428 - val_loss: 0.9065 - val_acc: 0.7455
Epoch 37/55
 - 2s - loss: 0.3453 - acc: 0.9452 - val_loss: 0.4597 - val_acc: 0.9063
Epoch 38/55
 - 2s - loss: 0.3479 - acc: 0.9431 - val_loss: 0.5338 - val_acc: 0.8565
Epoch 39/55
 - 2s - loss: 0.3364 - acc: 0.9467 - val_loss: 1.2659 - val_acc: 0.6251
Epoch 40/55
 - 2s - loss: 0.3417 - acc: 0.9464 - val_loss: 0.4662 - val_acc: 0.8652
Epoch 41/55
 - 2s - loss: 0.3407 - acc: 0.9379 - val_loss: 0.6980 - val_acc: 0.7981
Epoch 42/55
 - 2s - loss: 0.3424 - acc: 0.9443 - val_loss: 0.6002 - val_acc: 0.8198
Epoch 43/55
 - 2s - loss: 0.3223 - acc: 0.9461 - val_loss: 0.7452 - val_acc: 0.7058
Epoch 44/55
 - 2s - loss: 0.3468 - acc: 0.9397 - val_loss: 0.5374 - val_acc: 0.8421
Epoch 45/55
 - 2s - loss: 0.3263 - acc: 0.9403 - val_loss: 0.3459 - val_acc: 0.9524
Epoch 46/55
 - 2s - loss: 0.3302 - acc: 0.9437 - val_loss: 0.5176 - val_acc: 0.8450
Epoch 47/55
 - 2s - loss: 0.3188 - acc: 0.9458 - val_loss: 1.0189 - val_acc: 0.6864
Epoch 48/55
 - 2s - loss: 0.3404 - acc: 0.9397 - val_loss: 0.5271 - val_acc: 0.8435
Epoch 49/55
 - 2s - loss: 0.3234 - acc: 0.9452 - val_loss: 0.4461 - val_acc: 0.8789
Epoch 50/55
```

```
 - 2s - loss: 0.3290 - acc: 0.9403 - val_loss: 0.7060 - val_acc: 0.7924
Epoch 51/55
 - 2s - loss: 0.3050 - acc: 0.9495 - val_loss: 0.8587 - val_acc: 0.7751
Epoch 52/55
 - 2s - loss: 0.3309 - acc: 0.9428 - val_loss: 0.5563 - val_acc: 0.8407
Epoch 53/55
 - 2s - loss: 0.3049 - acc: 0.9434 - val_loss: 0.5133 - val_acc: 0.8479
Epoch 54/55
 - 2s - loss: 0.3184 - acc: 0.9461 - val_loss: 0.5947 - val_acc: 0.8760
Epoch 55/55
 - 2s - loss: 0.3195 - acc: 0.9452 - val_loss: 1.1686 - val_acc: 0.5768
Train accuracy 0.6821917808491346 Test accuracy: 0.5767844268419627
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 124, 32)	4064
dropout_1 (Dropout)	(None, 124, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 62, 32)	0
flatten_1 (Flatten)	(None, 1984)	0
dense_1 (Dense)	(None, 16)	31760
dense_2 (Dense)	(None, 3)	51

```
Total params: 37,051
Trainable params: 37,051
Non-trainable params: 0

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 23.4528 - acc: 0.5519 - val_loss: 3.0340 - val_acc: 0.6114
Epoch 2/35
 - 1s - loss: 1.1015 - acc: 0.7875 - val_loss: 0.8889 - val_acc: 0.6878
Epoch 3/35
 - 1s - loss: 0.5961 - acc: 0.8548 - val_loss: 1.0774 - val_acc: 0.6525
Epoch 4/35
```

```
                  - 1s - loss: 0.5061 - acc: 0.8773 - val_loss: 0.6353 - val_acc: 0.8335
          Epoch 5/35
                  - 1s - loss: 0.4545 - acc: 0.8977 - val_loss: 0.7941 - val_acc: 0.7267
          Epoch 6/35
                  - 1s - loss: 0.4194 - acc: 0.9078 - val_loss: 0.6599 - val_acc: 0.8198
          Epoch 7/35
                  - 1s - loss: 0.4131 - acc: 0.9117 - val_loss: 1.0075 - val_acc: 0.7066
          Epoch 8/35
                  - 1s - loss: 0.3933 - acc: 0.9215 - val_loss: 0.6010 - val_acc: 0.8479
          Epoch 9/35
                  - 1s - loss: 0.3786 - acc: 0.9205 - val_loss: 0.6193 - val_acc: 0.8378
          Epoch 10/35
                  - 1s - loss: 0.3597 - acc: 0.9227 - val_loss: 0.5554 - val_acc: 0.8479
          Epoch 11/35
                  - 1s - loss: 0.3586 - acc: 0.9215 - val_loss: 0.9227 - val_acc: 0.7066
          Epoch 12/35
                  - 1s - loss: 0.3650 - acc: 0.9218 - val_loss: 0.6627 - val_acc: 0.8118
          Epoch 13/35
                  - 1s - loss: 0.3405 - acc: 0.9352 - val_loss: 1.0211 - val_acc: 0.6460
          Epoch 14/35
                  - 1s - loss: 0.3535 - acc: 0.9254 - val_loss: 0.5645 - val_acc: 0.8508
          Epoch 15/35
                  - 1s - loss: 0.3471 - acc: 0.9321 - val_loss: 0.6164 - val_acc: 0.8255
          Epoch 16/35
                  - 1s - loss: 0.3306 - acc: 0.9370 - val_loss: 0.6660 - val_acc: 0.8125
          Epoch 17/35
                  - 1s - loss: 0.3346 - acc: 0.9327 - val_loss: 0.5251 - val_acc: 0.8738
          Epoch 18/35
                  - 1s - loss: 0.3503 - acc: 0.9300 - val_loss: 0.7160 - val_acc: 0.8010
          Epoch 19/35
                  - 1s - loss: 0.3267 - acc: 0.9358 - val_loss: 0.5577 - val_acc: 0.8666
          Epoch 20/35
                  - 1s - loss: 0.3318 - acc: 0.9358 - val_loss: 0.5640 - val_acc: 0.8594
          Epoch 21/35
                  - 1s - loss: 0.3488 - acc: 0.9312 - val_loss: 0.6625 - val_acc: 0.8169
          Epoch 22/35
                  - 1s - loss: 0.3511 - acc: 0.9294 - val_loss: 0.8688 - val_acc: 0.7527
          Epoch 23/35
                  - 1s - loss: 0.3243 - acc: 0.9355 - val_loss: 0.4566 - val_acc: 0.9063
          Epoch 24/35
                  - 1s - loss: 0.3412 - acc: 0.9342 - val_loss: 0.4717 - val_acc: 0.9149
          Epoch 25/35
                  - 1s - loss: 0.3115 - acc: 0.9452 - val_loss: 0.4459 - val_acc: 0.8983
```

```
Epoch 26/35
 - 1s - loss: 0.3313 - acc: 0.9400 - val_loss: 0.5215 - val_acc: 0.8810
Epoch 27/35
 - 1s - loss: 0.3099 - acc: 0.9394 - val_loss: 0.6833 - val_acc: 0.7988
Epoch 28/35
 - 1s - loss: 0.3338 - acc: 0.9361 - val_loss: 0.4430 - val_acc: 0.8868
Epoch 29/35
 - 1s - loss: 0.3073 - acc: 0.9437 - val_loss: 0.4927 - val_acc: 0.8998
Epoch 30/35
 - 1s - loss: 0.3156 - acc: 0.9397 - val_loss: 0.5164 - val_acc: 0.8745
Epoch 31/35
 - 1s - loss: 0.3132 - acc: 0.9409 - val_loss: 0.5715 - val_acc: 0.8652
Epoch 32/35
 - 1s - loss: 0.3254 - acc: 0.9406 - val_loss: 0.5323 - val_acc: 0.8839
Epoch 33/35
 - 1s - loss: 0.3126 - acc: 0.9452 - val_loss: 0.7513 - val_acc: 0.8068
Epoch 34/35
 - 1s - loss: 0.3180 - acc: 0.9406 - val_loss: 0.5241 - val_acc: 0.8745
Epoch 35/35
 - 1s - loss: 0.3073 - acc: 0.9452 - val_loss: 0.4203 - val_acc: 0.8976
Train accuracy 0.9747336377473363 Test accuracy: 0.8976207642393655
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 28)	784
conv1d_2 (Conv1D)	(None, 122, 16)	2256
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 32)	31264
dense_2 (Dense)	(None, 3)	99

```
Total params: 34,403
Trainable params: 34,403
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 138.2000 - acc: 0.5434 - val_loss: 87.4715 - val_acc: 0.5869
Epoch 2/55
 - 1s - loss: 60.0253 - acc: 0.7714 - val_loss: 39.0568 - val_acc: 0.6756
Epoch 3/55
 - 1s - loss: 26.7701 - acc: 0.8874 - val_loss: 17.5310 - val_acc: 0.7556
Epoch 4/55
 - 1s - loss: 11.7832 - acc: 0.9172 - val_loss: 7.7392 - val_acc: 0.7787
Epoch 5/55
 - 1s - loss: 5.0709 - acc: 0.9227 - val_loss: 3.4664 - val_acc: 0.8234
Epoch 6/55
 - 1s - loss: 2.2252 - acc: 0.9397 - val_loss: 1.7176 - val_acc: 0.8536
Epoch 7/55
 - 1s - loss: 1.1189 - acc: 0.9391 - val_loss: 1.0935 - val_acc: 0.7967
Epoch 8/55
 - 1s - loss: 0.7236 - acc: 0.9309 - val_loss: 0.8259 - val_acc: 0.8630
Epoch 9/55
 - 1s - loss: 0.5725 - acc: 0.9355 - val_loss: 0.7340 - val_acc: 0.8717
Epoch 10/55
 - 1s - loss: 0.5121 - acc: 0.9416 - val_loss: 0.7958 - val_acc: 0.7671
Epoch 11/55
 - 1s - loss: 0.4668 - acc: 0.9391 - val_loss: 0.5968 - val_acc: 0.9344
Epoch 12/55
 - 1s - loss: 0.4253 - acc: 0.9525 - val_loss: 0.6158 - val_acc: 0.8890
Epoch 13/55
 - 1s - loss: 0.4088 - acc: 0.9531 - val_loss: 0.6211 - val_acc: 0.8623
Epoch 14/55
 - 1s - loss: 0.3863 - acc: 0.9540 - val_loss: 0.5313 - val_acc: 0.9423
Epoch 15/55
 - 1s - loss: 0.3628 - acc: 0.9623 - val_loss: 0.4968 - val_acc: 0.9466
Epoch 16/55
 - 1s - loss: 0.3527 - acc: 0.9638 - val_loss: 0.5537 - val_acc: 0.8673
Epoch 17/55
 - 1s - loss: 0.3547 - acc: 0.9595 - val_loss: 0.5056 - val_acc: 0.9250
Epoch 18/55
 - 1s - loss: 0.3138 - acc: 0.9720 - val_loss: 0.4726 - val_acc: 0.9430
Epoch 19/55
 - 1s - loss: 0.3126 - acc: 0.9662 - val_loss: 0.5051 - val_acc: 0.8897
Epoch 20/55
 - 1s - loss: 0.3115 - acc: 0.9671 - val_loss: 0.4226 - val_acc: 0.9668
Epoch 21/55
```

```
         - 1s - loss: 0.2942 - acc: 0.9696 - val_loss: 0.4723 - val_acc: 0.9200
Epoch 22/55
         - 1s - loss: 0.2959 - acc: 0.9696 - val_loss: 0.4484 - val_acc: 0.9452
Epoch 23/55
         - 1s - loss: 0.2850 - acc: 0.9708 - val_loss: 0.4439 - val_acc: 0.9423
Epoch 24/55
         - 1s - loss: 0.2916 - acc: 0.9632 - val_loss: 0.3855 - val_acc: 0.9676
Epoch 25/55
         - 1s - loss: 0.2624 - acc: 0.9784 - val_loss: 0.4021 - val_acc: 0.9481
Epoch 26/55
         - 1s - loss: 0.2598 - acc: 0.9766 - val_loss: 0.3956 - val_acc: 0.9373
Epoch 27/55
         - 1s - loss: 0.2584 - acc: 0.9720 - val_loss: 0.4424 - val_acc: 0.9156
Epoch 28/55
         - 1s - loss: 0.2473 - acc: 0.9784 - val_loss: 0.3968 - val_acc: 0.9351
Epoch 29/55
         - 1s - loss: 0.2503 - acc: 0.9726 - val_loss: 0.4069 - val_acc: 0.9286
Epoch 30/55
         - 1s - loss: 0.2494 - acc: 0.9778 - val_loss: 0.3786 - val_acc: 0.9430
Epoch 31/55
         - 1s - loss: 0.2336 - acc: 0.9766 - val_loss: 0.3381 - val_acc: 0.9531
Epoch 32/55
         - 1s - loss: 0.2522 - acc: 0.9653 - val_loss: 0.4257 - val_acc: 0.9063
Epoch 33/55
         - 1s - loss: 0.2350 - acc: 0.9799 - val_loss: 0.4018 - val_acc: 0.9077
Epoch 34/55
         - 1s - loss: 0.2103 - acc: 0.9808 - val_loss: 0.3774 - val_acc: 0.9560
Epoch 35/55
         - 1s - loss: 0.2163 - acc: 0.9808 - val_loss: 0.4825 - val_acc: 0.8479
Epoch 36/55
         - 1s - loss: 0.2172 - acc: 0.9781 - val_loss: 0.3321 - val_acc: 0.9524
Epoch 37/55
         - 1s - loss: 0.2118 - acc: 0.9796 - val_loss: 0.3399 - val_acc: 0.9272
Epoch 38/55
         - 1s - loss: 0.2112 - acc: 0.9787 - val_loss: 0.3357 - val_acc: 0.9474
Epoch 39/55
         - 1s - loss: 0.1997 - acc: 0.9839 - val_loss: 0.3142 - val_acc: 0.9632
Epoch 40/55
         - 1s - loss: 0.1945 - acc: 0.9836 - val_loss: 0.3328 - val_acc: 0.9596
Epoch 41/55
         - 1s - loss: 0.1936 - acc: 0.9814 - val_loss: 0.3878 - val_acc: 0.9279
Epoch 42/55
         - 1s - loss: 0.2337 - acc: 0.9729 - val_loss: 0.3927 - val_acc: 0.9200
```

```
Epoch 43/55
 - 1s - loss: 0.1875 - acc: 0.9860 - val_loss: 0.3667 - val_acc: 0.8882
Epoch 44/55
 - 1s - loss: 0.1810 - acc: 0.9884 - val_loss: 0.3306 - val_acc: 0.9488
Epoch 45/55
 - 1s - loss: 0.1977 - acc: 0.9799 - val_loss: 0.4497 - val_acc: 0.9027
Epoch 46/55
 - 1s - loss: 0.2017 - acc: 0.9802 - val_loss: 0.2973 - val_acc: 0.9517
Epoch 47/55
 - 1s - loss: 0.1781 - acc: 0.9805 - val_loss: 0.3138 - val_acc: 0.9438
Epoch 48/55
 - 1s - loss: 0.1777 - acc: 0.9799 - val_loss: 0.4464 - val_acc: 0.8630
Epoch 49/55
 - 1s - loss: 0.1948 - acc: 0.9799 - val_loss: 0.3044 - val_acc: 0.9625
Epoch 50/55
 - 1s - loss: 0.1871 - acc: 0.9814 - val_loss: 0.2988 - val_acc: 0.9503
Epoch 51/55
 - 1s - loss: 0.1796 - acc: 0.9799 - val_loss: 0.4418 - val_acc: 0.8630
Epoch 52/55
 - 1s - loss: 0.1676 - acc: 0.9869 - val_loss: 0.2914 - val_acc: 0.9575
Epoch 53/55
 - 1s - loss: 0.1931 - acc: 0.9766 - val_loss: 0.3448 - val_acc: 0.9445
Epoch 54/55
 - 1s - loss: 0.1806 - acc: 0.9839 - val_loss: 0.3004 - val_acc: 0.9589
Epoch 55/55
 - 1s - loss: 0.1468 - acc: 0.9903 - val_loss: 0.2748 - val_acc: 0.9510
Train accuracy 0.9899543378995433 Test accuracy: 0.9509733237202596
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 120, 24)	5064
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 24)	0
flatten_1 (Flatten)	(None, 576)	0
dense_1 (Dense)	(None, 32)	18464

```
dense_2 (Dense)                 (None, 3)                      99
=================================================================
Total params: 25,559
Trainable params: 25,559
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 32.0117 - acc: 0.5251 - val_loss: 1.0820 - val_acc: 0.6691
Epoch 2/55
 - 2s - loss: 0.7649 - acc: 0.7534 - val_loss: 1.1165 - val_acc: 0.5119
Epoch 3/55
 - 2s - loss: 0.6777 - acc: 0.7948 - val_loss: 0.7769 - val_acc: 0.7830
Epoch 4/55
 - 2s - loss: 0.6377 - acc: 0.8149 - val_loss: 0.8609 - val_acc: 0.7513
Epoch 5/55
 - 2s - loss: 0.5717 - acc: 0.8621 - val_loss: 0.6948 - val_acc: 0.8774
Epoch 6/55
 - 2s - loss: 0.5568 - acc: 0.8694 - val_loss: 0.9440 - val_acc: 0.7563
Epoch 7/55
 - 2s - loss: 0.5312 - acc: 0.8788 - val_loss: 0.9818 - val_acc: 0.6359
Epoch 8/55
 - 2s - loss: 0.5160 - acc: 0.8861 - val_loss: 0.9606 - val_acc: 0.6006
Epoch 9/55
 - 2s - loss: 0.5276 - acc: 0.8828 - val_loss: 0.6106 - val_acc: 0.9142
Epoch 10/55
 - 2s - loss: 0.4975 - acc: 0.8959 - val_loss: 0.7108 - val_acc: 0.8594
Epoch 11/55
 - 2s - loss: 0.4842 - acc: 0.8983 - val_loss: 0.6303 - val_acc: 0.8558
Epoch 12/55
 - 2s - loss: 0.5106 - acc: 0.8944 - val_loss: 0.7753 - val_acc: 0.7931
Epoch 13/55
 - 2s - loss: 0.5170 - acc: 0.8971 - val_loss: 0.7631 - val_acc: 0.8342
Epoch 14/55
 - 2s - loss: 0.5088 - acc: 0.9005 - val_loss: 0.8247 - val_acc: 0.8262
Epoch 15/55
 - 2s - loss: 0.4950 - acc: 0.9105 - val_loss: 0.7549 - val_acc: 0.8342
Epoch 16/55
 - 2s - loss: 0.4967 - acc: 0.9017 - val_loss: 1.5809 - val_acc: 0.4758
Epoch 17/55
 - 2s - loss: 0.5020 - acc: 0.9081 - val_loss: 1.3523 - val_acc: 0.7383
Epoch 18/55
```

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        - 2s - loss: 0.4951 - acc: 0.9053 - val_loss: 1.0570 - val_acc: 0.6027
Epoch 19/55
        - 2s - loss: 0.5088 - acc: 0.9047 - val_loss: 0.6761 - val_acc: 0.8443
Epoch 20/55
        - 2s - loss: 0.4696 - acc: 0.9047 - val_loss: 0.7718 - val_acc: 0.7203
Epoch 21/55
        - 2s - loss: 0.4835 - acc: 0.9093 - val_loss: 0.6957 - val_acc: 0.8169
Epoch 22/55
        - 2s - loss: 0.4871 - acc: 0.9059 - val_loss: 0.5920 - val_acc: 0.9200
Epoch 23/55
        - 2s - loss: 0.4985 - acc: 0.9078 - val_loss: 0.6320 - val_acc: 0.8745
Epoch 24/55
        - 2s - loss: 0.4869 - acc: 0.9084 - val_loss: 0.7574 - val_acc: 0.8320
Epoch 25/55
        - 2s - loss: 0.4875 - acc: 0.9099 - val_loss: 0.7111 - val_acc: 0.7823
Epoch 26/55
        - 2s - loss: 0.4743 - acc: 0.9078 - val_loss: 0.7986 - val_acc: 0.8270
Epoch 27/55
        - 2s - loss: 0.5010 - acc: 0.9102 - val_loss: 0.6926 - val_acc: 0.8846
Epoch 28/55
        - 2s - loss: 0.4733 - acc: 0.9129 - val_loss: 0.6714 - val_acc: 0.8745
Epoch 29/55
        - 2s - loss: 0.4744 - acc: 0.9111 - val_loss: 0.6180 - val_acc: 0.8738
Epoch 30/55
        - 2s - loss: 0.4532 - acc: 0.9202 - val_loss: 1.1736 - val_acc: 0.5970
Epoch 31/55
        - 2s - loss: 0.4628 - acc: 0.9193 - val_loss: 0.6903 - val_acc: 0.8356
Epoch 32/55
        - 2s - loss: 0.4614 - acc: 0.9129 - val_loss: 0.5444 - val_acc: 0.8854
Epoch 33/55
        - 2s - loss: 0.4381 - acc: 0.9248 - val_loss: 1.4653 - val_acc: 0.5516
Epoch 34/55
        - 2s - loss: 0.4370 - acc: 0.9242 - val_loss: 0.7165 - val_acc: 0.7743
Epoch 35/55
        - 2s - loss: 0.4403 - acc: 0.9205 - val_loss: 0.5658 - val_acc: 0.8846
Epoch 36/55
        - 2s - loss: 0.4470 - acc: 0.9142 - val_loss: 0.6108 - val_acc: 0.8803
Epoch 37/55
        - 2s - loss: 0.4384 - acc: 0.9236 - val_loss: 1.7567 - val_acc: 0.5220
Epoch 38/55
        - 2s - loss: 0.4589 - acc: 0.9126 - val_loss: 0.6287 - val_acc: 0.8479
Epoch 39/55
        - 2s - loss: 0.4384 - acc: 0.9242 - val_loss: 2.5639 - val_acc: 0.3691
```

```
Epoch 40/55
 - 2s - loss: 0.4329 - acc: 0.9242 - val_loss: 1.2882 - val_acc: 0.6128
Epoch 41/55
 - 2s - loss: 0.4434 - acc: 0.9221 - val_loss: 0.5637 - val_acc: 0.8839
Epoch 42/55
 - 2s - loss: 0.4268 - acc: 0.9279 - val_loss: 0.6116 - val_acc: 0.8623
Epoch 43/55
 - 2s - loss: 0.4292 - acc: 0.9233 - val_loss: 0.7056 - val_acc: 0.8089
Epoch 44/55
 - 2s - loss: 0.4231 - acc: 0.9233 - val_loss: 0.7956 - val_acc: 0.7837
Epoch 45/55
 - 2s - loss: 0.4174 - acc: 0.9205 - val_loss: 0.7062 - val_acc: 0.7851
Epoch 46/55
 - 2s - loss: 0.4271 - acc: 0.9233 - val_loss: 0.8442 - val_acc: 0.7765
Epoch 47/55
 - 2s - loss: 0.4251 - acc: 0.9209 - val_loss: 1.5217 - val_acc: 0.5948
Epoch 48/55
 - 2s - loss: 0.4229 - acc: 0.9285 - val_loss: 0.7092 - val_acc: 0.7924
Epoch 49/55
 - 2s - loss: 0.4322 - acc: 0.9196 - val_loss: 0.7042 - val_acc: 0.8320
Epoch 50/55
 - 2s - loss: 0.4275 - acc: 0.9215 - val_loss: 0.5904 - val_acc: 0.8666
Epoch 51/55
 - 2s - loss: 0.4063 - acc: 0.9279 - val_loss: 0.9713 - val_acc: 0.7484
Epoch 52/55
 - 2s - loss: 0.4357 - acc: 0.9233 - val_loss: 0.7171 - val_acc: 0.7960
Epoch 53/55
 - 2s - loss: 0.4194 - acc: 0.9260 - val_loss: 1.1177 - val_acc: 0.5963
Epoch 54/55
 - 2s - loss: 0.4124 - acc: 0.9233 - val_loss: 0.5981 - val_acc: 0.8558
Epoch 55/55
 - 2s - loss: 0.4214 - acc: 0.9263 - val_loss: 0.9880 - val_acc: 0.7549
Train accuracy 0.8724505327245053 Test accuracy: 0.7548666186012978
----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 122, 32)	4064
dropout_1 (Dropout)	(None, 122, 32)	0

```
max_pooling1d_1 (MaxPooling1 (None, 24, 32)              0
_____
flatten_1 (Flatten)          (None, 768)                 0
_____
dense_1 (Dense)              (None, 16)               12304
_____
dense_2 (Dense)              (None, 3)                   51
===============================================================
Total params: 18,351
Trainable params: 18,351
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 54.7856 - acc: 0.6152 - val_loss: 2.3591 - val_acc: 0.7145
Epoch 2/35
 - 1s - loss: 0.7831 - acc: 0.8581 - val_loss: 0.8226 - val_acc: 0.7815
Epoch 3/35
 - 1s - loss: 0.4652 - acc: 0.9065 - val_loss: 0.7021 - val_acc: 0.8277
Epoch 4/35
 - 1s - loss: 0.3838 - acc: 0.9279 - val_loss: 0.5550 - val_acc: 0.9056
Epoch 5/35
 - 1s - loss: 0.3464 - acc: 0.9355 - val_loss: 0.5566 - val_acc: 0.8911
Epoch 6/35
 - 1s - loss: 0.3309 - acc: 0.9364 - val_loss: 0.5986 - val_acc: 0.8825
Epoch 7/35
 - 1s - loss: 0.3049 - acc: 0.9473 - val_loss: 0.5237 - val_acc: 0.9041
Epoch 8/35
 - 1s - loss: 0.2864 - acc: 0.9546 - val_loss: 0.7817 - val_acc: 0.7051
Epoch 9/35
 - 1s - loss: 0.2963 - acc: 0.9507 - val_loss: 0.5124 - val_acc: 0.9113
Epoch 10/35
 - 1s - loss: 0.2843 - acc: 0.9540 - val_loss: 0.4625 - val_acc: 0.9164
Epoch 11/35
 - 1s - loss: 0.2737 - acc: 0.9522 - val_loss: 0.5824 - val_acc: 0.8133
Epoch 12/35
 - 1s - loss: 0.2660 - acc: 0.9583 - val_loss: 0.4173 - val_acc: 0.9315
Epoch 13/35
 - 1s - loss: 0.2673 - acc: 0.9574 - val_loss: 0.8013 - val_acc: 0.7650
Epoch 14/35
 - 1s - loss: 0.2690 - acc: 0.9519 - val_loss: 0.4297 - val_acc: 0.9185
Epoch 15/35
```

```
        - 1s - loss: 0.2468 - acc: 0.9641 - val_loss: 0.5762 - val_acc: 0.7981
Epoch 16/35
        - 1s - loss: 0.2485 - acc: 0.9562 - val_loss: 0.3884 - val_acc: 0.9286
Epoch 17/35
        - 1s - loss: 0.2418 - acc: 0.9635 - val_loss: 0.9449 - val_acc: 0.7001
Epoch 18/35
        - 1s - loss: 0.2419 - acc: 0.9613 - val_loss: 0.6635 - val_acc: 0.7787
Epoch 19/35
        - 1s - loss: 0.2462 - acc: 0.9595 - val_loss: 0.4043 - val_acc: 0.9351
Epoch 20/35
        - 1s - loss: 0.2368 - acc: 0.9641 - val_loss: 0.4625 - val_acc: 0.8991
Epoch 21/35
        - 1s - loss: 0.2374 - acc: 0.9635 - val_loss: 0.6909 - val_acc: 0.7549
Epoch 22/35
        - 1s - loss: 0.2333 - acc: 0.9623 - val_loss: 0.6555 - val_acc: 0.8536
Epoch 23/35
        - 1s - loss: 0.2342 - acc: 0.9607 - val_loss: 0.4107 - val_acc: 0.8882
Epoch 24/35
        - 1s - loss: 0.2295 - acc: 0.9638 - val_loss: 0.3595 - val_acc: 0.9243
Epoch 25/35
        - 1s - loss: 0.2393 - acc: 0.9629 - val_loss: 0.4479 - val_acc: 0.8861
Epoch 26/35
        - 1s - loss: 0.2354 - acc: 0.9604 - val_loss: 0.3572 - val_acc: 0.9236
Epoch 27/35
        - 1s - loss: 0.2352 - acc: 0.9650 - val_loss: 0.3233 - val_acc: 0.9488
Epoch 28/35
        - 1s - loss: 0.2269 - acc: 0.9653 - val_loss: 0.3694 - val_acc: 0.9366
Epoch 29/35
        - 1s - loss: 0.2139 - acc: 0.9708 - val_loss: 0.3571 - val_acc: 0.9207
Epoch 30/35
        - 1s - loss: 0.2332 - acc: 0.9607 - val_loss: 0.4245 - val_acc: 0.8774
Epoch 31/35
        - 1s - loss: 0.2297 - acc: 0.9638 - val_loss: 0.3657 - val_acc: 0.9322
Epoch 32/35
        - 1s - loss: 0.2174 - acc: 0.9671 - val_loss: 0.3873 - val_acc: 0.9387
Epoch 33/35
        - 1s - loss: 0.2185 - acc: 0.9683 - val_loss: 0.4320 - val_acc: 0.8861
Epoch 34/35
        - 1s - loss: 0.2362 - acc: 0.9623 - val_loss: 0.3228 - val_acc: 0.9474
Epoch 35/35
        - 1s - loss: 0.2281 - acc: 0.9641 - val_loss: 0.4292 - val_acc: 0.8926
Train accuracy 0.9707762557077626 Test accuracy: 0.8925739005046863
-----------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
================================================================
conv1d_1 (Conv1D)            (None, 126, 42)            1176

_____
conv1d_2 (Conv1D)            (None, 120, 16)            4720

_____
dropout_1 (Dropout)          (None, 120, 16)            0

_____
max_pooling1d_1 (MaxPooling1 (None, 40, 16)            0

_____
flatten_1 (Flatten)          (None, 640)                0

_____
dense_1 (Dense)              (None, 32)                 20512

_____
dense_2 (Dense)              (None, 3)                  99
================================================================
Total params: 26,507
Trainable params: 26,507
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 28.4644 - acc: 0.7416 - val_loss: 7.5923 - val_acc: 0.8154
Epoch 2/55
 - 1s - loss: 2.9050 - acc: 0.9507 - val_loss: 1.1387 - val_acc: 0.8472
Epoch 3/55
 - 2s - loss: 0.5378 - acc: 0.9553 - val_loss: 0.6367 - val_acc: 0.8789
Epoch 4/55
 - 1s - loss: 0.3659 - acc: 0.9592 - val_loss: 0.5642 - val_acc: 0.8868
Epoch 5/55
 - 2s - loss: 0.3013 - acc: 0.9665 - val_loss: 0.5453 - val_acc: 0.8940
Epoch 6/55
 - 2s - loss: 0.2587 - acc: 0.9760 - val_loss: 0.4063 - val_acc: 0.9416
Epoch 7/55
 - 2s - loss: 0.2648 - acc: 0.9726 - val_loss: 0.4659 - val_acc: 0.8861
Epoch 8/55
 - 2s - loss: 0.2448 - acc: 0.9729 - val_loss: 0.4797 - val_acc: 0.8969
Epoch 9/55
 - 2s - loss: 0.2126 - acc: 0.9769 - val_loss: 0.3707 - val_acc: 0.9704
Epoch 10/55
 - 2s - loss: 0.2030 - acc: 0.9814 - val_loss: 0.3931 - val_acc: 0.9351
```

```
Epoch 11/55
 - 2s - loss: 0.2123 - acc: 0.9790 - val_loss: 0.3378 - val_acc: 0.9416
Epoch 12/55
 - 2s - loss: 0.1965 - acc: 0.9793 - val_loss: 0.3120 - val_acc: 0.9474
Epoch 13/55
 - 2s - loss: 0.1649 - acc: 0.9863 - val_loss: 0.3907 - val_acc: 0.9293
Epoch 14/55
 - 2s - loss: 0.1766 - acc: 0.9848 - val_loss: 0.3124 - val_acc: 0.9351
Epoch 15/55
 - 2s - loss: 0.1466 - acc: 0.9906 - val_loss: 0.2992 - val_acc: 0.9416
Epoch 16/55
 - 2s - loss: 0.1519 - acc: 0.9863 - val_loss: 0.2831 - val_acc: 0.9488
Epoch 17/55
 - 2s - loss: 0.2105 - acc: 0.9717 - val_loss: 0.2804 - val_acc: 0.9560
Epoch 18/55
 - 2s - loss: 0.1331 - acc: 0.9918 - val_loss: 0.2772 - val_acc: 0.9387
Epoch 19/55
 - 2s - loss: 0.1457 - acc: 0.9851 - val_loss: 0.2670 - val_acc: 0.9452
Epoch 20/55
 - 2s - loss: 0.1416 - acc: 0.9893 - val_loss: 0.3589 - val_acc: 0.9221
Epoch 21/55
 - 2s - loss: 0.1595 - acc: 0.9808 - val_loss: 0.3005 - val_acc: 0.9387
Epoch 22/55
 - 2s - loss: 0.1705 - acc: 0.9775 - val_loss: 0.2969 - val_acc: 0.9474
Epoch 23/55
 - 2s - loss: 0.1359 - acc: 0.9900 - val_loss: 0.2513 - val_acc: 0.9510
Epoch 24/55
 - 2s - loss: 0.1581 - acc: 0.9811 - val_loss: 0.3707 - val_acc: 0.9293
Epoch 25/55
 - 2s - loss: 0.1388 - acc: 0.9884 - val_loss: 0.2974 - val_acc: 0.9387
Epoch 26/55
 - 2s - loss: 0.1273 - acc: 0.9884 - val_loss: 0.2848 - val_acc: 0.9358
Epoch 27/55
 - 2s - loss: 0.1224 - acc: 0.9884 - val_loss: 0.2629 - val_acc: 0.9409
Epoch 28/55
 - 1s - loss: 0.1516 - acc: 0.9836 - val_loss: 0.3156 - val_acc: 0.9084
Epoch 29/55
 - 2s - loss: 0.1116 - acc: 0.9924 - val_loss: 0.3689 - val_acc: 0.9135
Epoch 30/55
 - 2s - loss: 0.1353 - acc: 0.9872 - val_loss: 0.4475 - val_acc: 0.8500
Epoch 31/55
 - 2s - loss: 0.1459 - acc: 0.9857 - val_loss: 0.3477 - val_acc: 0.9113
Epoch 32/55
```

```
                - 2s - loss: 0.1275 - acc: 0.9869 - val_loss: 0.3138 - val_acc: 0.9221
       Epoch 33/55
                - 2s - loss: 0.1106 - acc: 0.9900 - val_loss: 0.3453 - val_acc: 0.9005
       Epoch 34/55
                - 2s - loss: 0.1559 - acc: 0.9842 - val_loss: 0.3551 - val_acc: 0.9092
       Epoch 35/55
                - 2s - loss: 0.1262 - acc: 0.9875 - val_loss: 0.3875 - val_acc: 0.8825
       Epoch 36/55
                - 2s - loss: 0.1273 - acc: 0.9854 - val_loss: 0.4322 - val_acc: 0.8659
       Epoch 37/55
                - 2s - loss: 0.1369 - acc: 0.9884 - val_loss: 0.3638 - val_acc: 0.9214
       Epoch 38/55
                - 2s - loss: 0.1538 - acc: 0.9848 - val_loss: 0.2814 - val_acc: 0.9358
       Epoch 39/55
                - 2s - loss: 0.1691 - acc: 0.9808 - val_loss: 0.4038 - val_acc: 0.8789
       Epoch 40/55
                - 2s - loss: 0.1491 - acc: 0.9845 - val_loss: 0.3964 - val_acc: 0.9106
       Epoch 41/55
                - 2s - loss: 0.1560 - acc: 0.9784 - val_loss: 0.4678 - val_acc: 0.9185
       Epoch 42/55
                - 2s - loss: 0.1246 - acc: 0.9903 - val_loss: 0.4327 - val_acc: 0.8947
       Epoch 43/55
                - 2s - loss: 0.1319 - acc: 0.9839 - val_loss: 0.3348 - val_acc: 0.9257
       Epoch 44/55
                - 2s - loss: 0.1082 - acc: 0.9924 - val_loss: 0.3509 - val_acc: 0.9200
       Epoch 45/55
                - 2s - loss: 0.1542 - acc: 0.9775 - val_loss: 0.5506 - val_acc: 0.8407
       Epoch 46/55
                - 1s - loss: 0.1271 - acc: 0.9866 - val_loss: 0.3663 - val_acc: 0.9221
       Epoch 47/55
                - 2s - loss: 0.1178 - acc: 0.9866 - val_loss: 0.3634 - val_acc: 0.8940
       Epoch 48/55
                - 2s - loss: 0.1355 - acc: 0.9842 - val_loss: 0.2705 - val_acc: 0.9373
       Epoch 49/55
                - 2s - loss: 0.1339 - acc: 0.9842 - val_loss: 0.3740 - val_acc: 0.9063
       Epoch 50/55
                - 2s - loss: 0.1177 - acc: 0.9848 - val_loss: 0.3472 - val_acc: 0.9084
       Epoch 51/55
                - 1s - loss: 0.1404 - acc: 0.9814 - val_loss: 0.4542 - val_acc: 0.9128
       Epoch 52/55
                - 2s - loss: 0.1449 - acc: 0.9872 - val_loss: 0.4119 - val_acc: 0.9019
       Epoch 53/55
                - 2s - loss: 0.1280 - acc: 0.9887 - val_loss: 0.2186 - val_acc: 0.9481
```

```
Epoch 54/55
 - 2s - loss: 0.1346 - acc: 0.9833 - val_loss: 0.3687 - val_acc: 0.9257
Epoch 55/55
 - 2s - loss: 0.1437 - acc: 0.9866 - val_loss: 0.3049 - val_acc: 0.9394
Train accuracy 0.997869101978691 Test accuracy: 0.93943763518385
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 116, 24)	7080
dropout_1 (Dropout)	(None, 116, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 58, 24)	0
flatten_1 (Flatten)	(None, 1392)	0
dense_1 (Dense)	(None, 32)	44576
dense_2 (Dense)	(None, 3)	99

```
Total params: 54,443
Trainable params: 54,443
Non-trainable params: 0


None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 44.5118 - acc: 0.7452 - val_loss: 0.9315 - val_acc: 0.6936
Epoch 2/55
 - 2s - loss: 0.5590 - acc: 0.8965 - val_loss: 0.6744 - val_acc: 0.8053
Epoch 3/55
 - 2s - loss: 0.4779 - acc: 0.9041 - val_loss: 0.6955 - val_acc: 0.8248
Epoch 4/55
 - 2s - loss: 0.4760 - acc: 0.9032 - val_loss: 0.6007 - val_acc: 0.8609
Epoch 5/55
 - 2s - loss: 0.4152 - acc: 0.9218 - val_loss: 0.5213 - val_acc: 0.9229
Epoch 6/55
 - 2s - loss: 0.3777 - acc: 0.9318 - val_loss: 0.5880 - val_acc: 0.8226
Epoch 7/55
 - 2s - loss: 0.3963 - acc: 0.9297 - val_loss: 0.7228 - val_acc: 0.8536
```

```
Epoch 8/55
 - 2s - loss: 0.3518 - acc: 0.9397 - val_loss: 0.4974 - val_acc: 0.8832
Epoch 9/55
 - 2s - loss: 0.3823 - acc: 0.9303 - val_loss: 0.4852 - val_acc: 0.9056
Epoch 10/55
 - 2s - loss: 0.3791 - acc: 0.9318 - val_loss: 0.6130 - val_acc: 0.8385
Epoch 11/55
 - 2s - loss: 0.3951 - acc: 0.9297 - val_loss: 0.4726 - val_acc: 0.9092
Epoch 12/55
 - 2s - loss: 0.3434 - acc: 0.9406 - val_loss: 0.6734 - val_acc: 0.8796
Epoch 13/55
 - 2s - loss: 0.3412 - acc: 0.9373 - val_loss: 0.4951 - val_acc: 0.8991
Epoch 14/55
 - 2s - loss: 0.3269 - acc: 0.9452 - val_loss: 0.6933 - val_acc: 0.8601
Epoch 15/55
 - 2s - loss: 0.3963 - acc: 0.9233 - val_loss: 0.6766 - val_acc: 0.8392
Epoch 16/55
 - 2s - loss: 0.3194 - acc: 0.9461 - val_loss: 0.5510 - val_acc: 0.8738
Epoch 17/55
 - 2s - loss: 0.3490 - acc: 0.9400 - val_loss: 0.5323 - val_acc: 0.8515
Epoch 18/55
 - 2s - loss: 0.3093 - acc: 0.9458 - val_loss: 0.5361 - val_acc: 0.8839
Epoch 19/55
 - 2s - loss: 0.3478 - acc: 0.9376 - val_loss: 0.5095 - val_acc: 0.8738
Epoch 20/55
 - 2s - loss: 0.3425 - acc: 0.9373 - val_loss: 0.5057 - val_acc: 0.8854
Epoch 21/55
 - 2s - loss: 0.3447 - acc: 0.9367 - val_loss: 0.5154 - val_acc: 0.9164
Epoch 22/55
 - 2s - loss: 0.3447 - acc: 0.9385 - val_loss: 0.5577 - val_acc: 0.8904
Epoch 23/55
 - 2s - loss: 0.2775 - acc: 0.9516 - val_loss: 0.5036 - val_acc: 0.8673
Epoch 24/55
 - 2s - loss: 0.3623 - acc: 0.9297 - val_loss: 0.5883 - val_acc: 0.8464
Epoch 25/55
 - 2s - loss: 0.3179 - acc: 0.9458 - val_loss: 0.5279 - val_acc: 0.8695
Epoch 26/55
 - 2s - loss: 0.2929 - acc: 0.9531 - val_loss: 0.5582 - val_acc: 0.8623
Epoch 27/55
 - 2s - loss: 0.3316 - acc: 0.9440 - val_loss: 0.6394 - val_acc: 0.8738
Epoch 28/55
 - 2s - loss: 0.3239 - acc: 0.9440 - val_loss: 0.4072 - val_acc: 0.9012
Epoch 29/55
```

```
          - 2s - loss: 0.3413 - acc: 0.9388 - val_loss: 0.4610 - val_acc: 0.8911
Epoch 30/55
          - 2s - loss: 0.3787 - acc: 0.9330 - val_loss: 0.4763 - val_acc: 0.8688
Epoch 31/55
          - 2s - loss: 0.2919 - acc: 0.9492 - val_loss: 0.4912 - val_acc: 0.9041
Epoch 32/55
          - 2s - loss: 0.3054 - acc: 0.9437 - val_loss: 0.5216 - val_acc: 0.8565
Epoch 33/55
          - 2s - loss: 0.3102 - acc: 0.9449 - val_loss: 0.5359 - val_acc: 0.8738
Epoch 34/55
          - 2s - loss: 0.3148 - acc: 0.9431 - val_loss: 0.4207 - val_acc: 0.9156
Epoch 35/55
          - 2s - loss: 0.3130 - acc: 0.9412 - val_loss: 0.5339 - val_acc: 0.9084
Epoch 36/55
          - 2s - loss: 0.3004 - acc: 0.9504 - val_loss: 0.4776 - val_acc: 0.9034
Epoch 37/55
          - 2s - loss: 0.3118 - acc: 0.9443 - val_loss: 0.4777 - val_acc: 0.8933
Epoch 38/55
          - 2s - loss: 0.2978 - acc: 0.9479 - val_loss: 0.7795 - val_acc: 0.7347
Epoch 39/55
          - 2s - loss: 0.2999 - acc: 0.9455 - val_loss: 0.7837 - val_acc: 0.7873
Epoch 40/55
          - 2s - loss: 0.3392 - acc: 0.9409 - val_loss: 0.5640 - val_acc: 0.8825
Epoch 41/55
          - 2s - loss: 0.3181 - acc: 0.9492 - val_loss: 0.5489 - val_acc: 0.8796
Epoch 42/55
          - 2s - loss: 0.3250 - acc: 0.9461 - val_loss: 0.5183 - val_acc: 0.8738
Epoch 43/55
          - 2s - loss: 0.2481 - acc: 0.9580 - val_loss: 0.5551 - val_acc: 0.8248
Epoch 44/55
          - 2s - loss: 0.2675 - acc: 0.9528 - val_loss: 0.3985 - val_acc: 0.9250
Epoch 45/55
          - 2s - loss: 0.3214 - acc: 0.9412 - val_loss: 0.4146 - val_acc: 0.9301
Epoch 46/55
          - 2s - loss: 0.2832 - acc: 0.9519 - val_loss: 0.9030 - val_acc: 0.7311
Epoch 47/55
          - 2s - loss: 0.3583 - acc: 0.9312 - val_loss: 0.7931 - val_acc: 0.8421
Epoch 48/55
          - 2s - loss: 0.2985 - acc: 0.9476 - val_loss: 0.7842 - val_acc: 0.7981
Epoch 49/55
          - 2s - loss: 0.3033 - acc: 0.9519 - val_loss: 0.4369 - val_acc: 0.9142
Epoch 50/55
          - 2s - loss: 0.3563 - acc: 0.9355 - val_loss: 0.5136 - val_acc: 0.8796
```

```
Epoch 51/55
 - 2s - loss: 0.2677 - acc: 0.9577 - val_loss: 0.5134 - val_acc: 0.8745
Epoch 52/55
 - 2s - loss: 0.3046 - acc: 0.9452 - val_loss: 0.6087 - val_acc: 0.8464
Epoch 53/55
 - 2s - loss: 0.2747 - acc: 0.9568 - val_loss: 0.7035 - val_acc: 0.8226
Epoch 54/55
 - 2s - loss: 0.3255 - acc: 0.9409 - val_loss: 0.6753 - val_acc: 0.8428
Epoch 55/55
 - 2s - loss: 0.3057 - acc: 0.9449 - val_loss: 0.5029 - val_acc: 0.8955
Train accuracy 0.9765601217656013 Test accuracy: 0.8954578226387887
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 122, 24)	3864
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 64)	93760
dense_2 (Dense)	(None, 3)	195

```
Total params: 98,715
Trainable params: 98,715
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 82.7846 - acc: 0.5820 - val_loss: 16.3916 - val_acc: 0.7008
Epoch 2/55
 - 1s - loss: 6.0142 - acc: 0.8283 - val_loss: 1.6941 - val_acc: 0.7650
Epoch 3/55
 - 1s - loss: 0.9027 - acc: 0.8499 - val_loss: 0.7755 - val_acc: 0.8673
Epoch 4/55
 - 1s - loss: 0.6070 - acc: 0.8740 - val_loss: 0.8220 - val_acc: 0.7758
```

```
Epoch 5/55
 - 1s - loss: 0.5335 - acc: 0.8959 - val_loss: 0.7900 - val_acc: 0.8125
Epoch 6/55
 - 1s - loss: 0.5072 - acc: 0.9014 - val_loss: 0.6782 - val_acc: 0.8385
Epoch 7/55
 - 1s - loss: 0.4560 - acc: 0.9126 - val_loss: 0.5942 - val_acc: 0.8947
Epoch 8/55
 - 1s - loss: 0.4652 - acc: 0.8998 - val_loss: 0.6559 - val_acc: 0.8623
Epoch 9/55
 - 1s - loss: 0.4256 - acc: 0.9190 - val_loss: 0.5804 - val_acc: 0.8882
Epoch 10/55
 - 1s - loss: 0.5829 - acc: 0.8673 - val_loss: 0.8639 - val_acc: 0.8392
Epoch 11/55
 - 1s - loss: 0.4611 - acc: 0.9087 - val_loss: 0.5363 - val_acc: 0.9048
Epoch 12/55
 - 1s - loss: 0.3933 - acc: 0.9330 - val_loss: 0.6186 - val_acc: 0.8421
Epoch 13/55
 - 1s - loss: 0.4701 - acc: 0.9002 - val_loss: 0.7332 - val_acc: 0.7880
Epoch 14/55
 - 1s - loss: 0.4152 - acc: 0.9242 - val_loss: 0.5494 - val_acc: 0.8825
Epoch 15/55
 - 1s - loss: 0.4086 - acc: 0.9224 - val_loss: 0.4986 - val_acc: 0.8926
Epoch 16/55
 - 1s - loss: 0.3507 - acc: 0.9339 - val_loss: 0.6542 - val_acc: 0.7765
Epoch 17/55
 - 1s - loss: 0.3664 - acc: 0.9391 - val_loss: 0.4103 - val_acc: 0.9315
Epoch 18/55
 - 1s - loss: 0.3912 - acc: 0.9248 - val_loss: 0.5111 - val_acc: 0.9120
Epoch 19/55
 - 1s - loss: 0.3632 - acc: 0.9346 - val_loss: 0.4488 - val_acc: 0.9214
Epoch 20/55
 - 1s - loss: 0.4422 - acc: 0.9135 - val_loss: 0.5838 - val_acc: 0.9164
Epoch 21/55
 - 1s - loss: 0.3708 - acc: 0.9422 - val_loss: 0.5031 - val_acc: 0.9034
Epoch 22/55
 - 1s - loss: 0.3323 - acc: 0.9385 - val_loss: 0.4582 - val_acc: 0.9185
Epoch 23/55
 - 1s - loss: 0.3095 - acc: 0.9482 - val_loss: 0.4863 - val_acc: 0.8976
Epoch 24/55
 - 1s - loss: 0.3560 - acc: 0.9349 - val_loss: 0.4377 - val_acc: 0.9056
Epoch 25/55
 - 1s - loss: 0.3592 - acc: 0.9330 - val_loss: 0.4285 - val_acc: 0.9272
Epoch 26/55
```

```
            - 1s - loss: 0.3133 - acc: 0.9513 - val_loss: 0.4425 - val_acc: 0.9048
         Epoch 27/55
            - 1s - loss: 0.2903 - acc: 0.9528 - val_loss: 0.4872 - val_acc: 0.8839
         Epoch 28/55
            - 1s - loss: 0.3273 - acc: 0.9416 - val_loss: 0.6466 - val_acc: 0.7967
         Epoch 29/55
            - 1s - loss: 0.3459 - acc: 0.9333 - val_loss: 0.5911 - val_acc: 0.8544
         Epoch 30/55
            - 1s - loss: 0.3145 - acc: 0.9510 - val_loss: 0.5538 - val_acc: 0.8609
         Epoch 31/55
            - 1s - loss: 0.3342 - acc: 0.9428 - val_loss: 0.4887 - val_acc: 0.8767
         Epoch 32/55
            - 1s - loss: 0.2890 - acc: 0.9516 - val_loss: 0.5177 - val_acc: 0.8839
         Epoch 33/55
            - 1s - loss: 0.3659 - acc: 0.9355 - val_loss: 0.5414 - val_acc: 0.8572
         Epoch 34/55
            - 1s - loss: 0.3128 - acc: 0.9528 - val_loss: 0.5219 - val_acc: 0.8846
         Epoch 35/55
            - 1s - loss: 0.3608 - acc: 0.9355 - val_loss: 0.4993 - val_acc: 0.8601
         Epoch 36/55
            - 1s - loss: 0.3170 - acc: 0.9455 - val_loss: 0.5202 - val_acc: 0.8529
         Epoch 37/55
            - 1s - loss: 0.3030 - acc: 0.9525 - val_loss: 0.4707 - val_acc: 0.9236
         Epoch 38/55
            - 1s - loss: 0.2803 - acc: 0.9592 - val_loss: 0.3960 - val_acc: 0.9229
         Epoch 39/55
            - 1s - loss: 0.3076 - acc: 0.9467 - val_loss: 0.4876 - val_acc: 0.9178
         Epoch 40/55
            - 1s - loss: 0.3180 - acc: 0.9464 - val_loss: 0.5215 - val_acc: 0.9012
         Epoch 41/55
            - 1s - loss: 0.4000 - acc: 0.9294 - val_loss: 0.4896 - val_acc: 0.8839
         Epoch 42/55
            - 1s - loss: 0.3235 - acc: 0.9437 - val_loss: 0.4359 - val_acc: 0.9063
         Epoch 43/55
            - 1s - loss: 0.3761 - acc: 0.9297 - val_loss: 0.5142 - val_acc: 0.8818
         Epoch 44/55
            - 1s - loss: 0.3502 - acc: 0.9355 - val_loss: 0.5018 - val_acc: 0.8983
         Epoch 45/55
            - 1s - loss: 0.3634 - acc: 0.9324 - val_loss: 0.6018 - val_acc: 0.8536
         Epoch 46/55
            - 1s - loss: 0.3464 - acc: 0.9419 - val_loss: 0.5298 - val_acc: 0.8832
         Epoch 47/55
            - 1s - loss: 0.3469 - acc: 0.9385 - val_loss: 0.5465 - val_acc: 0.8652
```

```
Epoch 48/55
 - 1s - loss: 0.3607 - acc: 0.9397 - val_loss: 0.4754 - val_acc: 0.8998
Epoch 49/55
 - 1s - loss: 0.3080 - acc: 0.9473 - val_loss: 0.7684 - val_acc: 0.7779
Epoch 50/55
 - 1s - loss: 0.3273 - acc: 0.9428 - val_loss: 0.4133 - val_acc: 0.9293
Epoch 51/55
 - 1s - loss: 0.3596 - acc: 0.9257 - val_loss: 0.4448 - val_acc: 0.9142
Epoch 52/55
 - 1s - loss: 0.3180 - acc: 0.9467 - val_loss: 0.6559 - val_acc: 0.8169
Epoch 53/55
 - 1s - loss: 0.3250 - acc: 0.9458 - val_loss: 0.3928 - val_acc: 0.9229
Epoch 54/55
 - 1s - loss: 0.4115 - acc: 0.9248 - val_loss: 0.4735 - val_acc: 0.8955
Epoch 55/55
 - 1s - loss: 0.3015 - acc: 0.9470 - val_loss: 0.6110 - val_acc: 0.8046
Train accuracy 0.8840182648401826 Test accuracy: 0.8046142754145638
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 120, 24)	3864
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 24)	0
flatten_1 (Flatten)	(None, 576)	0
dense_1 (Dense)	(None, 32)	18464
dense_2 (Dense)	(None, 3)	99

```
Total params: 23,899
Trainable params: 23,899
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 108.5729 - acc: 0.5747 - val_loss: 58.5087 - val_acc: 0.7217
```

```
Epoch 2/35
 - 1s - loss: 35.0013 - acc: 0.8499 - val_loss: 18.7340 - val_acc: 0.8522
Epoch 3/35
 - 1s - loss: 10.9079 - acc: 0.9199 - val_loss: 5.9124 - val_acc: 0.8493
Epoch 4/35
 - 1s - loss: 3.3061 - acc: 0.9431 - val_loss: 2.0256 - val_acc: 0.9286
Epoch 5/35
 - 1s - loss: 1.1283 - acc: 0.9482 - val_loss: 1.0124 - val_acc: 0.8832
Epoch 6/35
 - 1s - loss: 0.5651 - acc: 0.9583 - val_loss: 0.7246 - val_acc: 0.9452
Epoch 7/35
 - 1s - loss: 0.4219 - acc: 0.9613 - val_loss: 0.6519 - val_acc: 0.9113
Epoch 8/35
 - 1s - loss: 0.3742 - acc: 0.9607 - val_loss: 0.6244 - val_acc: 0.9257
Epoch 9/35
 - 1s - loss: 0.3390 - acc: 0.9683 - val_loss: 0.6045 - val_acc: 0.9084
Epoch 10/35
 - 1s - loss: 0.3437 - acc: 0.9619 - val_loss: 0.6695 - val_acc: 0.8306
Epoch 11/35
 - 1s - loss: 0.3129 - acc: 0.9686 - val_loss: 0.5445 - val_acc: 0.9250
Epoch 12/35
 - 1s - loss: 0.2911 - acc: 0.9729 - val_loss: 0.5464 - val_acc: 0.9106
Epoch 13/35
 - 1s - loss: 0.2621 - acc: 0.9833 - val_loss: 0.5277 - val_acc: 0.9257
Epoch 14/35
 - 1s - loss: 0.2504 - acc: 0.9830 - val_loss: 0.4910 - val_acc: 0.9322
Epoch 15/35
 - 1s - loss: 0.2765 - acc: 0.9686 - val_loss: 0.4655 - val_acc: 0.9531
Epoch 16/35
 - 1s - loss: 0.2306 - acc: 0.9836 - val_loss: 0.4810 - val_acc: 0.9387
Epoch 17/35
 - 1s - loss: 0.2408 - acc: 0.9781 - val_loss: 0.4301 - val_acc: 0.9603
Epoch 18/35
 - 1s - loss: 0.2109 - acc: 0.9887 - val_loss: 0.4495 - val_acc: 0.9373
Epoch 19/35
 - 1s - loss: 0.2488 - acc: 0.9702 - val_loss: 0.4297 - val_acc: 0.9553
Epoch 20/35
 - 1s - loss: 0.2111 - acc: 0.9836 - val_loss: 0.4044 - val_acc: 0.9539
Epoch 21/35
 - 1s - loss: 0.1989 - acc: 0.9848 - val_loss: 0.4902 - val_acc: 0.8818
Epoch 22/35
 - 1s - loss: 0.1878 - acc: 0.9887 - val_loss: 0.3900 - val_acc: 0.9531
Epoch 23/35
```

```
        - 1s - loss: 0.1886 - acc: 0.9869 - val_loss: 0.4037 - val_acc: 0.9394
Epoch 24/35
        - 1s - loss: 0.2139 - acc: 0.9753 - val_loss: 0.3903 - val_acc: 0.9488
Epoch 25/35
        - 1s - loss: 0.1757 - acc: 0.9893 - val_loss: 0.3822 - val_acc: 0.9423
Epoch 26/35
        - 1s - loss: 0.1873 - acc: 0.9826 - val_loss: 0.3838 - val_acc: 0.9488
Epoch 27/35
        - 1s - loss: 0.2036 - acc: 0.9763 - val_loss: 0.4516 - val_acc: 0.9164
Epoch 28/35
        - 1s - loss: 0.1804 - acc: 0.9866 - val_loss: 0.4332 - val_acc: 0.9034
Epoch 29/35
        - 1s - loss: 0.1742 - acc: 0.9866 - val_loss: 0.3755 - val_acc: 0.9438
Epoch 30/35
        - 1s - loss: 0.1546 - acc: 0.9909 - val_loss: 0.3517 - val_acc: 0.9423
Epoch 31/35
        - 1s - loss: 0.1570 - acc: 0.9872 - val_loss: 0.3205 - val_acc: 0.9632
Epoch 32/35
        - 1s - loss: 0.1833 - acc: 0.9778 - val_loss: 0.3808 - val_acc: 0.9344
Epoch 33/35
        - 1s - loss: 0.1704 - acc: 0.9836 - val_loss: 0.4720 - val_acc: 0.9012
Epoch 34/35
        - 1s - loss: 0.1776 - acc: 0.9826 - val_loss: 0.4516 - val_acc: 0.9106
Epoch 35/35
        - 1s - loss: 0.1670 - acc: 0.9863 - val_loss: 0.3924 - val_acc: 0.9301
Train accuracy 0.9817351598173516 Test accuracy: 0.9300648882480173
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 28)	784
conv1d_2 (Conv1D)	(None, 124, 16)	1360
dropout_1 (Dropout)	(None, 124, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 41, 16)	0
flatten_1 (Flatten)	(None, 656)	0
dense_1 (Dense)	(None, 64)	42048
dense_2 (Dense)	(None, 3)	195

```
================================================================
Total params: 44,387
Trainable params: 44,387
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 48.2485 - acc: 0.6240 - val_loss: 5.8736 - val_acc: 0.6229
Epoch 2/35
 - 1s - loss: 1.5410 - acc: 0.8033 - val_loss: 0.9214 - val_acc: 0.7167
Epoch 3/35
 - 1s - loss: 0.5971 - acc: 0.8557 - val_loss: 0.7990 - val_acc: 0.7823
Epoch 4/35
 - 1s - loss: 0.5133 - acc: 0.8773 - val_loss: 0.7069 - val_acc: 0.7837
Epoch 5/35
 - 1s - loss: 0.4665 - acc: 0.8956 - val_loss: 0.7327 - val_acc: 0.8327
Epoch 6/35
 - 1s - loss: 0.4398 - acc: 0.8977 - val_loss: 0.6458 - val_acc: 0.8219
Epoch 7/35
 - 1s - loss: 0.4304 - acc: 0.9075 - val_loss: 0.7424 - val_acc: 0.7722
Epoch 8/35
 - 1s - loss: 0.3986 - acc: 0.9151 - val_loss: 0.9455 - val_acc: 0.6316
Epoch 9/35
 - 1s - loss: 0.3893 - acc: 0.9221 - val_loss: 0.5072 - val_acc: 0.8897
Epoch 10/35
 - 1s - loss: 0.3804 - acc: 0.9209 - val_loss: 0.5693 - val_acc: 0.8659
Epoch 11/35
 - 1s - loss: 0.3730 - acc: 0.9218 - val_loss: 0.7394 - val_acc: 0.7311
Epoch 12/35
 - 1s - loss: 0.3628 - acc: 0.9282 - val_loss: 0.4802 - val_acc: 0.8890
Epoch 13/35
 - 1s - loss: 0.3492 - acc: 0.9303 - val_loss: 0.5821 - val_acc: 0.8717
Epoch 14/35
 - 1s - loss: 0.3525 - acc: 0.9275 - val_loss: 0.5234 - val_acc: 0.8673
Epoch 15/35
 - 1s - loss: 0.3303 - acc: 0.9370 - val_loss: 0.8273 - val_acc: 0.7181
Epoch 16/35
 - 1s - loss: 0.3334 - acc: 0.9370 - val_loss: 0.5803 - val_acc: 0.8277
Epoch 17/35
 - 1s - loss: 0.3361 - acc: 0.9403 - val_loss: 1.1432 - val_acc: 0.7051
Epoch 18/35
 - 1s - loss: 0.3314 - acc: 0.9379 - val_loss: 0.7253 - val_acc: 0.7952
```

```
Epoch 19/35
 - 1s - loss: 0.3220 - acc: 0.9370 - val_loss: 0.5290 - val_acc: 0.8536
Epoch 20/35
 - 1s - loss: 0.3326 - acc: 0.9373 - val_loss: 0.5625 - val_acc: 0.8630
Epoch 21/35
 - 1s - loss: 0.3224 - acc: 0.9361 - val_loss: 0.8055 - val_acc: 0.7830
Epoch 22/35
 - 1s - loss: 0.3151 - acc: 0.9425 - val_loss: 0.7265 - val_acc: 0.7635
Epoch 23/35
 - 1s - loss: 0.3359 - acc: 0.9376 - val_loss: 0.5619 - val_acc: 0.8493
Epoch 24/35
 - 1s - loss: 0.3138 - acc: 0.9416 - val_loss: 0.6181 - val_acc: 0.8198
Epoch 25/35
 - 1s - loss: 0.3091 - acc: 0.9461 - val_loss: 0.5318 - val_acc: 0.8479
Epoch 26/35
 - 1s - loss: 0.3178 - acc: 0.9388 - val_loss: 0.7968 - val_acc: 0.7859
Epoch 27/35
 - 1s - loss: 0.3063 - acc: 0.9409 - val_loss: 0.6380 - val_acc: 0.8464
Epoch 28/35
 - 1s - loss: 0.3012 - acc: 0.9446 - val_loss: 0.4938 - val_acc: 0.8688
Epoch 29/35
 - 1s - loss: 0.3136 - acc: 0.9437 - val_loss: 0.5382 - val_acc: 0.8803
Epoch 30/35
 - 1s - loss: 0.3050 - acc: 0.9431 - val_loss: 0.6502 - val_acc: 0.7888
Epoch 31/35
 - 1s - loss: 0.3027 - acc: 0.9467 - val_loss: 0.5022 - val_acc: 0.8767
Epoch 32/35
 - 1s - loss: 0.3063 - acc: 0.9440 - val_loss: 0.5957 - val_acc: 0.8760
Epoch 33/35
 - 1s - loss: 0.2955 - acc: 0.9452 - val_loss: 0.7796 - val_acc: 0.8010
Epoch 34/35
 - 1s - loss: 0.2999 - acc: 0.9464 - val_loss: 0.6464 - val_acc: 0.8262
Epoch 35/35
 - 1s - loss: 0.3021 - acc: 0.9406 - val_loss: 0.6297 - val_acc: 0.8443
Train accuracy 0.9360730593607306 Test accuracy: 0.8442682047584715
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 120, 24)	2040

```
dropout_1 (Dropout)              (None, 120, 24)              0
_____
max_pooling1d_1 (MaxPooling1 (None, 24, 24)                0
_____
flatten_1 (Flatten)              (None, 576)                  0
_____
dense_1 (Dense)                  (None, 16)                9232
_____
dense_2 (Dense)                  (None, 3)                   51
=================================================================
Total params: 13,115
Trainable params: 13,115
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 1s - loss: 29.3135 - acc: 0.6000 - val_loss: 7.7892 - val_acc: 0.7981
Epoch 2/55
 - 1s - loss: 2.9721 - acc: 0.8219 - val_loss: 1.3881 - val_acc: 0.7051
Epoch 3/55
 - 1s - loss: 0.8016 - acc: 0.8801 - val_loss: 1.6854 - val_acc: 0.4607
Epoch 4/55
 - 1s - loss: 0.6110 - acc: 0.9026 - val_loss: 0.6197 - val_acc: 0.9373
Epoch 5/55
 - 1s - loss: 0.4904 - acc: 0.9111 - val_loss: 0.5982 - val_acc: 0.9077
Epoch 6/55
 - 1s - loss: 0.4253 - acc: 0.9349 - val_loss: 0.7381 - val_acc: 0.8313
Epoch 7/55
 - 1s - loss: 0.3938 - acc: 0.9455 - val_loss: 0.5153 - val_acc: 0.9293
Epoch 8/55
 - 1s - loss: 0.3834 - acc: 0.9364 - val_loss: 0.5473 - val_acc: 0.9019
Epoch 9/55
 - 1s - loss: 0.3448 - acc: 0.9470 - val_loss: 0.4388 - val_acc: 0.9402
Epoch 10/55
 - 1s - loss: 0.3055 - acc: 0.9595 - val_loss: 0.3709 - val_acc: 0.9560
Epoch 11/55
 - 1s - loss: 0.3161 - acc: 0.9473 - val_loss: 0.4167 - val_acc: 0.9229
Epoch 12/55
 - 1s - loss: 0.3385 - acc: 0.9501 - val_loss: 0.5301 - val_acc: 0.8709
Epoch 13/55
 - 1s - loss: 0.2848 - acc: 0.9613 - val_loss: 0.5217 - val_acc: 0.8515
Epoch 14/55
```

```
                    - 1s - loss: 0.3723 - acc: 0.9376 - val_loss: 0.5367 - val_acc: 0.8637
          Epoch 15/55
                    - 1s - loss: 0.3092 - acc: 0.9540 - val_loss: 0.4560 - val_acc: 0.8904
          Epoch 16/55
                    - 1s - loss: 0.2785 - acc: 0.9613 - val_loss: 0.3751 - val_acc: 0.9387
          Epoch 17/55
                    - 1s - loss: 0.3290 - acc: 0.9449 - val_loss: 0.3674 - val_acc: 0.9481
          Epoch 18/55
                    - 1s - loss: 0.3014 - acc: 0.9559 - val_loss: 0.3540 - val_acc: 0.9409
          Epoch 19/55
                    - 1s - loss: 0.3365 - acc: 0.9540 - val_loss: 0.3279 - val_acc: 0.9611
          Epoch 20/55
                    - 1s - loss: 0.3122 - acc: 0.9479 - val_loss: 0.3785 - val_acc: 0.9402
          Epoch 21/55
                    - 1s - loss: 0.2878 - acc: 0.9540 - val_loss: 0.6014 - val_acc: 0.8053
          Epoch 22/55
                    - 1s - loss: 0.2785 - acc: 0.9644 - val_loss: 0.3821 - val_acc: 0.9351
          Epoch 23/55
                    - 1s - loss: 0.2570 - acc: 0.9598 - val_loss: 0.3598 - val_acc: 0.9466
          Epoch 24/55
                    - 1s - loss: 0.2497 - acc: 0.9665 - val_loss: 0.3262 - val_acc: 0.9531
          Epoch 25/55
                    - 1s - loss: 0.2823 - acc: 0.9604 - val_loss: 0.3239 - val_acc: 0.9358
          Epoch 26/55
                    - 1s - loss: 0.2595 - acc: 0.9607 - val_loss: 0.3112 - val_acc: 0.9524
          Epoch 27/55
                    - 1s - loss: 0.2697 - acc: 0.9595 - val_loss: 0.3774 - val_acc: 0.9236
          Epoch 28/55
                    - 1s - loss: 0.2986 - acc: 0.9534 - val_loss: 0.3325 - val_acc: 0.9416
          Epoch 29/55
                    - 1s - loss: 0.2932 - acc: 0.9546 - val_loss: 0.3127 - val_acc: 0.9546
          Epoch 30/55
                    - 1s - loss: 0.2980 - acc: 0.9525 - val_loss: 0.3501 - val_acc: 0.9394
          Epoch 31/55
                    - 1s - loss: 0.2275 - acc: 0.9756 - val_loss: 0.2849 - val_acc: 0.9618
          Epoch 32/55
                    - 1s - loss: 0.2773 - acc: 0.9592 - val_loss: 0.3277 - val_acc: 0.9351
          Epoch 33/55
                    - 1s - loss: 0.2524 - acc: 0.9650 - val_loss: 2.0771 - val_acc: 0.4730
          Epoch 34/55
                    - 1s - loss: 0.2820 - acc: 0.9562 - val_loss: 0.3141 - val_acc: 0.9416
          Epoch 35/55
                    - 1s - loss: 0.2940 - acc: 0.9464 - val_loss: 0.3777 - val_acc: 0.9438
```

```
Epoch 36/55
 - 1s - loss: 0.2274 - acc: 0.9699 - val_loss: 0.3068 - val_acc: 0.9466
Epoch 37/55
 - 1s - loss: 0.3298 - acc: 0.9443 - val_loss: 0.4727 - val_acc: 0.8709
Epoch 38/55
 - 1s - loss: 0.2340 - acc: 0.9717 - val_loss: 0.3166 - val_acc: 0.9373
Epoch 39/55
 - 1s - loss: 0.2863 - acc: 0.9607 - val_loss: 0.2817 - val_acc: 0.9531
Epoch 40/55
 - 1s - loss: 0.2498 - acc: 0.9644 - val_loss: 0.3719 - val_acc: 0.9128
Epoch 41/55
 - 1s - loss: 0.2987 - acc: 0.9610 - val_loss: 0.3748 - val_acc: 0.9135
Epoch 42/55
 - 1s - loss: 0.2359 - acc: 0.9680 - val_loss: 0.4147 - val_acc: 0.8767
Epoch 43/55
 - 1s - loss: 0.3210 - acc: 0.9531 - val_loss: 0.2731 - val_acc: 0.9560
Epoch 44/55
 - 1s - loss: 0.2329 - acc: 0.9629 - val_loss: 0.2800 - val_acc: 0.9560
Epoch 45/55
 - 1s - loss: 0.2500 - acc: 0.9623 - val_loss: 0.3005 - val_acc: 0.9466
Epoch 46/55
 - 1s - loss: 0.2492 - acc: 0.9653 - val_loss: 0.3526 - val_acc: 0.9193
Epoch 47/55
 - 1s - loss: 0.2381 - acc: 0.9689 - val_loss: 0.3617 - val_acc: 0.9171
Epoch 48/55
 - 1s - loss: 0.2948 - acc: 0.9525 - val_loss: 0.2921 - val_acc: 0.9611
Epoch 49/55
 - 1s - loss: 0.2866 - acc: 0.9601 - val_loss: 0.6125 - val_acc: 0.8435
Epoch 50/55
 - 1s - loss: 0.2718 - acc: 0.9662 - val_loss: 0.2698 - val_acc: 0.9546
Epoch 51/55
 - 1s - loss: 0.2960 - acc: 0.9571 - val_loss: 0.4566 - val_acc: 0.8717
Epoch 52/55
 - 1s - loss: 0.2208 - acc: 0.9741 - val_loss: 0.2958 - val_acc: 0.9402
Epoch 53/55
 - 1s - loss: 0.3009 - acc: 0.9592 - val_loss: 0.3041 - val_acc: 0.9402
Epoch 54/55
 - 1s - loss: 0.1855 - acc: 0.9799 - val_loss: 1.1516 - val_acc: 0.7008
Epoch 55/55
 - 1s - loss: 0.3230 - acc: 0.9559 - val_loss: 0.2878 - val_acc: 0.9510
Train accuracy 0.9963470319634703 Test accuracy: 0.9509733237202596
--------------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape               Param #
=================================================================
conv1d_1 (Conv1D)               (None, 122, 28)            1792

conv1d_2 (Conv1D)               (None, 118, 32)            4512

dropout_1 (Dropout)             (None, 118, 32)            0

max_pooling1d_1 (MaxPooling1    (None, 59, 32)             0

flatten_1 (Flatten)             (None, 1888)               0

dense_1 (Dense)                 (None, 32)                 60448

dense_2 (Dense)                 (None, 3)                  99
=================================================================
Total params: 66,851
Trainable params: 66,851
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 19.6802 - acc: 0.6271 - val_loss: 0.9131 - val_acc: 0.8125
Epoch 2/35
 - 1s - loss: 0.5932 - acc: 0.8810 - val_loss: 0.6998 - val_acc: 0.7751
Epoch 3/35
 - 1s - loss: 0.4060 - acc: 0.9342 - val_loss: 0.4753 - val_acc: 0.9077
Epoch 4/35
 - 1s - loss: 0.3425 - acc: 0.9498 - val_loss: 1.0625 - val_acc: 0.7282
Epoch 5/35
 - 1s - loss: 0.2992 - acc: 0.9571 - val_loss: 0.4183 - val_acc: 0.9214
Epoch 6/35
 - 1s - loss: 0.2885 - acc: 0.9595 - val_loss: 0.3325 - val_acc: 0.9488
Epoch 7/35
 - 1s - loss: 0.2759 - acc: 0.9601 - val_loss: 0.6696 - val_acc: 0.8219
Epoch 8/35
 - 1s - loss: 0.2730 - acc: 0.9549 - val_loss: 0.3160 - val_acc: 0.9524
Epoch 9/35
 - 1s - loss: 0.2424 - acc: 0.9677 - val_loss: 1.2398 - val_acc: 0.6792
Epoch 10/35
 - 1s - loss: 0.2518 - acc: 0.9641 - val_loss: 0.2850 - val_acc: 0.9546
Epoch 11/35
```

```
         - 1s - loss: 0.2325 - acc: 0.9677 - val_loss: 0.3865 - val_acc: 0.9092
Epoch 12/35
         - 1s - loss: 0.2177 - acc: 0.9686 - val_loss: 0.2696 - val_acc: 0.9618
Epoch 13/35
         - 1s - loss: 0.2199 - acc: 0.9677 - val_loss: 1.1256 - val_acc: 0.7441
Epoch 14/35
         - 1s - loss: 0.2590 - acc: 0.9632 - val_loss: 0.2905 - val_acc: 0.9567
Epoch 15/35
         - 1s - loss: 0.2118 - acc: 0.9735 - val_loss: 0.2592 - val_acc: 0.9452
Epoch 16/35
         - 1s - loss: 0.2300 - acc: 0.9650 - val_loss: 0.3090 - val_acc: 0.9409
Epoch 17/35
         - 1s - loss: 0.2355 - acc: 0.9671 - val_loss: 0.2885 - val_acc: 0.9409
Epoch 18/35
         - 1s - loss: 0.2115 - acc: 0.9708 - val_loss: 0.3402 - val_acc: 0.9301
Epoch 19/35
         - 1s - loss: 0.2206 - acc: 0.9662 - val_loss: 0.2514 - val_acc: 0.9603
Epoch 20/35
         - 1s - loss: 0.1985 - acc: 0.9708 - val_loss: 0.3219 - val_acc: 0.9293
Epoch 21/35
         - 1s - loss: 0.2488 - acc: 0.9653 - val_loss: 0.3690 - val_acc: 0.9358
Epoch 22/35
         - 1s - loss: 0.1965 - acc: 0.9735 - val_loss: 0.3755 - val_acc: 0.9128
Epoch 23/35
         - 1s - loss: 0.2113 - acc: 0.9711 - val_loss: 0.2905 - val_acc: 0.9366
Epoch 24/35
         - 1s - loss: 0.2444 - acc: 0.9635 - val_loss: 0.3364 - val_acc: 0.9200
Epoch 25/35
         - 1s - loss: 0.2248 - acc: 0.9668 - val_loss: 0.3211 - val_acc: 0.9221
Epoch 26/35
         - 1s - loss: 0.1995 - acc: 0.9720 - val_loss: 0.2774 - val_acc: 0.9373
Epoch 27/35
         - 1s - loss: 0.1930 - acc: 0.9705 - val_loss: 0.3421 - val_acc: 0.9301
Epoch 28/35
         - 1s - loss: 0.1980 - acc: 0.9738 - val_loss: 0.2708 - val_acc: 0.9409
Epoch 29/35
         - 1s - loss: 0.1904 - acc: 0.9723 - val_loss: 0.3314 - val_acc: 0.9099
Epoch 30/35
         - 1s - loss: 0.2011 - acc: 0.9708 - val_loss: 0.2918 - val_acc: 0.9416
Epoch 31/35
         - 1s - loss: 0.2049 - acc: 0.9738 - val_loss: 0.2583 - val_acc: 0.9488
Epoch 32/35
         - 1s - loss: 0.2028 - acc: 0.9729 - val_loss: 0.2554 - val_acc: 0.9452
```

```
Epoch 33/35
 - 1s - loss: 0.1898 - acc: 0.9750 - val_loss: 0.3153 - val_acc: 0.9358
Epoch 34/35
 - 1s - loss: 0.1847 - acc: 0.9750 - val_loss: 0.3360 - val_acc: 0.9394
Epoch 35/35
 - 1s - loss: 0.2085 - acc: 0.9723 - val_loss: 0.2669 - val_acc: 0.9481
Train accuracy 0.9933028919330289 Test accuracy: 0.9480894015861572
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 28)	784
conv1d_2 (Conv1D)	(None, 120, 32)	6304
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 32)	0
flatten_1 (Flatten)	(None, 1920)	0
dense_1 (Dense)	(None, 32)	61472
dense_2 (Dense)	(None, 3)	99

```
Total params: 68,659
Trainable params: 68,659
Non-trainable params: 0

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 95.4337 - acc: 0.5126 - val_loss: 55.2795 - val_acc: 0.6337
Epoch 2/55
 - 1s - loss: 36.4584 - acc: 0.7823 - val_loss: 22.7771 - val_acc: 0.7794
Epoch 3/55
 - 1s - loss: 16.0509 - acc: 0.9142 - val_loss: 11.4714 - val_acc: 0.7361
Epoch 4/55
 - 1s - loss: 8.5271 - acc: 0.9135 - val_loss: 6.5640 - val_acc: 0.8681
Epoch 5/55
 - 1s - loss: 4.9886 - acc: 0.9519 - val_loss: 4.1052 - val_acc: 0.8133
Epoch 6/55
 - 1s - loss: 3.0604 - acc: 0.9540 - val_loss: 2.5909 - val_acc: 0.8839
```

```
Epoch 7/55
 - 1s - loss: 1.9087 - acc: 0.9638 - val_loss: 1.7950 - val_acc: 0.7952
Epoch 8/55
 - 1s - loss: 1.2285 - acc: 0.9632 - val_loss: 1.2314 - val_acc: 0.8529
Epoch 9/55
 - 1s - loss: 0.8407 - acc: 0.9626 - val_loss: 0.9079 - val_acc: 0.9012
Epoch 10/55
 - 1s - loss: 0.6388 - acc: 0.9601 - val_loss: 0.7614 - val_acc: 0.8854
Epoch 11/55
 - 1s - loss: 0.4823 - acc: 0.9693 - val_loss: 0.6700 - val_acc: 0.8796
Epoch 12/55
 - 1s - loss: 0.4158 - acc: 0.9662 - val_loss: 0.6266 - val_acc: 0.8673
Epoch 13/55
 - 1s - loss: 0.3668 - acc: 0.9729 - val_loss: 0.5746 - val_acc: 0.9164
Epoch 14/55
 - 1s - loss: 0.3466 - acc: 0.9689 - val_loss: 0.5622 - val_acc: 0.9084
Epoch 15/55
 - 1s - loss: 0.3306 - acc: 0.9753 - val_loss: 0.4808 - val_acc: 0.9229
Epoch 16/55
 - 1s - loss: 0.3065 - acc: 0.9723 - val_loss: 0.4493 - val_acc: 0.9575
Epoch 17/55
 - 1s - loss: 0.3170 - acc: 0.9708 - val_loss: 0.4463 - val_acc: 0.9423
Epoch 18/55
 - 1s - loss: 0.2880 - acc: 0.9778 - val_loss: 0.4248 - val_acc: 0.9430
Epoch 19/55
 - 1s - loss: 0.2545 - acc: 0.9839 - val_loss: 0.4274 - val_acc: 0.9301
Epoch 20/55
 - 1s - loss: 0.2721 - acc: 0.9763 - val_loss: 0.3898 - val_acc: 0.9517
Epoch 21/55
 - 1s - loss: 0.2488 - acc: 0.9823 - val_loss: 0.4761 - val_acc: 0.8818
Epoch 22/55
 - 1s - loss: 0.2557 - acc: 0.9769 - val_loss: 0.4775 - val_acc: 0.8803
Epoch 23/55
 - 1s - loss: 0.2456 - acc: 0.9787 - val_loss: 0.4484 - val_acc: 0.9056
Epoch 24/55
 - 1s - loss: 0.2484 - acc: 0.9814 - val_loss: 0.4017 - val_acc: 0.9301
Epoch 25/55
 - 1s - loss: 0.2215 - acc: 0.9851 - val_loss: 0.4198 - val_acc: 0.9135
Epoch 26/55
 - 1s - loss: 0.2440 - acc: 0.9753 - val_loss: 0.4460 - val_acc: 0.8919
Epoch 27/55
 - 1s - loss: 0.2143 - acc: 0.9884 - val_loss: 0.3737 - val_acc: 0.9546
Epoch 28/55
```

```
           - 1s - loss: 0.2047 - acc: 0.9842 - val_loss: 0.3686 - val_acc: 0.9380
Epoch 29/55
           - 1s - loss: 0.2642 - acc: 0.9677 - val_loss: 0.3501 - val_acc: 0.9603
Epoch 30/55
           - 1s - loss: 0.2133 - acc: 0.9860 - val_loss: 0.3633 - val_acc: 0.9423
Epoch 31/55
           - 1s - loss: 0.2674 - acc: 0.9729 - val_loss: 0.3325 - val_acc: 0.9560
Epoch 32/55
           - 1s - loss: 0.2271 - acc: 0.9747 - val_loss: 0.3805 - val_acc: 0.9416
Epoch 33/55
           - 1s - loss: 0.1873 - acc: 0.9906 - val_loss: 0.3400 - val_acc: 0.9503
Epoch 34/55
           - 1s - loss: 0.1923 - acc: 0.9857 - val_loss: 0.3601 - val_acc: 0.9387
Epoch 35/55
           - 1s - loss: 0.1795 - acc: 0.9878 - val_loss: 0.3172 - val_acc: 0.9632
Epoch 36/55
           - 1s - loss: 0.1808 - acc: 0.9890 - val_loss: 0.3080 - val_acc: 0.9618
Epoch 37/55
           - 1s - loss: 0.1851 - acc: 0.9814 - val_loss: 0.3457 - val_acc: 0.9560
Epoch 38/55
           - 1s - loss: 0.1978 - acc: 0.9833 - val_loss: 0.3197 - val_acc: 0.9582
Epoch 39/55
           - 1s - loss: 0.1804 - acc: 0.9842 - val_loss: 0.4270 - val_acc: 0.8926
Epoch 40/55
           - 1s - loss: 0.1712 - acc: 0.9893 - val_loss: 0.3222 - val_acc: 0.9466
Epoch 41/55
           - 1s - loss: 0.1670 - acc: 0.9896 - val_loss: 0.2998 - val_acc: 0.9618
Epoch 42/55
           - 1s - loss: 0.1586 - acc: 0.9915 - val_loss: 0.3370 - val_acc: 0.9394
Epoch 43/55
           - 1s - loss: 0.1545 - acc: 0.9903 - val_loss: 0.3191 - val_acc: 0.9322
Epoch 44/55
           - 1s - loss: 0.1717 - acc: 0.9872 - val_loss: 0.3326 - val_acc: 0.9546
Epoch 45/55
           - 1s - loss: 0.1638 - acc: 0.9900 - val_loss: 0.2884 - val_acc: 0.9640
Epoch 46/55
           - 1s - loss: 0.1414 - acc: 0.9970 - val_loss: 0.3286 - val_acc: 0.9380
Epoch 47/55
           - 1s - loss: 0.1535 - acc: 0.9854 - val_loss: 0.3711 - val_acc: 0.9265
Epoch 48/55
           - 1s - loss: 0.1531 - acc: 0.9915 - val_loss: 0.3159 - val_acc: 0.9344
Epoch 49/55
           - 1s - loss: 0.1588 - acc: 0.9857 - val_loss: 0.2789 - val_acc: 0.9668
```

```
Epoch 50/55
 - 1s - loss: 0.1466 - acc: 0.9924 - val_loss: 0.2765 - val_acc: 0.9582
Epoch 51/55
 - 1s - loss: 0.1420 - acc: 0.9912 - val_loss: 0.3139 - val_acc: 0.9416
Epoch 52/55
 - 1s - loss: 0.1470 - acc: 0.9906 - val_loss: 0.2778 - val_acc: 0.9596
Epoch 53/55
 - 1s - loss: 0.1296 - acc: 0.9939 - val_loss: 0.2560 - val_acc: 0.9596
Epoch 54/55
 - 1s - loss: 0.1377 - acc: 0.9909 - val_loss: 0.2633 - val_acc: 0.9676
Epoch 55/55
 - 1s - loss: 0.1322 - acc: 0.9909 - val_loss: 0.3027 - val_acc: 0.9596
Train accuracy 0.9996955859969558 Test accuracy: 0.9596250901225667
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 118, 24)	7080
dropout_1 (Dropout)	(None, 118, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 24)	0
flatten_1 (Flatten)	(None, 936)	0
dense_1 (Dense)	(None, 16)	14992
dense_2 (Dense)	(None, 3)	51

```
Total params: 24,055
Trainable params: 24,055
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 87.5415 - acc: 0.5409 - val_loss: 36.6075 - val_acc: 0.8025
Epoch 2/35
 - 1s - loss: 18.9570 - acc: 0.8460 - val_loss: 8.1154 - val_acc: 0.8688
Epoch 3/35
 - 1s - loss: 3.9785 - acc: 0.9294 - val_loss: 1.9917 - val_acc: 0.7866
```

```
Epoch 4/35
 - 1s - loss: 0.9943 - acc: 0.9367 - val_loss: 0.9098 - val_acc: 0.8428
Epoch 5/35
 - 1s - loss: 0.5195 - acc: 0.9315 - val_loss: 0.7598 - val_acc: 0.8572
Epoch 6/35
 - 1s - loss: 0.4200 - acc: 0.9400 - val_loss: 0.7159 - val_acc: 0.8363
Epoch 7/35
 - 1s - loss: 0.3844 - acc: 0.9461 - val_loss: 0.6051 - val_acc: 0.9106
Epoch 8/35
 - 1s - loss: 0.3446 - acc: 0.9607 - val_loss: 0.5975 - val_acc: 0.8774
Epoch 9/35
 - 1s - loss: 0.3181 - acc: 0.9686 - val_loss: 0.5575 - val_acc: 0.8976
Epoch 10/35
 - 1s - loss: 0.3145 - acc: 0.9607 - val_loss: 0.5424 - val_acc: 0.9099
Epoch 11/35
 - 1s - loss: 0.2863 - acc: 0.9729 - val_loss: 0.4923 - val_acc: 0.9394
Epoch 12/35
 - 1s - loss: 0.2645 - acc: 0.9769 - val_loss: 0.4939 - val_acc: 0.9286
Epoch 13/35
 - 1s - loss: 0.2706 - acc: 0.9753 - val_loss: 0.4751 - val_acc: 0.9430
Epoch 14/35
 - 1s - loss: 0.2242 - acc: 0.9845 - val_loss: 0.4586 - val_acc: 0.9351
Epoch 15/35
 - 1s - loss: 0.2674 - acc: 0.9686 - val_loss: 0.4372 - val_acc: 0.9416
Epoch 16/35
 - 1s - loss: 0.2170 - acc: 0.9830 - val_loss: 0.5706 - val_acc: 0.8183
Epoch 17/35
 - 1s - loss: 0.2365 - acc: 0.9766 - val_loss: 0.4478 - val_acc: 0.8955
Epoch 18/35
 - 1s - loss: 0.2371 - acc: 0.9756 - val_loss: 0.4430 - val_acc: 0.9221
Epoch 19/35
 - 1s - loss: 0.1968 - acc: 0.9866 - val_loss: 0.3913 - val_acc: 0.9503
Epoch 20/35
 - 1s - loss: 0.2556 - acc: 0.9693 - val_loss: 0.3845 - val_acc: 0.9575
Epoch 21/35
 - 1s - loss: 0.1875 - acc: 0.9866 - val_loss: 0.3915 - val_acc: 0.9394
Epoch 22/35
 - 1s - loss: 0.1742 - acc: 0.9893 - val_loss: 0.3786 - val_acc: 0.9560
Epoch 23/35
 - 1s - loss: 0.1728 - acc: 0.9884 - val_loss: 0.3756 - val_acc: 0.9308
Epoch 24/35
 - 1s - loss: 0.1859 - acc: 0.9787 - val_loss: 0.3833 - val_acc: 0.9156
Epoch 25/35
```

```
 - 1s - loss: 0.1790 - acc: 0.9836 - val_loss: 0.3460 - val_acc: 0.9539
Epoch 26/35
 - 1s - loss: 0.2200 - acc: 0.9689 - val_loss: 0.4282 - val_acc: 0.8947
Epoch 27/35
 - 1s - loss: 0.2361 - acc: 0.9641 - val_loss: 0.4356 - val_acc: 0.9250
Epoch 28/35
 - 1s - loss: 0.1993 - acc: 0.9823 - val_loss: 0.3629 - val_acc: 0.9495
Epoch 29/35
 - 1s - loss: 0.1626 - acc: 0.9881 - val_loss: 0.3385 - val_acc: 0.9495
Epoch 30/35
 - 1s - loss: 0.1517 - acc: 0.9887 - val_loss: 0.3407 - val_acc: 0.9524
Epoch 31/35
 - 1s - loss: 0.1469 - acc: 0.9915 - val_loss: 0.3395 - val_acc: 0.9466
Epoch 32/35
 - 1s - loss: 0.2824 - acc: 0.9546 - val_loss: 0.3741 - val_acc: 0.9582
Epoch 33/35
 - 1s - loss: 0.1700 - acc: 0.9893 - val_loss: 0.3984 - val_acc: 0.8825
Epoch 34/35
 - 1s - loss: 0.1573 - acc: 0.9872 - val_loss: 0.4015 - val_acc: 0.9077
Epoch 35/35
 - 1s - loss: 0.1664 - acc: 0.9826 - val_loss: 0.2986 - val_acc: 0.9625
Train accuracy 0.9914764079147641 Test accuracy: 0.9625090122566691
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 24)	5400
dropout_1 (Dropout)	(None, 118, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 24)	0
flatten_1 (Flatten)	(None, 936)	0
dense_1 (Dense)	(None, 16)	14992
dense_2 (Dense)	(None, 3)	51

```
Total params: 21,915
Trainable params: 21,915
Non-trainable params: 0
```

```
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 85.1565 - acc: 0.4460 - val_loss: 49.3456 - val_acc: 0.5141
Epoch 2/40
 - 1s - loss: 32.3933 - acc: 0.6180 - val_loss: 19.6011 - val_acc: 0.5429
Epoch 3/40
 - 1s - loss: 12.9653 - acc: 0.7577 - val_loss: 7.9837 - val_acc: 0.8125
Epoch 4/40
 - 1s - loss: 5.1502 - acc: 0.9157 - val_loss: 3.2855 - val_acc: 0.9272
Epoch 5/40
 - 1s - loss: 2.0406 - acc: 0.9626 - val_loss: 1.5167 - val_acc: 0.9135
Epoch 6/40
 - 1s - loss: 0.9360 - acc: 0.9650 - val_loss: 0.8992 - val_acc: 0.9293
Epoch 7/40
 - 1s - loss: 0.5685 - acc: 0.9598 - val_loss: 0.6918 - val_acc: 0.9034
Epoch 8/40
 - 1s - loss: 0.4304 - acc: 0.9699 - val_loss: 0.6078 - val_acc: 0.9135
Epoch 9/40
 - 1s - loss: 0.3659 - acc: 0.9784 - val_loss: 0.5444 - val_acc: 0.9510
Epoch 10/40
 - 1s - loss: 0.3370 - acc: 0.9760 - val_loss: 0.5407 - val_acc: 0.9070
Epoch 11/40
 - 1s - loss: 0.3190 - acc: 0.9732 - val_loss: 0.5221 - val_acc: 0.9257
Epoch 12/40
 - 1s - loss: 0.3090 - acc: 0.9753 - val_loss: 0.4770 - val_acc: 0.9553
Epoch 13/40
 - 1s - loss: 0.2736 - acc: 0.9845 - val_loss: 0.5106 - val_acc: 0.8875
Epoch 14/40
 - 1s - loss: 0.2749 - acc: 0.9763 - val_loss: 0.4519 - val_acc: 0.9279
Epoch 15/40
 - 1s - loss: 0.2535 - acc: 0.9857 - val_loss: 0.4465 - val_acc: 0.9178
Epoch 16/40
 - 1s - loss: 0.2491 - acc: 0.9826 - val_loss: 0.4006 - val_acc: 0.9596
Epoch 17/40
 - 1s - loss: 0.2992 - acc: 0.9616 - val_loss: 0.3988 - val_acc: 0.9567
Epoch 18/40
 - 1s - loss: 0.2349 - acc: 0.9842 - val_loss: 0.3993 - val_acc: 0.9430
Epoch 19/40
 - 1s - loss: 0.2160 - acc: 0.9884 - val_loss: 0.3914 - val_acc: 0.9409
Epoch 20/40
 - 1s - loss: 0.2274 - acc: 0.9817 - val_loss: 0.3453 - val_acc: 0.9632
```

```
Epoch 21/40
 - 1s - loss: 0.2069 - acc: 0.9893 - val_loss: 0.4010 - val_acc: 0.9459
Epoch 22/40
 - 1s - loss: 0.2150 - acc: 0.9830 - val_loss: 0.4046 - val_acc: 0.9351
Epoch 23/40
 - 1s - loss: 0.3346 - acc: 0.9425 - val_loss: 0.7621 - val_acc: 0.7678
Epoch 24/40
 - 1s - loss: 0.2809 - acc: 0.9784 - val_loss: 0.4118 - val_acc: 0.9315
Epoch 25/40
 - 1s - loss: 0.1915 - acc: 0.9921 - val_loss: 0.3870 - val_acc: 0.9373
Epoch 26/40
 - 1s - loss: 0.1751 - acc: 0.9942 - val_loss: 0.3772 - val_acc: 0.9402
Epoch 27/40
 - 1s - loss: 0.1755 - acc: 0.9942 - val_loss: 0.3491 - val_acc: 0.9589
Epoch 28/40
 - 1s - loss: 0.1799 - acc: 0.9900 - val_loss: 0.3251 - val_acc: 0.9647
Epoch 29/40
 - 1s - loss: 0.1843 - acc: 0.9884 - val_loss: 0.3398 - val_acc: 0.9466
Epoch 30/40
 - 1s - loss: 0.1886 - acc: 0.9817 - val_loss: 0.3237 - val_acc: 0.9618
Epoch 31/40
 - 1s - loss: 0.1584 - acc: 0.9918 - val_loss: 0.3268 - val_acc: 0.9416
Epoch 32/40
 - 1s - loss: 0.1680 - acc: 0.9896 - val_loss: 0.3537 - val_acc: 0.9394
Epoch 33/40
 - 1s - loss: 0.1955 - acc: 0.9784 - val_loss: 0.3502 - val_acc: 0.9279
Epoch 34/40
 - 1s - loss: 0.1818 - acc: 0.9854 - val_loss: 0.3326 - val_acc: 0.9589
Epoch 35/40
 - 1s - loss: 0.1500 - acc: 0.9945 - val_loss: 0.2975 - val_acc: 0.9740
Epoch 36/40
 - 1s - loss: 0.1430 - acc: 0.9942 - val_loss: 0.3193 - val_acc: 0.9510
Epoch 37/40
 - 1s - loss: 0.1734 - acc: 0.9836 - val_loss: 0.5081 - val_acc: 0.8385
Epoch 38/40
 - 1s - loss: 0.3715 - acc: 0.9519 - val_loss: 0.3502 - val_acc: 0.9438
Epoch 39/40
 - 1s - loss: 0.1664 - acc: 0.9939 - val_loss: 0.3342 - val_acc: 0.9438
Epoch 40/40
 - 1s - loss: 0.1381 - acc: 0.9954 - val_loss: 0.3313 - val_acc: 0.9416
Train accuracy 0.9929984779299847 Test accuracy: 0.9416005767844268
--------------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)               (None, 124, 32)           1472

_____
conv1d_2 (Conv1D)               (None, 122, 24)           2328

_____
dropout_1 (Dropout)             (None, 122, 24)           0

_____
max_pooling1d_1 (MaxPooling1    (None, 61, 24)            0

_____
flatten_1 (Flatten)             (None, 1464)              0

_____
dense_1 (Dense)                 (None, 16)                23440

_____
dense_2 (Dense)                 (None, 3)                 51
=================================================================
Total params: 27,291
Trainable params: 27,291
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 55.9596 - acc: 0.3674 - val_loss: 14.4817 - val_acc: 0.3576
Epoch 2/40
 - 1s - loss: 5.9546 - acc: 0.3732 - val_loss: 1.9221 - val_acc: 0.4045
Epoch 3/40
 - 1s - loss: 1.2886 - acc: 0.5504 - val_loss: 1.0939 - val_acc: 0.6013
Epoch 4/40
 - 1s - loss: 0.9819 - acc: 0.6000 - val_loss: 1.0079 - val_acc: 0.6215
Epoch 5/40
 - 1s - loss: 0.8812 - acc: 0.6347 - val_loss: 0.9780 - val_acc: 0.6157
Epoch 6/40
 - 1s - loss: 0.8315 - acc: 0.6594 - val_loss: 0.8693 - val_acc: 0.6568
Epoch 7/40
 - 1s - loss: 0.7689 - acc: 0.7848 - val_loss: 0.7859 - val_acc: 0.8681
Epoch 8/40
 - 1s - loss: 0.6622 - acc: 0.8883 - val_loss: 0.7829 - val_acc: 0.8731
Epoch 9/40
 - 1s - loss: 0.5112 - acc: 0.9172 - val_loss: 0.5939 - val_acc: 0.8926
Epoch 10/40
 - 1s - loss: 0.4262 - acc: 0.9349 - val_loss: 0.5416 - val_acc: 0.9041
Epoch 11/40
```

```
         - 1s - loss: 0.3531 - acc: 0.9507 - val_loss: 0.5927 - val_acc: 0.8356
Epoch 12/40
         - 1s - loss: 0.3161 - acc: 0.9613 - val_loss: 0.5052 - val_acc: 0.8753
Epoch 13/40
         - 1s - loss: 0.3013 - acc: 0.9537 - val_loss: 0.4510 - val_acc: 0.9329
Epoch 14/40
         - 1s - loss: 0.2861 - acc: 0.9601 - val_loss: 0.4758 - val_acc: 0.8854
Epoch 15/40
         - 1s - loss: 0.3090 - acc: 0.9510 - val_loss: 0.4494 - val_acc: 0.8933
Epoch 16/40
         - 1s - loss: 0.2911 - acc: 0.9574 - val_loss: 0.4040 - val_acc: 0.9149
Epoch 17/40
         - 1s - loss: 0.2925 - acc: 0.9549 - val_loss: 0.4272 - val_acc: 0.9286
Epoch 18/40
         - 1s - loss: 0.2419 - acc: 0.9741 - val_loss: 0.4279 - val_acc: 0.9077
Epoch 19/40
         - 1s - loss: 0.2173 - acc: 0.9760 - val_loss: 0.4216 - val_acc: 0.8904
Epoch 20/40
         - 1s - loss: 0.2392 - acc: 0.9680 - val_loss: 0.3915 - val_acc: 0.9135
Epoch 21/40
         - 1s - loss: 0.2317 - acc: 0.9763 - val_loss: 0.4039 - val_acc: 0.9185
Epoch 22/40
         - 1s - loss: 0.2384 - acc: 0.9632 - val_loss: 0.5001 - val_acc: 0.8681
Epoch 23/40
         - 1s - loss: 0.2692 - acc: 0.9589 - val_loss: 0.3776 - val_acc: 0.9250
Epoch 24/40
         - 1s - loss: 0.2136 - acc: 0.9750 - val_loss: 0.4421 - val_acc: 0.8767
Epoch 25/40
         - 1s - loss: 0.2154 - acc: 0.9680 - val_loss: 0.5168 - val_acc: 0.8767
Epoch 26/40
         - 1s - loss: 0.2163 - acc: 0.9732 - val_loss: 0.4347 - val_acc: 0.9005
Epoch 27/40
         - 1s - loss: 0.2277 - acc: 0.9635 - val_loss: 0.3555 - val_acc: 0.9344
Epoch 28/40
         - 1s - loss: 0.2051 - acc: 0.9744 - val_loss: 0.4175 - val_acc: 0.8947
Epoch 29/40
         - 1s - loss: 0.2417 - acc: 0.9656 - val_loss: 0.3813 - val_acc: 0.9070
Epoch 30/40
         - 1s - loss: 0.1868 - acc: 0.9790 - val_loss: 0.3227 - val_acc: 0.9394
Epoch 31/40
         - 1s - loss: 0.2549 - acc: 0.9601 - val_loss: 0.4935 - val_acc: 0.8803
Epoch 32/40
         - 1s - loss: 0.2185 - acc: 0.9686 - val_loss: 0.3868 - val_acc: 0.9113
```

```
Epoch 33/40
 - 1s - loss: 0.2033 - acc: 0.9772 - val_loss: 0.3807 - val_acc: 0.9005
Epoch 34/40
 - 1s - loss: 0.1946 - acc: 0.9766 - val_loss: 0.5521 - val_acc: 0.8536
Epoch 35/40
 - 1s - loss: 0.2080 - acc: 0.9656 - val_loss: 0.4317 - val_acc: 0.9056
Epoch 36/40
 - 1s - loss: 0.2102 - acc: 0.9753 - val_loss: 0.4125 - val_acc: 0.8962
Epoch 37/40
 - 1s - loss: 0.2366 - acc: 0.9592 - val_loss: 0.4850 - val_acc: 0.9005
Epoch 38/40
 - 1s - loss: 0.2289 - acc: 0.9756 - val_loss: 0.3950 - val_acc: 0.9243
Epoch 39/40
 - 1s - loss: 0.2300 - acc: 0.9683 - val_loss: 0.4255 - val_acc: 0.8983
Epoch 40/40
 - 1s - loss: 0.1990 - acc: 0.9747 - val_loss: 0.3737 - val_acc: 0.9185
Train accuracy 0.9899543378995433 Test accuracy: 0.9185291997116077
-------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 32)           1472
_____
conv1d_2 (Conv1D)            (None, 118, 24)           5400
_____
dropout_1 (Dropout)          (None, 118, 24)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 59, 24)            0
_____
flatten_1 (Flatten)          (None, 1416)              0
_____
dense_1 (Dense)              (None, 64)                90688
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 6.6326 - acc: 0.6776 - val_loss: 1.0498 - val_acc: 0.8320
```

```
Epoch 2/40
 - 2s - loss: 0.6944 - acc: 0.8928 - val_loss: 0.7633 - val_acc: 0.7693
Epoch 3/40
 - 2s - loss: 0.4890 - acc: 0.9139 - val_loss: 0.4900 - val_acc: 0.9459
Epoch 4/40
 - 2s - loss: 0.3483 - acc: 0.9470 - val_loss: 0.4432 - val_acc: 0.8904
Epoch 5/40
 - 2s - loss: 0.3421 - acc: 0.9467 - val_loss: 0.3884 - val_acc: 0.9265
Epoch 6/40
 - 2s - loss: 0.3027 - acc: 0.9495 - val_loss: 0.3657 - val_acc: 0.9380
Epoch 7/40
 - 2s - loss: 0.2648 - acc: 0.9626 - val_loss: 0.3525 - val_acc: 0.9351
Epoch 8/40
 - 2s - loss: 0.2563 - acc: 0.9586 - val_loss: 0.5729 - val_acc: 0.9128
Epoch 9/40
 - 2s - loss: 0.2537 - acc: 0.9574 - val_loss: 0.6147 - val_acc: 0.8702
Epoch 10/40
 - 2s - loss: 0.2265 - acc: 0.9702 - val_loss: 0.3758 - val_acc: 0.9250
Epoch 11/40
 - 2s - loss: 0.2303 - acc: 0.9677 - val_loss: 0.4734 - val_acc: 0.9142
Epoch 12/40
 - 2s - loss: 0.2143 - acc: 0.9699 - val_loss: 0.3164 - val_acc: 0.9430
Epoch 13/40
 - 2s - loss: 0.2131 - acc: 0.9665 - val_loss: 0.3232 - val_acc: 0.9193
Epoch 14/40
 - 2s - loss: 0.1970 - acc: 0.9735 - val_loss: 0.2773 - val_acc: 0.9459
Epoch 15/40
 - 2s - loss: 0.2062 - acc: 0.9714 - val_loss: 0.3049 - val_acc: 0.9265
Epoch 16/40
 - 2s - loss: 0.1949 - acc: 0.9729 - val_loss: 0.2761 - val_acc: 0.9351
Epoch 17/40
 - 2s - loss: 0.2233 - acc: 0.9699 - val_loss: 0.2988 - val_acc: 0.9243
Epoch 18/40
 - 2s - loss: 0.1943 - acc: 0.9714 - val_loss: 0.3911 - val_acc: 0.9012
Epoch 19/40
 - 2s - loss: 0.2372 - acc: 0.9723 - val_loss: 0.3490 - val_acc: 0.9200
Epoch 20/40
 - 2s - loss: 0.1851 - acc: 0.9699 - val_loss: 0.3073 - val_acc: 0.9185
Epoch 21/40
 - 2s - loss: 0.1914 - acc: 0.9760 - val_loss: 0.6075 - val_acc: 0.8407
Epoch 22/40
 - 2s - loss: 0.1950 - acc: 0.9747 - val_loss: 0.2876 - val_acc: 0.9272
Epoch 23/40
```

```
 - 2s - loss: 0.1920 - acc: 0.9787 - val_loss: 0.3236 - val_acc: 0.9445
Epoch 24/40
 - 2s - loss: 0.1734 - acc: 0.9775 - val_loss: 0.3048 - val_acc: 0.9301
Epoch 25/40
 - 2s - loss: 0.2054 - acc: 0.9741 - val_loss: 0.3498 - val_acc: 0.9250
Epoch 26/40
 - 2s - loss: 0.2171 - acc: 0.9723 - val_loss: 0.2809 - val_acc: 0.9380
Epoch 27/40
 - 2s - loss: 0.1726 - acc: 0.9805 - val_loss: 0.8492 - val_acc: 0.8082
Epoch 28/40
 - 2s - loss: 0.2375 - acc: 0.9705 - val_loss: 0.3286 - val_acc: 0.9250
Epoch 29/40
 - 2s - loss: 0.2058 - acc: 0.9775 - val_loss: 0.3316 - val_acc: 0.9293
Epoch 30/40
 - 2s - loss: 0.1890 - acc: 0.9714 - val_loss: 0.3223 - val_acc: 0.9387
Epoch 31/40
 - 2s - loss: 0.1837 - acc: 0.9796 - val_loss: 0.5722 - val_acc: 0.8616
Epoch 32/40
 - 2s - loss: 0.1798 - acc: 0.9729 - val_loss: 0.3130 - val_acc: 0.9337
Epoch 33/40
 - 2s - loss: 0.1671 - acc: 0.9763 - val_loss: 0.4361 - val_acc: 0.8926
Epoch 34/40
 - 2s - loss: 0.1656 - acc: 0.9784 - val_loss: 0.3187 - val_acc: 0.9142
Epoch 35/40
 - 2s - loss: 0.1664 - acc: 0.9741 - val_loss: 0.3011 - val_acc: 0.9423
Epoch 36/40
 - 2s - loss: 0.1923 - acc: 0.9753 - val_loss: 0.4052 - val_acc: 0.8998
Epoch 37/40
 - 2s - loss: 0.1590 - acc: 0.9808 - val_loss: 0.6466 - val_acc: 0.8428
Epoch 38/40
 - 2s - loss: 0.1683 - acc: 0.9769 - val_loss: 0.4506 - val_acc: 0.9063
Epoch 39/40
 - 2s - loss: 0.1813 - acc: 0.9772 - val_loss: 0.4706 - val_acc: 0.8695
Epoch 40/40
 - 2s - loss: 0.1570 - acc: 0.9848 - val_loss: 0.3215 - val_acc: 0.9394
Train accuracy 0.997869101978691 Test accuracy: 0.93943763518385
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 122, 24)	3048

```
_____
dropout_1 (Dropout)              (None, 122, 24)              0
_____
max_pooling1d_1 (MaxPooling1     (None, 40, 24)               0
_____
flatten_1 (Flatten)              (None, 960)                  0
_____
dense_1 (Dense)                  (None, 16)                   15376
_____
dense_2 (Dense)                  (None, 3)                    51
===================================================================
Total params: 20,407
Trainable params: 20,407
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 57.8075 - acc: 0.4581 - val_loss: 30.3956 - val_acc: 0.5552
Epoch 2/40
 - 1s - loss: 18.3318 - acc: 0.7005 - val_loss: 9.9586 - val_acc: 0.5739
Epoch 3/40
 - 1s - loss: 6.1367 - acc: 0.8143 - val_loss: 3.7412 - val_acc: 0.8089
Epoch 4/40
 - 1s - loss: 2.3430 - acc: 0.9087 - val_loss: 1.7612 - val_acc: 0.8565
Epoch 5/40
 - 1s - loss: 1.0621 - acc: 0.9452 - val_loss: 1.0515 - val_acc: 0.8782
Epoch 6/40
 - 1s - loss: 0.6138 - acc: 0.9592 - val_loss: 0.8012 - val_acc: 0.8810
Epoch 7/40
 - 1s - loss: 0.4603 - acc: 0.9598 - val_loss: 0.6833 - val_acc: 0.8926
Epoch 8/40
 - 1s - loss: 0.3824 - acc: 0.9717 - val_loss: 0.6263 - val_acc: 0.8976
Epoch 9/40
 - 1s - loss: 0.3546 - acc: 0.9693 - val_loss: 0.5784 - val_acc: 0.9265
Epoch 10/40
 - 1s - loss: 0.3527 - acc: 0.9653 - val_loss: 0.5689 - val_acc: 0.8810
Epoch 11/40
 - 1s - loss: 0.3277 - acc: 0.9668 - val_loss: 0.5336 - val_acc: 0.9272
Epoch 12/40
 - 1s - loss: 0.2918 - acc: 0.9842 - val_loss: 0.4984 - val_acc: 0.9503
Epoch 13/40
 - 1s - loss: 0.2754 - acc: 0.9823 - val_loss: 0.5545 - val_acc: 0.8565
```

```
Epoch 14/40
 - 1s - loss: 0.2777 - acc: 0.9799 - val_loss: 0.4690 - val_acc: 0.9517
Epoch 15/40
 - 1s - loss: 0.2788 - acc: 0.9744 - val_loss: 0.4825 - val_acc: 0.9099
Epoch 16/40
 - 1s - loss: 0.2492 - acc: 0.9817 - val_loss: 0.4511 - val_acc: 0.9373
Epoch 17/40
 - 1s - loss: 0.2644 - acc: 0.9793 - val_loss: 0.4430 - val_acc: 0.9423
Epoch 18/40
 - 1s - loss: 0.2250 - acc: 0.9872 - val_loss: 0.4816 - val_acc: 0.8998
Epoch 19/40
 - 1s - loss: 0.2360 - acc: 0.9808 - val_loss: 0.4396 - val_acc: 0.9221
Epoch 20/40
 - 1s - loss: 0.2453 - acc: 0.9787 - val_loss: 0.4382 - val_acc: 0.9373
Epoch 21/40
 - 1s - loss: 0.2095 - acc: 0.9878 - val_loss: 0.3967 - val_acc: 0.9567
Epoch 22/40
 - 1s - loss: 0.2052 - acc: 0.9884 - val_loss: 0.4457 - val_acc: 0.8998
Epoch 23/40
 - 1s - loss: 0.2117 - acc: 0.9848 - val_loss: 0.3861 - val_acc: 0.9575
Epoch 24/40
 - 1s - loss: 0.2288 - acc: 0.9744 - val_loss: 0.5430 - val_acc: 0.8443
Epoch 25/40
 - 1s - loss: 0.2485 - acc: 0.9738 - val_loss: 0.3781 - val_acc: 0.9553
Epoch 26/40
 - 1s - loss: 0.1955 - acc: 0.9881 - val_loss: 0.3674 - val_acc: 0.9539
Epoch 27/40
 - 1s - loss: 0.1849 - acc: 0.9903 - val_loss: 0.3476 - val_acc: 0.9553
Epoch 28/40
 - 1s - loss: 0.1755 - acc: 0.9896 - val_loss: 0.3498 - val_acc: 0.9632
Epoch 29/40
 - 1s - loss: 0.2445 - acc: 0.9702 - val_loss: 0.3641 - val_acc: 0.9452
Epoch 30/40
 - 1s - loss: 0.1792 - acc: 0.9903 - val_loss: 0.3500 - val_acc: 0.9632
Epoch 31/40
 - 1s - loss: 0.1877 - acc: 0.9893 - val_loss: 0.3345 - val_acc: 0.9668
Epoch 32/40
 - 1s - loss: 0.1910 - acc: 0.9826 - val_loss: 0.3348 - val_acc: 0.9546
Epoch 33/40
 - 1s - loss: 0.1661 - acc: 0.9912 - val_loss: 0.3549 - val_acc: 0.9344
Epoch 34/40
 - 1s - loss: 0.1668 - acc: 0.9906 - val_loss: 0.3733 - val_acc: 0.9322
Epoch 35/40
```

```
    - 1s - loss: 0.1607 - acc: 0.9921 - val_loss: 0.3266 - val_acc: 0.9625
Epoch 36/40
    - 1s - loss: 0.1613 - acc: 0.9906 - val_loss: 0.3389 - val_acc: 0.9438
Epoch 37/40
    - 1s - loss: 0.1645 - acc: 0.9872 - val_loss: 0.3712 - val_acc: 0.9113
Epoch 38/40
    - 1s - loss: 0.2702 - acc: 0.9662 - val_loss: 0.3522 - val_acc: 0.9344
Epoch 39/40
    - 1s - loss: 0.1600 - acc: 0.9887 - val_loss: 0.3527 - val_acc: 0.9481
Epoch 40/40
    - 1s - loss: 0.1416 - acc: 0.9963 - val_loss: 0.3086 - val_acc: 0.9647
Train accuracy 1.0 Test accuracy: 0.9646719538572458
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 24)	0
flatten_1 (Flatten)	(None, 960)	0
dense_1 (Dense)	(None, 64)	61504
dense_2 (Dense)	(None, 3)	195

```
Total params: 65,499
Trainable params: 65,499
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
    - 2s - loss: 43.9603 - acc: 0.5702 - val_loss: 17.8761 - val_acc: 0.7541
Epoch 2/40
    - 1s - loss: 8.9323 - acc: 0.8785 - val_loss: 3.8264 - val_acc: 0.7736
Epoch 3/40
    - 1s - loss: 1.9260 - acc: 0.9306 - val_loss: 1.3479 - val_acc: 0.7707
Epoch 4/40
```

```
            - 1s - loss: 0.6863 - acc: 0.9431 - val_loss: 0.7324 - val_acc: 0.9012
        Epoch 5/40
            - 1s - loss: 0.4043 - acc: 0.9613 - val_loss: 0.5895 - val_acc: 0.9250
        Epoch 6/40
            - 1s - loss: 0.3250 - acc: 0.9699 - val_loss: 0.5050 - val_acc: 0.9351
        Epoch 7/40
            - 1s - loss: 0.2935 - acc: 0.9699 - val_loss: 0.4889 - val_acc: 0.9185
        Epoch 8/40
            - 1s - loss: 0.2735 - acc: 0.9735 - val_loss: 0.4389 - val_acc: 0.9466
        Epoch 9/40
            - 1s - loss: 0.2945 - acc: 0.9644 - val_loss: 0.4953 - val_acc: 0.9056
        Epoch 10/40
            - 1s - loss: 0.2696 - acc: 0.9699 - val_loss: 0.4491 - val_acc: 0.8962
        Epoch 11/40
            - 1s - loss: 0.2565 - acc: 0.9680 - val_loss: 0.4417 - val_acc: 0.9142
        Epoch 12/40
            - 1s - loss: 0.2215 - acc: 0.9848 - val_loss: 0.3811 - val_acc: 0.9618
        Epoch 13/40
            - 1s - loss: 0.2016 - acc: 0.9866 - val_loss: 0.3529 - val_acc: 0.9676
        Epoch 14/40
            - 1s - loss: 0.1997 - acc: 0.9845 - val_loss: 0.3590 - val_acc: 0.9603
        Epoch 15/40
            - 1s - loss: 0.1805 - acc: 0.9881 - val_loss: 0.4034 - val_acc: 0.9041
        Epoch 16/40
            - 1s - loss: 0.1792 - acc: 0.9887 - val_loss: 0.3141 - val_acc: 0.9712
        Epoch 17/40
            - 1s - loss: 0.1857 - acc: 0.9851 - val_loss: 0.3371 - val_acc: 0.9452
        Epoch 18/40
            - 1s - loss: 0.1903 - acc: 0.9811 - val_loss: 0.3066 - val_acc: 0.9683
        Epoch 19/40
            - 1s - loss: 0.1561 - acc: 0.9939 - val_loss: 0.3127 - val_acc: 0.9683
        Epoch 20/40
            - 1s - loss: 0.1535 - acc: 0.9896 - val_loss: 0.2905 - val_acc: 0.9640
        Epoch 21/40
            - 1s - loss: 0.1698 - acc: 0.9906 - val_loss: 0.3075 - val_acc: 0.9611
        Epoch 22/40
            - 1s - loss: 0.1772 - acc: 0.9808 - val_loss: 0.3226 - val_acc: 0.9618
        Epoch 23/40
            - 1s - loss: 0.1990 - acc: 0.9802 - val_loss: 0.3202 - val_acc: 0.9438
        Epoch 24/40
            - 1s - loss: 0.1733 - acc: 0.9839 - val_loss: 0.3075 - val_acc: 0.9603
        Epoch 25/40
            - 1s - loss: 0.1404 - acc: 0.9915 - val_loss: 0.3008 - val_acc: 0.9503
```

```
Epoch 26/40
 - 1s - loss: 0.1343 - acc: 0.9942 - val_loss: 0.3551 - val_acc: 0.9106
Epoch 27/40
 - 1s - loss: 0.1232 - acc: 0.9945 - val_loss: 0.3003 - val_acc: 0.9510
Epoch 28/40
 - 1s - loss: 0.1297 - acc: 0.9915 - val_loss: 0.2888 - val_acc: 0.9640
Epoch 29/40
 - 1s - loss: 0.1871 - acc: 0.9781 - val_loss: 0.2573 - val_acc: 0.9719
Epoch 30/40
 - 1s - loss: 0.1867 - acc: 0.9717 - val_loss: 0.3745 - val_acc: 0.9084
Epoch 31/40
 - 1s - loss: 0.1644 - acc: 0.9881 - val_loss: 0.2575 - val_acc: 0.9647
Epoch 32/40
 - 1s - loss: 0.1216 - acc: 0.9954 - val_loss: 0.3056 - val_acc: 0.9466
Epoch 33/40
 - 1s - loss: 0.1175 - acc: 0.9945 - val_loss: 0.3707 - val_acc: 0.8810
Epoch 34/40
 - 1s - loss: 0.1803 - acc: 0.9750 - val_loss: 0.4388 - val_acc: 0.8796
Epoch 35/40
 - 1s - loss: 0.1624 - acc: 0.9839 - val_loss: 0.2533 - val_acc: 0.9719
Epoch 36/40
 - 1s - loss: 0.1083 - acc: 0.9960 - val_loss: 0.2537 - val_acc: 0.9676
Epoch 37/40
 - 1s - loss: 0.1061 - acc: 0.9960 - val_loss: 0.2308 - val_acc: 0.9726
Epoch 38/40
 - 1s - loss: 0.1058 - acc: 0.9957 - val_loss: 0.2835 - val_acc: 0.9488
Epoch 39/40
 - 1s - loss: 0.1046 - acc: 0.9930 - val_loss: 0.2833 - val_acc: 0.9344
Epoch 40/40
 - 1s - loss: 0.1469 - acc: 0.9826 - val_loss: 0.4784 - val_acc: 0.8580
Train accuracy 0.9449010654490106 Test accuracy: 0.8579668348954578
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 122, 24)	3048
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0

```
flatten_1 (Flatten)              (None, 1464)              0
_____
dense_1 (Dense)                  (None, 16)                23440
_____
dense_2 (Dense)                  (None, 3)                 51
=================================================================
Total params: 28,471
Trainable params: 28,471
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 1s - loss: 62.0416 - acc: 0.5473 - val_loss: 42.8468 - val_acc: 0.6359
Epoch 2/40
 - 1s - loss: 30.8149 - acc: 0.7869 - val_loss: 20.7443 - val_acc: 0.7030
Epoch 3/40
 - 1s - loss: 14.1636 - acc: 0.8791 - val_loss: 9.6504 - val_acc: 0.5335
Epoch 4/40
 - 1s - loss: 6.2533 - acc: 0.8974 - val_loss: 4.1405 - val_acc: 0.8782
Epoch 5/40
 - 1s - loss: 2.7522 - acc: 0.9032 - val_loss: 1.9396 - val_acc: 0.8940
Epoch 6/40
 - 1s - loss: 1.2634 - acc: 0.9139 - val_loss: 1.0698 - val_acc: 0.8515
Epoch 7/40
 - 1s - loss: 0.6999 - acc: 0.9221 - val_loss: 0.8565 - val_acc: 0.7844
Epoch 8/40
 - 1s - loss: 0.5127 - acc: 0.9315 - val_loss: 0.6892 - val_acc: 0.8392
Epoch 9/40
 - 1s - loss: 0.4466 - acc: 0.9379 - val_loss: 0.7635 - val_acc: 0.8234
Epoch 10/40
 - 1s - loss: 0.4066 - acc: 0.9400 - val_loss: 0.6013 - val_acc: 0.8472
Epoch 11/40
 - 1s - loss: 0.3764 - acc: 0.9437 - val_loss: 0.5284 - val_acc: 0.9063
Epoch 12/40
 - 1s - loss: 0.3566 - acc: 0.9473 - val_loss: 0.4842 - val_acc: 0.9380
Epoch 13/40
 - 1s - loss: 0.3372 - acc: 0.9519 - val_loss: 0.8628 - val_acc: 0.6597
Epoch 14/40
 - 1s - loss: 0.3128 - acc: 0.9613 - val_loss: 0.4750 - val_acc: 0.8969
Epoch 15/40
 - 1s - loss: 0.3185 - acc: 0.9513 - val_loss: 0.4837 - val_acc: 0.8745
Epoch 16/40
```

```
        - 1s - loss: 0.2949 - acc: 0.9598 - val_loss: 0.4367 - val_acc: 0.9019
Epoch 17/40
        - 1s - loss: 0.2884 - acc: 0.9629 - val_loss: 0.4677 - val_acc: 0.9185
Epoch 18/40
        - 1s - loss: 0.2739 - acc: 0.9689 - val_loss: 0.4236 - val_acc: 0.9171
Epoch 19/40
        - 1s - loss: 0.2761 - acc: 0.9632 - val_loss: 0.4144 - val_acc: 0.9250
Epoch 20/40
        - 1s - loss: 0.2543 - acc: 0.9699 - val_loss: 0.3885 - val_acc: 0.9193
Epoch 21/40
        - 1s - loss: 0.2567 - acc: 0.9656 - val_loss: 0.4905 - val_acc: 0.8515
Epoch 22/40
        - 1s - loss: 0.2369 - acc: 0.9744 - val_loss: 0.4731 - val_acc: 0.8645
Epoch 23/40
        - 1s - loss: 0.2318 - acc: 0.9726 - val_loss: 0.4238 - val_acc: 0.8955
Epoch 24/40
        - 1s - loss: 0.2266 - acc: 0.9717 - val_loss: 0.3659 - val_acc: 0.9373
Epoch 25/40
        - 1s - loss: 0.2281 - acc: 0.9702 - val_loss: 0.3389 - val_acc: 0.9517
Epoch 26/40
        - 1s - loss: 0.2133 - acc: 0.9756 - val_loss: 0.9000 - val_acc: 0.7030
Epoch 27/40
        - 1s - loss: 0.2133 - acc: 0.9732 - val_loss: 0.7304 - val_acc: 0.8097
Epoch 28/40
        - 1s - loss: 0.2125 - acc: 0.9729 - val_loss: 0.3762 - val_acc: 0.9466
Epoch 29/40
        - 1s - loss: 0.2051 - acc: 0.9766 - val_loss: 0.3298 - val_acc: 0.9596
Epoch 30/40
        - 1s - loss: 0.2039 - acc: 0.9747 - val_loss: 0.3510 - val_acc: 0.9539
Epoch 31/40
        - 1s - loss: 0.1924 - acc: 0.9784 - val_loss: 0.3083 - val_acc: 0.9517
Epoch 32/40
        - 1s - loss: 0.2045 - acc: 0.9717 - val_loss: 0.7867 - val_acc: 0.7851
Epoch 33/40
        - 1s - loss: 0.2124 - acc: 0.9668 - val_loss: 0.3087 - val_acc: 0.9466
Epoch 34/40
        - 1s - loss: 0.1794 - acc: 0.9830 - val_loss: 0.2954 - val_acc: 0.9589
Epoch 35/40
        - 1s - loss: 0.2013 - acc: 0.9702 - val_loss: 0.3438 - val_acc: 0.9185
Epoch 36/40
        - 1s - loss: 0.1936 - acc: 0.9744 - val_loss: 0.3056 - val_acc: 0.9683
Epoch 37/40
        - 1s - loss: 0.1862 - acc: 0.9744 - val_loss: 0.3313 - val_acc: 0.9272
```

```
Epoch 38/40
 - 1s - loss: 0.1953 - acc: 0.9717 - val_loss: 0.3143 - val_acc: 0.9640
Epoch 39/40
 - 1s - loss: 0.1799 - acc: 0.9790 - val_loss: 0.3067 - val_acc: 0.9438
Epoch 40/40
 - 1s - loss: 0.1625 - acc: 0.9830 - val_loss: 0.3031 - val_acc: 0.9683
Train accuracy 0.9954337899543378 Test accuracy: 0.9682768565248738
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 16)	23440
dense_2 (Dense)	(None, 3)	51

```
Total params: 27,291
Trainable params: 27,291
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 100.2142 - acc: 0.3985 - val_loss: 72.1857 - val_acc: 0.5133
Epoch 2/40
 - 1s - loss: 53.5881 - acc: 0.6371 - val_loss: 37.0141 - val_acc: 0.6330
Epoch 3/40
 - 1s - loss: 25.9923 - acc: 0.7750 - val_loss: 17.0753 - val_acc: 0.4463
Epoch 4/40
 - 1s - loss: 11.1382 - acc: 0.8231 - val_loss: 6.8775 - val_acc: 0.6720
Epoch 5/40
 - 1s - loss: 4.2413 - acc: 0.8350 - val_loss: 2.5696 - val_acc: 0.7563
Epoch 6/40
 - 1s - loss: 1.5146 - acc: 0.8588 - val_loss: 1.1587 - val_acc: 0.7851
```

```
Epoch 7/40
 - 1s - loss: 0.7388 - acc: 0.8834 - val_loss: 0.8759 - val_acc: 0.7657
Epoch 8/40
 - 1s - loss: 0.5890 - acc: 0.8965 - val_loss: 0.7878 - val_acc: 0.8169
Epoch 9/40
 - 1s - loss: 0.5423 - acc: 0.9008 - val_loss: 0.6869 - val_acc: 0.8724
Epoch 10/40
 - 1s - loss: 0.5015 - acc: 0.9139 - val_loss: 0.8108 - val_acc: 0.7231
Epoch 11/40
 - 1s - loss: 0.4863 - acc: 0.9023 - val_loss: 0.7972 - val_acc: 0.7462
Epoch 12/40
 - 1s - loss: 0.4608 - acc: 0.9196 - val_loss: 0.5820 - val_acc: 0.8998
Epoch 13/40
 - 1s - loss: 0.4331 - acc: 0.9218 - val_loss: 0.9686 - val_acc: 0.6251
Epoch 14/40
 - 1s - loss: 0.4180 - acc: 0.9233 - val_loss: 0.7345 - val_acc: 0.7534
Epoch 15/40
 - 1s - loss: 0.4128 - acc: 0.9275 - val_loss: 0.6106 - val_acc: 0.8335
Epoch 16/40
 - 1s - loss: 0.3901 - acc: 0.9300 - val_loss: 0.6130 - val_acc: 0.8306
Epoch 17/40
 - 1s - loss: 0.3723 - acc: 0.9367 - val_loss: 0.6063 - val_acc: 0.8645
Epoch 18/40
 - 1s - loss: 0.3710 - acc: 0.9324 - val_loss: 0.8155 - val_acc: 0.7159
Epoch 19/40
 - 1s - loss: 0.3644 - acc: 0.9367 - val_loss: 0.5030 - val_acc: 0.9106
Epoch 20/40
 - 1s - loss: 0.3282 - acc: 0.9504 - val_loss: 0.6710 - val_acc: 0.7960
Epoch 21/40
 - 1s - loss: 0.3288 - acc: 0.9428 - val_loss: 0.7998 - val_acc: 0.6864
Epoch 22/40
 - 1s - loss: 0.3149 - acc: 0.9495 - val_loss: 0.7698 - val_acc: 0.7361
Epoch 23/40
 - 1s - loss: 0.3098 - acc: 0.9531 - val_loss: 0.4478 - val_acc: 0.9207
Epoch 24/40
 - 1s - loss: 0.2983 - acc: 0.9553 - val_loss: 0.4443 - val_acc: 0.9164
Epoch 25/40
 - 1s - loss: 0.2971 - acc: 0.9559 - val_loss: 0.4930 - val_acc: 0.8702
Epoch 26/40
 - 1s - loss: 0.2878 - acc: 0.9556 - val_loss: 0.4956 - val_acc: 0.8882
Epoch 27/40
 - 1s - loss: 0.2709 - acc: 0.9650 - val_loss: 0.6329 - val_acc: 0.8616
Epoch 28/40
```

```
 - 1s - loss: 0.2920 - acc: 0.9504 - val_loss: 0.5043 - val_acc: 0.9034
Epoch 29/40
 - 1s - loss: 0.2780 - acc: 0.9568 - val_loss: 0.4207 - val_acc: 0.9279
Epoch 30/40
 - 1s - loss: 0.2793 - acc: 0.9525 - val_loss: 0.4326 - val_acc: 0.9257
Epoch 31/40
 - 1s - loss: 0.2459 - acc: 0.9680 - val_loss: 0.4114 - val_acc: 0.9084
Epoch 32/40
 - 1s - loss: 0.2686 - acc: 0.9595 - val_loss: 0.4717 - val_acc: 0.8955
Epoch 33/40
 - 1s - loss: 0.2549 - acc: 0.9680 - val_loss: 0.7609 - val_acc: 0.7174
Epoch 34/40
 - 1s - loss: 0.2527 - acc: 0.9604 - val_loss: 0.3776 - val_acc: 0.9286
Epoch 35/40
 - 1s - loss: 0.2672 - acc: 0.9586 - val_loss: 0.4608 - val_acc: 0.9048
Epoch 36/40
 - 1s - loss: 0.2444 - acc: 0.9641 - val_loss: 0.4535 - val_acc: 0.9106
Epoch 37/40
 - 1s - loss: 0.2393 - acc: 0.9644 - val_loss: 0.4711 - val_acc: 0.9048
Epoch 38/40
 - 1s - loss: 0.2512 - acc: 0.9629 - val_loss: 0.4923 - val_acc: 0.9084
Epoch 39/40
 - 1s - loss: 0.2401 - acc: 0.9665 - val_loss: 0.4260 - val_acc: 0.9005
Epoch 40/40
 - 1s - loss: 0.2326 - acc: 0.9635 - val_loss: 0.3904 - val_acc: 0.9279
Train accuracy 0.9914764079147641 Test accuracy: 0.9279019466474405
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 64)	93760
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 78.7403 - acc: 0.5266 - val_loss: 53.4401 - val_acc: 0.5595
Epoch 2/40
 - 1s - loss: 37.7553 - acc: 0.7574 - val_loss: 24.6322 - val_acc: 0.5703
Epoch 3/40
 - 1s - loss: 16.1910 - acc: 0.8298 - val_loss: 9.8387 - val_acc: 0.6518
Epoch 4/40
 - 1s - loss: 5.8844 - acc: 0.8688 - val_loss: 3.3221 - val_acc: 0.7671
Epoch 5/40
 - 1s - loss: 1.8497 - acc: 0.8828 - val_loss: 1.1520 - val_acc: 0.8356
Epoch 6/40
 - 1s - loss: 0.7387 - acc: 0.8907 - val_loss: 0.7810 - val_acc: 0.8515
Epoch 7/40
 - 1s - loss: 0.5296 - acc: 0.9078 - val_loss: 0.6851 - val_acc: 0.8298
Epoch 8/40
 - 1s - loss: 0.4524 - acc: 0.9227 - val_loss: 0.5487 - val_acc: 0.9012
Epoch 9/40
 - 1s - loss: 0.4015 - acc: 0.9318 - val_loss: 0.5317 - val_acc: 0.9063
Epoch 10/40
 - 1s - loss: 0.3588 - acc: 0.9455 - val_loss: 0.6625 - val_acc: 0.8111
Epoch 11/40
 - 1s - loss: 0.3513 - acc: 0.9422 - val_loss: 0.5353 - val_acc: 0.8731
Epoch 12/40
 - 1s - loss: 0.3240 - acc: 0.9476 - val_loss: 0.4208 - val_acc: 0.9423
Epoch 13/40
 - 1s - loss: 0.3059 - acc: 0.9519 - val_loss: 0.9699 - val_acc: 0.6734
Epoch 14/40
 - 1s - loss: 0.2818 - acc: 0.9592 - val_loss: 0.3844 - val_acc: 0.9279
Epoch 15/40
 - 1s - loss: 0.2890 - acc: 0.9492 - val_loss: 0.4856 - val_acc: 0.8782
Epoch 16/40
 - 1s - loss: 0.2640 - acc: 0.9589 - val_loss: 0.3873 - val_acc: 0.9019
Epoch 17/40
 - 1s - loss: 0.2550 - acc: 0.9589 - val_loss: 0.4247 - val_acc: 0.9128
Epoch 18/40
 - 1s - loss: 0.2609 - acc: 0.9583 - val_loss: 0.4597 - val_acc: 0.8774
```

```
Epoch 19/40
 - 1s - loss: 0.2450 - acc: 0.9598 - val_loss: 0.3492 - val_acc: 0.9517
Epoch 20/40
 - 1s - loss: 0.2336 - acc: 0.9662 - val_loss: 0.2985 - val_acc: 0.9503
Epoch 21/40
 - 1s - loss: 0.2391 - acc: 0.9647 - val_loss: 0.3626 - val_acc: 0.9250
Epoch 22/40
 - 1s - loss: 0.2308 - acc: 0.9683 - val_loss: 0.3894 - val_acc: 0.9063
Epoch 23/40
 - 1s - loss: 0.2199 - acc: 0.9705 - val_loss: 0.2990 - val_acc: 0.9539
Epoch 24/40
 - 1s - loss: 0.2120 - acc: 0.9729 - val_loss: 0.2984 - val_acc: 0.9466
Epoch 25/40
 - 1s - loss: 0.2324 - acc: 0.9610 - val_loss: 0.2758 - val_acc: 0.9611
Epoch 26/40
 - 1s - loss: 0.2391 - acc: 0.9607 - val_loss: 0.3088 - val_acc: 0.9553
Epoch 27/40
 - 1s - loss: 0.2028 - acc: 0.9729 - val_loss: 0.2921 - val_acc: 0.9640
Epoch 28/40
 - 1s - loss: 0.1901 - acc: 0.9799 - val_loss: 0.2532 - val_acc: 0.9640
Epoch 29/40
 - 1s - loss: 0.2394 - acc: 0.9623 - val_loss: 0.3216 - val_acc: 0.9402
Epoch 30/40
 - 1s - loss: 0.1929 - acc: 0.9720 - val_loss: 0.3294 - val_acc: 0.9171
Epoch 31/40
 - 1s - loss: 0.2254 - acc: 0.9647 - val_loss: 0.2655 - val_acc: 0.9647
Epoch 32/40
 - 1s - loss: 0.1892 - acc: 0.9747 - val_loss: 0.2959 - val_acc: 0.9524
Epoch 33/40
 - 1s - loss: 0.2175 - acc: 0.9650 - val_loss: 0.7249 - val_acc: 0.7505
Epoch 34/40
 - 1s - loss: 0.1785 - acc: 0.9781 - val_loss: 0.3165 - val_acc: 0.9229
Epoch 35/40
 - 1s - loss: 0.2052 - acc: 0.9686 - val_loss: 0.2530 - val_acc: 0.9466
Epoch 36/40
 - 1s - loss: 0.2449 - acc: 0.9632 - val_loss: 0.2673 - val_acc: 0.9611
Epoch 37/40
 - 1s - loss: 0.1509 - acc: 0.9851 - val_loss: 1.1246 - val_acc: 0.7231
Epoch 38/40
 - 1s - loss: 0.2035 - acc: 0.9689 - val_loss: 0.2580 - val_acc: 0.9553
Epoch 39/40
 - 1s - loss: 0.1959 - acc: 0.9705 - val_loss: 0.2407 - val_acc: 0.9640
Epoch 40/40
```

```
 - 1s - loss: 0.2122 - acc: 0.9729 - val_loss: 0.2622 - val_acc: 0.9647
Train accuracy 0.9972602739726028 Test accuracy: 0.9646719538572458
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 122, 24)	3048
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 64)	93760
dense_2 (Dense)	(None, 3)	195

```
Total params: 98,935
Trainable params: 98,935
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 41.7386 - acc: 0.6174 - val_loss: 31.5608 - val_acc: 0.7376
Epoch 2/40
 - 1s - loss: 24.6770 - acc: 0.8575 - val_loss: 18.9945 - val_acc: 0.6828
Epoch 3/40
 - 1s - loss: 14.3140 - acc: 0.9160 - val_loss: 11.3941 - val_acc: 0.5068
Epoch 4/40
 - 1s - loss: 8.0415 - acc: 0.9300 - val_loss: 5.8800 - val_acc: 0.9553
Epoch 5/40
 - 1s - loss: 4.2703 - acc: 0.9467 - val_loss: 3.3998 - val_acc: 0.7556
Epoch 6/40
 - 1s - loss: 2.1918 - acc: 0.9546 - val_loss: 1.6663 - val_acc: 0.9409
Epoch 7/40
 - 1s - loss: 1.1443 - acc: 0.9519 - val_loss: 1.0074 - val_acc: 0.9142
Epoch 8/40
 - 1s - loss: 0.6416 - acc: 0.9659 - val_loss: 0.6936 - val_acc: 0.9128
Epoch 9/40
```

```
             - 1s - loss: 0.4455 - acc: 0.9656 - val_loss: 0.7062 - val_acc: 0.8673
         Epoch 10/40
             - 1s - loss: 0.3538 - acc: 0.9726 - val_loss: 0.4646 - val_acc: 0.9373
         Epoch 11/40
             - 1s - loss: 0.2994 - acc: 0.9717 - val_loss: 0.4204 - val_acc: 0.9394
         Epoch 12/40
             - 1s - loss: 0.2599 - acc: 0.9763 - val_loss: 0.3822 - val_acc: 0.9611
         Epoch 13/40
             - 1s - loss: 0.2432 - acc: 0.9747 - val_loss: 0.7292 - val_acc: 0.7311
         Epoch 14/40
             - 1s - loss: 0.2204 - acc: 0.9763 - val_loss: 0.3405 - val_acc: 0.9430
         Epoch 15/40
             - 1s - loss: 0.2107 - acc: 0.9793 - val_loss: 0.3614 - val_acc: 0.9286
         Epoch 16/40
             - 1s - loss: 0.1987 - acc: 0.9775 - val_loss: 0.3231 - val_acc: 0.9466
         Epoch 17/40
             - 1s - loss: 0.1876 - acc: 0.9820 - val_loss: 0.3232 - val_acc: 0.9495
         Epoch 18/40
             - 1s - loss: 0.1714 - acc: 0.9830 - val_loss: 0.3223 - val_acc: 0.9445
         Epoch 19/40
             - 1s - loss: 0.1588 - acc: 0.9863 - val_loss: 0.2948 - val_acc: 0.9488
         Epoch 20/40
             - 1s - loss: 0.1626 - acc: 0.9793 - val_loss: 0.2598 - val_acc: 0.9647
         Epoch 21/40
             - 1s - loss: 0.1527 - acc: 0.9842 - val_loss: 0.3461 - val_acc: 0.9113
         Epoch 22/40
             - 1s - loss: 0.1344 - acc: 0.9884 - val_loss: 0.3476 - val_acc: 0.8955
         Epoch 23/40
             - 1s - loss: 0.1392 - acc: 0.9845 - val_loss: 0.2527 - val_acc: 0.9668
         Epoch 24/40
             - 1s - loss: 0.1335 - acc: 0.9830 - val_loss: 0.2599 - val_acc: 0.9567
         Epoch 25/40
             - 1s - loss: 0.1257 - acc: 0.9890 - val_loss: 0.2547 - val_acc: 0.9618
         Epoch 26/40
             - 1s - loss: 0.1362 - acc: 0.9814 - val_loss: 0.2604 - val_acc: 0.9531
         Epoch 27/40
             - 1s - loss: 0.1205 - acc: 0.9875 - val_loss: 0.5791 - val_acc: 0.8609
         Epoch 28/40
             - 1s - loss: 0.1330 - acc: 0.9830 - val_loss: 0.3271 - val_acc: 0.9416
         Epoch 29/40
             - 1s - loss: 0.1089 - acc: 0.9903 - val_loss: 0.2977 - val_acc: 0.9185
         Epoch 30/40
             - 1s - loss: 0.1217 - acc: 0.9839 - val_loss: 0.2639 - val_acc: 0.9380
```

```
Epoch 31/40
 - 1s - loss: 0.1143 - acc: 0.9866 - val_loss: 0.2275 - val_acc: 0.9603
Epoch 32/40
 - 1s - loss: 0.1159 - acc: 0.9866 - val_loss: 0.2652 - val_acc: 0.9560
Epoch 33/40
 - 1s - loss: 0.1310 - acc: 0.9802 - val_loss: 0.2249 - val_acc: 0.9661
Epoch 34/40
 - 1s - loss: 0.0968 - acc: 0.9896 - val_loss: 0.2394 - val_acc: 0.9524
Epoch 35/40
 - 1s - loss: 0.1178 - acc: 0.9826 - val_loss: 0.2234 - val_acc: 0.9575
Epoch 36/40
 - 1s - loss: 0.1055 - acc: 0.9884 - val_loss: 0.2971 - val_acc: 0.9265
Epoch 37/40
 - 1s - loss: 0.1099 - acc: 0.9836 - val_loss: 0.2702 - val_acc: 0.9402
Epoch 38/40
 - 1s - loss: 0.0973 - acc: 0.9896 - val_loss: 0.2393 - val_acc: 0.9618
Epoch 39/40
 - 1s - loss: 0.1083 - acc: 0.9845 - val_loss: 0.2615 - val_acc: 0.9452
Epoch 40/40
 - 1s - loss: 0.1134 - acc: 0.9826 - val_loss: 0.2624 - val_acc: 0.9459
Train accuracy 0.9993911719939117 Test accuracy: 0.9459264599855803
------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 16)	23440
dense_2 (Dense)	(None, 3)	51

```
Total params: 27,291
Trainable params: 27,291
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 33.4108 - acc: 0.4170 - val_loss: 13.3672 - val_acc: 0.5032
Epoch 2/40
 - 1s - loss: 6.0350 - acc: 0.7339 - val_loss: 2.2628 - val_acc: 0.5681
Epoch 3/40
 - 1s - loss: 1.2194 - acc: 0.8405 - val_loss: 1.9999 - val_acc: 0.3655
Epoch 4/40
 - 1s - loss: 0.7596 - acc: 0.8928 - val_loss: 1.3635 - val_acc: 0.6799
Epoch 5/40
 - 1s - loss: 0.5828 - acc: 0.9212 - val_loss: 0.6467 - val_acc: 0.8767
Epoch 6/40
 - 1s - loss: 0.5134 - acc: 0.9263 - val_loss: 0.7113 - val_acc: 0.8450
Epoch 7/40
 - 1s - loss: 0.4366 - acc: 0.9412 - val_loss: 0.4868 - val_acc: 0.9329
Epoch 8/40
 - 1s - loss: 0.4225 - acc: 0.9437 - val_loss: 0.4775 - val_acc: 0.9128
Epoch 9/40
 - 1s - loss: 0.3760 - acc: 0.9412 - val_loss: 0.5319 - val_acc: 0.8897
Epoch 10/40
 - 1s - loss: 0.3149 - acc: 0.9610 - val_loss: 0.4175 - val_acc: 0.9149
Epoch 11/40
 - 1s - loss: 0.3192 - acc: 0.9528 - val_loss: 0.3876 - val_acc: 0.9243
Epoch 12/40
 - 1s - loss: 0.3123 - acc: 0.9537 - val_loss: 0.3665 - val_acc: 0.9229
Epoch 13/40
 - 1s - loss: 0.2741 - acc: 0.9644 - val_loss: 1.4452 - val_acc: 0.6503
Epoch 14/40
 - 1s - loss: 0.2866 - acc: 0.9610 - val_loss: 0.3844 - val_acc: 0.9012
Epoch 15/40
 - 1s - loss: 0.2638 - acc: 0.9583 - val_loss: 0.3570 - val_acc: 0.9236
Epoch 16/40
 - 1s - loss: 0.2384 - acc: 0.9680 - val_loss: 0.3070 - val_acc: 0.9308
Epoch 17/40
 - 1s - loss: 0.2528 - acc: 0.9632 - val_loss: 0.2993 - val_acc: 0.9423
Epoch 18/40
 - 1s - loss: 0.2145 - acc: 0.9674 - val_loss: 0.2936 - val_acc: 0.9474
Epoch 19/40
 - 1s - loss: 0.2111 - acc: 0.9699 - val_loss: 0.3002 - val_acc: 0.9402
Epoch 20/40
 - 1s - loss: 0.2049 - acc: 0.9656 - val_loss: 0.2870 - val_acc: 0.9358
Epoch 21/40
```

```
          - 1s - loss: 0.1922 - acc: 0.9756 - val_loss: 0.2907 - val_acc: 0.9329
Epoch 22/40
          - 1s - loss: 0.1823 - acc: 0.9769 - val_loss: 0.3019 - val_acc: 0.9272
Epoch 23/40
          - 1s - loss: 0.1799 - acc: 0.9756 - val_loss: 0.2767 - val_acc: 0.9344
Epoch 24/40
          - 1s - loss: 0.1587 - acc: 0.9802 - val_loss: 0.2483 - val_acc: 0.9445
Epoch 25/40
          - 1s - loss: 0.1747 - acc: 0.9756 - val_loss: 0.2631 - val_acc: 0.9438
Epoch 26/40
          - 1s - loss: 0.1536 - acc: 0.9805 - val_loss: 0.2614 - val_acc: 0.9308
Epoch 27/40
          - 1s - loss: 0.1655 - acc: 0.9756 - val_loss: 0.3405 - val_acc: 0.9171
Epoch 28/40
          - 1s - loss: 0.1603 - acc: 0.9781 - val_loss: 0.3508 - val_acc: 0.9063
Epoch 29/40
          - 1s - loss: 0.1545 - acc: 0.9760 - val_loss: 0.2540 - val_acc: 0.9416
Epoch 30/40
          - 1s - loss: 0.1577 - acc: 0.9750 - val_loss: 0.2669 - val_acc: 0.9286
Epoch 31/40
          - 1s - loss: 0.1524 - acc: 0.9778 - val_loss: 0.2746 - val_acc: 0.9394
Epoch 32/40
          - 1s - loss: 0.1322 - acc: 0.9854 - val_loss: 1.1133 - val_acc: 0.7426
Epoch 33/40
          - 1s - loss: 0.1462 - acc: 0.9823 - val_loss: 0.2514 - val_acc: 0.9315
Epoch 34/40
          - 1s - loss: 0.1501 - acc: 0.9775 - val_loss: 0.2364 - val_acc: 0.9402
Epoch 35/40
          - 1s - loss: 0.1596 - acc: 0.9769 - val_loss: 0.2295 - val_acc: 0.9394
Epoch 36/40
          - 1s - loss: 0.1145 - acc: 0.9878 - val_loss: 0.2130 - val_acc: 0.9488
Epoch 37/40
          - 1s - loss: 0.1625 - acc: 0.9723 - val_loss: 0.2533 - val_acc: 0.9171
Epoch 38/40
          - 1s - loss: 0.1412 - acc: 0.9790 - val_loss: 0.2142 - val_acc: 0.9409
Epoch 39/40
          - 1s - loss: 0.1767 - acc: 0.9726 - val_loss: 0.2288 - val_acc: 0.9409
Epoch 40/40
          - 1s - loss: 0.1233 - acc: 0.9830 - val_loss: 0.2539 - val_acc: 0.9409
Train accuracy 0.9984779299847792 Test accuracy: 0.9408795962509012
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
```

```
=================================================================
conv1d_1 (Conv1D)            (None, 124, 42)           1932
_____
conv1d_2 (Conv1D)            (None, 122, 24)           3048
_____
dropout_1 (Dropout)          (None, 122, 24)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 24)            0
_____
flatten_1 (Flatten)          (None, 1464)              0
_____
dense_1 (Dense)              (None, 64)                93760
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 98,935
Trainable params: 98,935
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 106.9503 - acc: 0.5893 - val_loss: 80.3954 - val_acc: 0.7066
Epoch 2/40
 - 1s - loss: 62.3671 - acc: 0.8247 - val_loss: 46.2742 - val_acc: 0.6604
Epoch 3/40
 - 1s - loss: 34.6308 - acc: 0.8798 - val_loss: 24.9618 - val_acc: 0.6929
Epoch 4/40
 - 1s - loss: 17.9532 - acc: 0.9044 - val_loss: 12.3662 - val_acc: 0.8443
Epoch 5/40
 - 1s - loss: 8.5478 - acc: 0.9081 - val_loss: 5.6170 - val_acc: 0.8962
Epoch 6/40
 - 1s - loss: 3.6214 - acc: 0.9175 - val_loss: 2.3321 - val_acc: 0.8839
Epoch 7/40
 - 1s - loss: 1.3837 - acc: 0.9245 - val_loss: 1.1140 - val_acc: 0.7902
Epoch 8/40
 - 1s - loss: 0.6339 - acc: 0.9327 - val_loss: 0.7311 - val_acc: 0.8270
Epoch 9/40
 - 1s - loss: 0.4678 - acc: 0.9297 - val_loss: 0.7587 - val_acc: 0.8291
Epoch 10/40
 - 1s - loss: 0.4094 - acc: 0.9388 - val_loss: 0.5997 - val_acc: 0.8544
Epoch 11/40
 - 1s - loss: 0.3745 - acc: 0.9376 - val_loss: 0.5785 - val_acc: 0.8558
```

```
Epoch 12/40
 - 1s - loss: 0.3593 - acc: 0.9412 - val_loss: 0.4892 - val_acc: 0.9279
Epoch 13/40
 - 1s - loss: 0.3312 - acc: 0.9486 - val_loss: 0.7624 - val_acc: 0.7311
Epoch 14/40
 - 1s - loss: 0.3108 - acc: 0.9553 - val_loss: 0.5138 - val_acc: 0.8652
Epoch 15/40
 - 1s - loss: 0.3084 - acc: 0.9519 - val_loss: 0.5050 - val_acc: 0.8731
Epoch 16/40
 - 1s - loss: 0.2927 - acc: 0.9577 - val_loss: 0.4250 - val_acc: 0.9156
Epoch 17/40
 - 1s - loss: 0.2830 - acc: 0.9589 - val_loss: 0.4878 - val_acc: 0.8947
Epoch 18/40
 - 1s - loss: 0.2690 - acc: 0.9619 - val_loss: 0.5722 - val_acc: 0.8277
Epoch 19/40
 - 1s - loss: 0.2564 - acc: 0.9644 - val_loss: 0.4091 - val_acc: 0.9322
Epoch 20/40
 - 1s - loss: 0.2473 - acc: 0.9665 - val_loss: 0.4115 - val_acc: 0.9048
Epoch 21/40
 - 1s - loss: 0.2431 - acc: 0.9665 - val_loss: 0.5464 - val_acc: 0.8053
Epoch 22/40
 - 1s - loss: 0.2302 - acc: 0.9674 - val_loss: 0.7014 - val_acc: 0.7859
Epoch 23/40
 - 1s - loss: 0.2221 - acc: 0.9717 - val_loss: 0.4387 - val_acc: 0.9128
Epoch 24/40
 - 1s - loss: 0.2087 - acc: 0.9763 - val_loss: 0.3580 - val_acc: 0.9430
Epoch 25/40
 - 1s - loss: 0.2307 - acc: 0.9656 - val_loss: 0.3269 - val_acc: 0.9495
Epoch 26/40
 - 1s - loss: 0.2207 - acc: 0.9668 - val_loss: 0.3476 - val_acc: 0.9466
Epoch 27/40
 - 1s - loss: 0.2100 - acc: 0.9693 - val_loss: 0.3814 - val_acc: 0.9351
Epoch 28/40
 - 1s - loss: 0.2018 - acc: 0.9753 - val_loss: 0.4059 - val_acc: 0.9301
Epoch 29/40
 - 1s - loss: 0.2017 - acc: 0.9747 - val_loss: 0.4008 - val_acc: 0.9106
Epoch 30/40
 - 1s - loss: 0.2035 - acc: 0.9680 - val_loss: 0.3961 - val_acc: 0.9221
Epoch 31/40
 - 1s - loss: 0.1959 - acc: 0.9717 - val_loss: 0.3022 - val_acc: 0.9517
Epoch 32/40
 - 1s - loss: 0.1783 - acc: 0.9811 - val_loss: 0.3222 - val_acc: 0.9524
Epoch 33/40
```

```
 - 1s - loss: 0.1994 - acc: 0.9674 - val_loss: 0.2963 - val_acc: 0.9510
Epoch 34/40
 - 1s - loss: 0.1718 - acc: 0.9802 - val_loss: 0.2851 - val_acc: 0.9632
Epoch 35/40
 - 1s - loss: 0.1879 - acc: 0.9708 - val_loss: 0.2732 - val_acc: 0.9596
Epoch 36/40
 - 1s - loss: 0.1761 - acc: 0.9772 - val_loss: 0.2938 - val_acc: 0.9481
Epoch 37/40
 - 1s - loss: 0.1770 - acc: 0.9763 - val_loss: 0.4876 - val_acc: 0.8717
Epoch 38/40
 - 1s - loss: 0.1855 - acc: 0.9726 - val_loss: 0.3014 - val_acc: 0.9546
Epoch 39/40
 - 1s - loss: 0.1573 - acc: 0.9830 - val_loss: 0.2785 - val_acc: 0.9488
Epoch 40/40
 - 1s - loss: 0.1598 - acc: 0.9814 - val_loss: 0.3084 - val_acc: 0.9459
Train accuracy 0.9969558599695586 Test accuracy: 0.9459264599855803
-------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)            (None, 120, 16)           1552
_____
dropout_1 (Dropout)          (None, 120, 16)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 60, 16)            0
_____
flatten_1 (Flatten)          (None, 960)               0
_____
dense_1 (Dense)              (None, 64)                61504
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 65,299
Trainable params: 65,299
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 30.0979 - acc: 0.6000 - val_loss: 14.2811 - val_acc: 0.5350
Epoch 2/40
```

```
         - 1s - loss: 7.4249 - acc: 0.8088 - val_loss: 3.1186 - val_acc: 0.8075
        Epoch 3/40
         - 1s - loss: 1.5964 - acc: 0.8788 - val_loss: 0.9289 - val_acc: 0.8882
        Epoch 4/40
         - 1s - loss: 0.6370 - acc: 0.9117 - val_loss: 0.6152 - val_acc: 0.9048
        Epoch 5/40
         - 1s - loss: 0.4560 - acc: 0.9312 - val_loss: 0.7100 - val_acc: 0.7758
        Epoch 6/40
         - 1s - loss: 0.3922 - acc: 0.9364 - val_loss: 0.4500 - val_acc: 0.9257
        Epoch 7/40
         - 1s - loss: 0.3310 - acc: 0.9507 - val_loss: 0.4030 - val_acc: 0.9366
        Epoch 8/40
         - 1s - loss: 0.2861 - acc: 0.9571 - val_loss: 0.6610 - val_acc: 0.8133
        Epoch 9/40
         - 1s - loss: 0.2614 - acc: 0.9635 - val_loss: 0.3370 - val_acc: 0.9387
        Epoch 10/40
         - 1s - loss: 0.2455 - acc: 0.9650 - val_loss: 0.5695 - val_acc: 0.8472
        Epoch 11/40
         - 1s - loss: 0.2774 - acc: 0.9553 - val_loss: 0.3305 - val_acc: 0.9517
        Epoch 12/40
         - 1s - loss: 0.2438 - acc: 0.9668 - val_loss: 0.3020 - val_acc: 0.9625
        Epoch 13/40
         - 1s - loss: 0.2460 - acc: 0.9613 - val_loss: 0.8487 - val_acc: 0.7224
        Epoch 14/40
         - 1s - loss: 0.2154 - acc: 0.9674 - val_loss: 0.3148 - val_acc: 0.9452
        Epoch 15/40
         - 1s - loss: 0.2283 - acc: 0.9626 - val_loss: 0.2899 - val_acc: 0.9373
        Epoch 16/40
         - 1s - loss: 0.2106 - acc: 0.9680 - val_loss: 0.2599 - val_acc: 0.9546
        Epoch 17/40
         - 1s - loss: 0.2395 - acc: 0.9638 - val_loss: 0.2456 - val_acc: 0.9690
        Epoch 18/40
         - 1s - loss: 0.1704 - acc: 0.9778 - val_loss: 0.3783 - val_acc: 0.9156
        Epoch 19/40
         - 1s - loss: 0.2020 - acc: 0.9689 - val_loss: 0.2757 - val_acc: 0.9531
        Epoch 20/40
         - 1s - loss: 0.1610 - acc: 0.9772 - val_loss: 0.2634 - val_acc: 0.9416
        Epoch 21/40
         - 1s - loss: 0.2251 - acc: 0.9668 - val_loss: 0.6010 - val_acc: 0.8118
        Epoch 22/40
         - 1s - loss: 0.2133 - acc: 0.9665 - val_loss: 0.3398 - val_acc: 0.9236
        Epoch 23/40
         - 1s - loss: 0.1597 - acc: 0.9839 - val_loss: 0.2699 - val_acc: 0.9293
```

```
Epoch 24/40
 - 1s - loss: 0.2341 - acc: 0.9616 - val_loss: 0.2574 - val_acc: 0.9560
Epoch 25/40
 - 1s - loss: 0.1625 - acc: 0.9796 - val_loss: 0.2328 - val_acc: 0.9539
Epoch 26/40
 - 1s - loss: 0.2110 - acc: 0.9665 - val_loss: 0.3678 - val_acc: 0.9149
Epoch 27/40
 - 1s - loss: 0.1599 - acc: 0.9796 - val_loss: 0.2429 - val_acc: 0.9603
Epoch 28/40
 - 1s - loss: 0.1936 - acc: 0.9677 - val_loss: 0.2535 - val_acc: 0.9510
Epoch 29/40
 - 1s - loss: 0.2344 - acc: 0.9638 - val_loss: 0.2681 - val_acc: 0.9589
Epoch 30/40
 - 1s - loss: 0.1950 - acc: 0.9696 - val_loss: 0.2721 - val_acc: 0.9553
Epoch 31/40
 - 1s - loss: 0.1644 - acc: 0.9805 - val_loss: 0.2012 - val_acc: 0.9676
Epoch 32/40
 - 1s - loss: 0.1731 - acc: 0.9714 - val_loss: 0.2970 - val_acc: 0.9488
Epoch 33/40
 - 1s - loss: 0.1586 - acc: 0.9766 - val_loss: 0.2328 - val_acc: 0.9596
Epoch 34/40
 - 1s - loss: 0.2043 - acc: 0.9641 - val_loss: 0.2427 - val_acc: 0.9611
Epoch 35/40
 - 1s - loss: 0.1393 - acc: 0.9802 - val_loss: 0.6245 - val_acc: 0.8688
Epoch 36/40
 - 1s - loss: 0.1568 - acc: 0.9747 - val_loss: 0.2495 - val_acc: 0.9589
Epoch 37/40
 - 1s - loss: 0.1342 - acc: 0.9857 - val_loss: 1.3945 - val_acc: 0.6857
Epoch 38/40
 - 1s - loss: 0.1800 - acc: 0.9717 - val_loss: 0.2478 - val_acc: 0.9625
Epoch 39/40
 - 1s - loss: 0.1553 - acc: 0.9778 - val_loss: 0.2457 - val_acc: 0.9409
Epoch 40/40
 - 1s - loss: 0.1654 - acc: 0.9741 - val_loss: 0.2158 - val_acc: 0.9596
Train accuracy 0.9954337899724824 Test accuracy: 0.9596250901225667
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 32)	3104

```
dropout_1 (Dropout)              (None, 122, 32)                0
_____
max_pooling1d_1 (MaxPooling1 (None, 24, 32)                 0
_____
flatten_1 (Flatten)              (None, 768)                    0
_____
dense_1 (Dense)                  (None, 16)                  12304
_____
dense_2 (Dense)                  (None, 3)                     51
=================================================================
Total params: 16,931
Trainable params: 16,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 41.6498 - acc: 0.5486 - val_loss: 29.3217 - val_acc: 0.7094
Epoch 2/40
 - 1s - loss: 21.1196 - acc: 0.8408 - val_loss: 14.2424 - val_acc: 0.7880
Epoch 3/40
 - 1s - loss: 9.4430 - acc: 0.9361 - val_loss: 6.2857 - val_acc: 0.5833
Epoch 4/40
 - 1s - loss: 3.6011 - acc: 0.9543 - val_loss: 2.1980 - val_acc: 0.9524
Epoch 5/40
 - 1s - loss: 1.2979 - acc: 0.9592 - val_loss: 1.0934 - val_acc: 0.9106
Epoch 6/40
 - 1s - loss: 0.7002 - acc: 0.9607 - val_loss: 0.7710 - val_acc: 0.9553
Epoch 7/40
 - 1s - loss: 0.5478 - acc: 0.9559 - val_loss: 0.6767 - val_acc: 0.9200
Epoch 8/40
 - 1s - loss: 0.4696 - acc: 0.9613 - val_loss: 0.6072 - val_acc: 0.9481
Epoch 9/40
 - 1s - loss: 0.3822 - acc: 0.9756 - val_loss: 0.5270 - val_acc: 0.9647
Epoch 10/40
 - 1s - loss: 0.3737 - acc: 0.9677 - val_loss: 0.4799 - val_acc: 0.9503
Epoch 11/40
 - 1s - loss: 0.3369 - acc: 0.9644 - val_loss: 0.4552 - val_acc: 0.9575
Epoch 12/40
 - 1s - loss: 0.2975 - acc: 0.9726 - val_loss: 0.4247 - val_acc: 0.9553
Epoch 13/40
 - 1s - loss: 0.2857 - acc: 0.9702 - val_loss: 1.0057 - val_acc: 0.6914
Epoch 14/40
```

```
  - 1s - loss: 0.2624 - acc: 0.9756 - val_loss: 0.3727 - val_acc: 0.9690
Epoch 15/40
  - 1s - loss: 0.2463 - acc: 0.9744 - val_loss: 0.4244 - val_acc: 0.9056
Epoch 16/40
  - 1s - loss: 0.2312 - acc: 0.9717 - val_loss: 0.3487 - val_acc: 0.9661
Epoch 17/40
  - 1s - loss: 0.2140 - acc: 0.9769 - val_loss: 0.3246 - val_acc: 0.9712
Epoch 18/40
  - 1s - loss: 0.1899 - acc: 0.9833 - val_loss: 0.6432 - val_acc: 0.7541
Epoch 19/40
  - 1s - loss: 0.1910 - acc: 0.9778 - val_loss: 0.3856 - val_acc: 0.9236
Epoch 20/40
  - 1s - loss: 0.1822 - acc: 0.9778 - val_loss: 0.2965 - val_acc: 0.9481
Epoch 21/40
  - 1s - loss: 0.1757 - acc: 0.9769 - val_loss: 0.2997 - val_acc: 0.9719
Epoch 22/40
  - 1s - loss: 0.1581 - acc: 0.9814 - val_loss: 0.3025 - val_acc: 0.9430
Epoch 23/40
  - 1s - loss: 0.1701 - acc: 0.9760 - val_loss: 0.3693 - val_acc: 0.9063
Epoch 24/40
  - 1s - loss: 0.1585 - acc: 0.9836 - val_loss: 0.2759 - val_acc: 0.9596
Epoch 25/40
  - 1s - loss: 0.1658 - acc: 0.9750 - val_loss: 0.2709 - val_acc: 0.9683
Epoch 26/40
  - 1s - loss: 0.1253 - acc: 0.9881 - val_loss: 1.2106 - val_acc: 0.5739
Epoch 27/40
  - 1s - loss: 0.1650 - acc: 0.9766 - val_loss: 0.2672 - val_acc: 0.9567
Epoch 28/40
  - 1s - loss: 0.1644 - acc: 0.9778 - val_loss: 0.4073 - val_acc: 0.8904
Epoch 29/40
  - 1s - loss: 0.1269 - acc: 0.9845 - val_loss: 0.2633 - val_acc: 0.9589
Epoch 30/40
  - 1s - loss: 0.1534 - acc: 0.9738 - val_loss: 0.3406 - val_acc: 0.9034
Epoch 31/40
  - 1s - loss: 0.1256 - acc: 0.9826 - val_loss: 0.2469 - val_acc: 0.9654
Epoch 32/40
  - 1s - loss: 0.1462 - acc: 0.9808 - val_loss: 0.2465 - val_acc: 0.9668
Epoch 33/40
  - 1s - loss: 0.1221 - acc: 0.9848 - val_loss: 0.2726 - val_acc: 0.9510
Epoch 34/40
  - 1s - loss: 0.1372 - acc: 0.9823 - val_loss: 0.2388 - val_acc: 0.9690
Epoch 35/40
  - 1s - loss: 0.1261 - acc: 0.9836 - val_loss: 0.2409 - val_acc: 0.9668
```

```
Epoch 36/40
 - 1s - loss: 0.1329 - acc: 0.9830 - val_loss: 0.2778 - val_acc: 0.9481
Epoch 37/40
 - 1s - loss: 0.1305 - acc: 0.9845 - val_loss: 0.2334 - val_acc: 0.9740
Epoch 38/40
 - 1s - loss: 0.1232 - acc: 0.9830 - val_loss: 0.3433 - val_acc: 0.9063
Epoch 39/40
 - 1s - loss: 0.1335 - acc: 0.9799 - val_loss: 0.2734 - val_acc: 0.9567
Epoch 40/40
 - 1s - loss: 0.1001 - acc: 0.9918 - val_loss: 0.2633 - val_acc: 0.9488
Train accuracy 0.9981735159817352 Test accuracy: 0.9488103821196827
---------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 124, 42)           1932
_____
conv1d_2 (Conv1D)            (None, 122, 24)           3048
_____
dropout_1 (Dropout)          (None, 122, 24)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 61, 24)            0
_____
flatten_1 (Flatten)          (None, 1464)              0
_____
dense_1 (Dense)              (None, 64)                93760
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 98,935
Trainable params: 98,935
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 23.0664 - acc: 0.6085 - val_loss: 11.9232 - val_acc: 0.8565
Epoch 2/40
 - 1s - loss: 7.1927 - acc: 0.8594 - val_loss: 4.0556 - val_acc: 0.7743
Epoch 3/40
 - 1s - loss: 2.2803 - acc: 0.9166 - val_loss: 1.4436 - val_acc: 0.8911
Epoch 4/40
 - 1s - loss: 0.8426 - acc: 0.9388 - val_loss: 0.6843 - val_acc: 0.9466
```

```
Epoch 5/40
 - 1s - loss: 0.4616 - acc: 0.9540 - val_loss: 0.5415 - val_acc: 0.9135
Epoch 6/40
 - 1s - loss: 0.3475 - acc: 0.9571 - val_loss: 0.4943 - val_acc: 0.8940
Epoch 7/40
 - 1s - loss: 0.2922 - acc: 0.9616 - val_loss: 0.6324 - val_acc: 0.7960
Epoch 8/40
 - 1s - loss: 0.2577 - acc: 0.9656 - val_loss: 0.3816 - val_acc: 0.9279
Epoch 9/40
 - 1s - loss: 0.2365 - acc: 0.9689 - val_loss: 0.4737 - val_acc: 0.8947
Epoch 10/40
 - 1s - loss: 0.2165 - acc: 0.9726 - val_loss: 0.3093 - val_acc: 0.9589
Epoch 11/40
 - 1s - loss: 0.2185 - acc: 0.9668 - val_loss: 0.3044 - val_acc: 0.9546
Epoch 12/40
 - 1s - loss: 0.1809 - acc: 0.9775 - val_loss: 0.2782 - val_acc: 0.9661
Epoch 13/40
 - 1s - loss: 0.1874 - acc: 0.9741 - val_loss: 0.3088 - val_acc: 0.9337
Epoch 14/40
 - 1s - loss: 0.1760 - acc: 0.9775 - val_loss: 0.2694 - val_acc: 0.9517
Epoch 15/40
 - 1s - loss: 0.1887 - acc: 0.9738 - val_loss: 0.3293 - val_acc: 0.9164
Epoch 16/40
 - 1s - loss: 0.1799 - acc: 0.9720 - val_loss: 0.3102 - val_acc: 0.9229
Epoch 17/40
 - 1s - loss: 0.1808 - acc: 0.9726 - val_loss: 0.2609 - val_acc: 0.9647
Epoch 18/40
 - 1s - loss: 0.1521 - acc: 0.9799 - val_loss: 0.2731 - val_acc: 0.9553
Epoch 19/40
 - 1s - loss: 0.1647 - acc: 0.9741 - val_loss: 0.2603 - val_acc: 0.9495
Epoch 20/40
 - 1s - loss: 0.1484 - acc: 0.9802 - val_loss: 0.2566 - val_acc: 0.9517
Epoch 21/40
 - 1s - loss: 0.1272 - acc: 0.9826 - val_loss: 0.9598 - val_acc: 0.6842
Epoch 22/40
 - 1s - loss: 0.1603 - acc: 0.9778 - val_loss: 0.6501 - val_acc: 0.7787
Epoch 23/40
 - 1s - loss: 0.1665 - acc: 0.9787 - val_loss: 0.2424 - val_acc: 0.9640
Epoch 24/40
 - 1s - loss: 0.1299 - acc: 0.9893 - val_loss: 0.2394 - val_acc: 0.9546
Epoch 25/40
 - 1s - loss: 0.1578 - acc: 0.9747 - val_loss: 0.2203 - val_acc: 0.9618
Epoch 26/40
```

```
 - 1s - loss: 0.1394 - acc: 0.9760 - val_loss: 0.2428 - val_acc: 0.9539
Epoch 27/40
 - 1s - loss: 0.1213 - acc: 0.9833 - val_loss: 0.2602 - val_acc: 0.9445
Epoch 28/40
 - 1s - loss: 0.1185 - acc: 0.9836 - val_loss: 0.3513 - val_acc: 0.9351
Epoch 29/40
 - 1s - loss: 0.1313 - acc: 0.9811 - val_loss: 0.2452 - val_acc: 0.9560
Epoch 30/40
 - 1s - loss: 0.1794 - acc: 0.9711 - val_loss: 0.2382 - val_acc: 0.9618
Epoch 31/40
 - 1s - loss: 0.0886 - acc: 0.9915 - val_loss: 0.2202 - val_acc: 0.9589
Epoch 32/40
 - 1s - loss: 0.1288 - acc: 0.9793 - val_loss: 0.2371 - val_acc: 0.9524
Epoch 33/40
 - 1s - loss: 0.1360 - acc: 0.9784 - val_loss: 0.2584 - val_acc: 0.9293
Epoch 34/40
 - 1s - loss: 0.0939 - acc: 0.9915 - val_loss: 0.2193 - val_acc: 0.9618
Epoch 35/40
 - 1s - loss: 0.1236 - acc: 0.9811 - val_loss: 0.1988 - val_acc: 0.9632
Epoch 36/40
 - 1s - loss: 0.1228 - acc: 0.9817 - val_loss: 0.2361 - val_acc: 0.9575
Epoch 37/40
 - 1s - loss: 0.1116 - acc: 0.9872 - val_loss: 0.1952 - val_acc: 0.9575
Epoch 38/40
 - 1s - loss: 0.1352 - acc: 0.9863 - val_loss: 0.2147 - val_acc: 0.9582
Epoch 39/40
 - 1s - loss: 0.1087 - acc: 0.9872 - val_loss: 0.5577 - val_acc: 0.8572
Epoch 40/40
 - 1s - loss: 0.0937 - acc: 0.9896 - val_loss: 0.2266 - val_acc: 0.9553
Train accuracy 0.9996955859969558 Test accuracy: 0.9552992069214131
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 120, 16)	2032
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 60, 16)	0
flatten_1 (Flatten)	(None, 960)	0

```
_____
dense_1 (Dense)                    (None, 16)                15376
_____
dense_2 (Dense)                    (None, 3)                  51
===============================================================
Total params: 20,147
Trainable params: 20,147
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 1s - loss: 41.3950 - acc: 0.5939 - val_loss: 14.4605 - val_acc: 0.6965
Epoch 2/40
 - 1s - loss: 6.1990 - acc: 0.7778 - val_loss: 1.8791 - val_acc: 0.7534
Epoch 3/40
 - 1s - loss: 0.9181 - acc: 0.8350 - val_loss: 0.7546 - val_acc: 0.8248
Epoch 4/40
 - 1s - loss: 0.5609 - acc: 0.8798 - val_loss: 0.6497 - val_acc: 0.8702
Epoch 5/40
 - 1s - loss: 0.4813 - acc: 0.9005 - val_loss: 0.5687 - val_acc: 0.9084
Epoch 6/40
 - 1s - loss: 0.4343 - acc: 0.9227 - val_loss: 0.8471 - val_acc: 0.6914
Epoch 7/40
 - 1s - loss: 0.4056 - acc: 0.9306 - val_loss: 0.7489 - val_acc: 0.7736
Epoch 8/40
 - 1s - loss: 0.3726 - acc: 0.9358 - val_loss: 0.5324 - val_acc: 0.8897
Epoch 9/40
 - 1s - loss: 0.3810 - acc: 0.9279 - val_loss: 0.4716 - val_acc: 0.9200
Epoch 10/40
 - 1s - loss: 0.3340 - acc: 0.9537 - val_loss: 0.4798 - val_acc: 0.9034
Epoch 11/40
 - 1s - loss: 0.3697 - acc: 0.9324 - val_loss: 0.4493 - val_acc: 0.9019
Epoch 12/40
 - 1s - loss: 0.3454 - acc: 0.9437 - val_loss: 0.4169 - val_acc: 0.9503
Epoch 13/40
 - 1s - loss: 0.3255 - acc: 0.9449 - val_loss: 0.4790 - val_acc: 0.9286
Epoch 14/40
 - 1s - loss: 0.3394 - acc: 0.9455 - val_loss: 0.5453 - val_acc: 0.8572
Epoch 15/40
 - 1s - loss: 0.3332 - acc: 0.9428 - val_loss: 0.4369 - val_acc: 0.9185
Epoch 16/40
 - 1s - loss: 0.2867 - acc: 0.9604 - val_loss: 0.3648 - val_acc: 0.9301
```

```
Epoch 17/40
 - 1s - loss: 0.3403 - acc: 0.9367 - val_loss: 0.3916 - val_acc: 0.9416
Epoch 18/40
 - 1s - loss: 0.2873 - acc: 0.9516 - val_loss: 0.4755 - val_acc: 0.9041
Epoch 19/40
 - 1s - loss: 0.3050 - acc: 0.9537 - val_loss: 0.3637 - val_acc: 0.9546
Epoch 20/40
 - 1s - loss: 0.2877 - acc: 0.9540 - val_loss: 0.4203 - val_acc: 0.9106
Epoch 21/40
 - 1s - loss: 0.3167 - acc: 0.9446 - val_loss: 0.4953 - val_acc: 0.8695
Epoch 22/40
 - 1s - loss: 0.2924 - acc: 0.9537 - val_loss: 0.4502 - val_acc: 0.9012
Epoch 23/40
 - 1s - loss: 0.2857 - acc: 0.9525 - val_loss: 0.4165 - val_acc: 0.9005
Epoch 24/40
 - 1s - loss: 0.2702 - acc: 0.9571 - val_loss: 0.3634 - val_acc: 0.9337
Epoch 25/40
 - 1s - loss: 0.2834 - acc: 0.9595 - val_loss: 0.3778 - val_acc: 0.9322
Epoch 26/40
 - 1s - loss: 0.3133 - acc: 0.9534 - val_loss: 0.4192 - val_acc: 0.9207
Epoch 27/40
 - 1s - loss: 0.2615 - acc: 0.9580 - val_loss: 1.5410 - val_acc: 0.6301
Epoch 28/40
 - 1s - loss: 0.2966 - acc: 0.9470 - val_loss: 0.3474 - val_acc: 0.9539
Epoch 29/40
 - 1s - loss: 0.3027 - acc: 0.9464 - val_loss: 0.3964 - val_acc: 0.9402
Epoch 30/40
 - 1s - loss: 0.2770 - acc: 0.9586 - val_loss: 0.4206 - val_acc: 0.9279
Epoch 31/40
 - 1s - loss: 0.2583 - acc: 0.9577 - val_loss: 0.3367 - val_acc: 0.9531
Epoch 32/40
 - 1s - loss: 0.2528 - acc: 0.9619 - val_loss: 0.3651 - val_acc: 0.9452
Epoch 33/40
 - 1s - loss: 0.2604 - acc: 0.9619 - val_loss: 0.3358 - val_acc: 0.9366
Epoch 34/40
 - 1s - loss: 0.3194 - acc: 0.9473 - val_loss: 0.3490 - val_acc: 0.9387
Epoch 35/40
 - 1s - loss: 0.2703 - acc: 0.9568 - val_loss: 0.3564 - val_acc: 0.9243
Epoch 36/40
 - 1s - loss: 0.2364 - acc: 0.9653 - val_loss: 0.3478 - val_acc: 0.9423
Epoch 37/40
 - 1s - loss: 0.2630 - acc: 0.9632 - val_loss: 0.8841 - val_acc: 0.6611
Epoch 38/40
```

```
 - 1s - loss: 0.2446 - acc: 0.9619 - val_loss: 0.3985 - val_acc: 0.9416
Epoch 39/40
 - 1s - loss: 0.2800 - acc: 0.9519 - val_loss: 0.6032 - val_acc: 0.8421
Epoch 40/40
 - 1s - loss: 0.2654 - acc: 0.9583 - val_loss: 0.4747 - val_acc: 0.9063
Train accuracy 0.9844748858447488 Test accuracy: 0.9062725306416727
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 122, 24)	2328
dropout_1 (Dropout)	(None, 122, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 24)	0
flatten_1 (Flatten)	(None, 1464)	0
dense_1 (Dense)	(None, 64)	93760
dense_2 (Dense)	(None, 3)	195

```
Total params: 97,755
Trainable params: 97,755
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 79.5933 - acc: 0.5291 - val_loss: 60.6032 - val_acc: 0.5717
Epoch 2/40
 - 1s - loss: 47.3121 - acc: 0.7525 - val_loss: 35.3753 - val_acc: 0.6813
Epoch 3/40
 - 1s - loss: 26.6650 - acc: 0.8457 - val_loss: 19.6036 - val_acc: 0.5220
Epoch 4/40
 - 1s - loss: 14.0150 - acc: 0.8807 - val_loss: 9.8197 - val_acc: 0.7974
Epoch 5/40
 - 1s - loss: 6.8483 - acc: 0.8871 - val_loss: 4.7404 - val_acc: 0.7743
Epoch 6/40
 - 1s - loss: 3.1759 - acc: 0.8865 - val_loss: 2.3041 - val_acc: 0.8205
Epoch 7/40
```

```
       - 1s - loss: 1.4629 - acc: 0.9139 - val_loss: 1.2242 - val_acc: 0.8046
Epoch 8/40
       - 1s - loss: 0.7657 - acc: 0.9291 - val_loss: 0.8114 - val_acc: 0.8399
Epoch 9/40
       - 1s - loss: 0.5437 - acc: 0.9294 - val_loss: 0.7918 - val_acc: 0.8039
Epoch 10/40
       - 1s - loss: 0.4496 - acc: 0.9431 - val_loss: 0.6725 - val_acc: 0.8378
Epoch 11/40
       - 1s - loss: 0.4069 - acc: 0.9370 - val_loss: 0.5931 - val_acc: 0.8767
Epoch 12/40
       - 1s - loss: 0.3637 - acc: 0.9507 - val_loss: 0.4976 - val_acc: 0.9113
Epoch 13/40
       - 1s - loss: 0.3331 - acc: 0.9531 - val_loss: 0.9708 - val_acc: 0.6330
Epoch 14/40
       - 1s - loss: 0.3065 - acc: 0.9629 - val_loss: 0.4816 - val_acc: 0.8868
Epoch 15/40
       - 1s - loss: 0.3042 - acc: 0.9592 - val_loss: 0.5505 - val_acc: 0.8558
Epoch 16/40
       - 1s - loss: 0.2856 - acc: 0.9595 - val_loss: 0.3686 - val_acc: 0.9539
Epoch 17/40
       - 1s - loss: 0.2732 - acc: 0.9623 - val_loss: 0.3686 - val_acc: 0.9481
Epoch 18/40
       - 1s - loss: 0.2611 - acc: 0.9662 - val_loss: 0.4133 - val_acc: 0.9185
Epoch 19/40
       - 1s - loss: 0.2518 - acc: 0.9638 - val_loss: 0.3714 - val_acc: 0.9438
Epoch 20/40
       - 1s - loss: 0.2377 - acc: 0.9705 - val_loss: 0.3654 - val_acc: 0.9293
Epoch 21/40
       - 1s - loss: 0.2311 - acc: 0.9711 - val_loss: 0.3786 - val_acc: 0.9250
Epoch 22/40
       - 1s - loss: 0.2209 - acc: 0.9705 - val_loss: 0.4102 - val_acc: 0.9084
Epoch 23/40
       - 1s - loss: 0.2155 - acc: 0.9741 - val_loss: 0.3460 - val_acc: 0.9387
Epoch 24/40
       - 1s - loss: 0.1947 - acc: 0.9826 - val_loss: 0.2961 - val_acc: 0.9503
Epoch 25/40
       - 1s - loss: 0.2065 - acc: 0.9769 - val_loss: 0.2846 - val_acc: 0.9459
Epoch 26/40
       - 1s - loss: 0.2000 - acc: 0.9729 - val_loss: 0.3090 - val_acc: 0.9466
Epoch 27/40
       - 1s - loss: 0.1936 - acc: 0.9747 - val_loss: 0.2939 - val_acc: 0.9582
Epoch 28/40
       - 1s - loss: 0.1830 - acc: 0.9769 - val_loss: 0.3100 - val_acc: 0.9423
```

```
Epoch 29/40
 - 1s - loss: 0.1865 - acc: 0.9760 - val_loss: 0.2777 - val_acc: 0.9582
Epoch 30/40
 - 1s - loss: 0.1975 - acc: 0.9680 - val_loss: 0.2679 - val_acc: 0.9640
Epoch 31/40
 - 1s - loss: 0.1676 - acc: 0.9805 - val_loss: 0.2543 - val_acc: 0.9625
Epoch 32/40
 - 1s - loss: 0.1792 - acc: 0.9763 - val_loss: 0.2749 - val_acc: 0.9560
Epoch 33/40
 - 1s - loss: 0.1757 - acc: 0.9784 - val_loss: 0.3023 - val_acc: 0.9452
Epoch 34/40
 - 1s - loss: 0.1516 - acc: 0.9848 - val_loss: 0.7825 - val_acc: 0.7051
Epoch 35/40
 - 1s - loss: 0.1812 - acc: 0.9720 - val_loss: 0.2555 - val_acc: 0.9466
Epoch 36/40
 - 1s - loss: 0.1571 - acc: 0.9814 - val_loss: 0.2410 - val_acc: 0.9647
Epoch 37/40
 - 1s - loss: 0.1661 - acc: 0.9784 - val_loss: 0.2668 - val_acc: 0.9481
Epoch 38/40
 - 1s - loss: 0.1716 - acc: 0.9735 - val_loss: 0.2774 - val_acc: 0.9517
Epoch 39/40
 - 1s - loss: 0.1517 - acc: 0.9836 - val_loss: 0.2852 - val_acc: 0.9409
Epoch 40/40
 - 1s - loss: 0.1796 - acc: 0.9723 - val_loss: 0.2657 - val_acc: 0.9524
Train accuracy 0.995738203957382 Test accuracy: 0.9524152847873107
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 122, 32)	4064
dropout_1 (Dropout)	(None, 122, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 32)	0
flatten_1 (Flatten)	(None, 1952)	0
dense_1 (Dense)	(None, 16)	31248
dense_2 (Dense)	(None, 3)	51

```
Total params: 37,295
Trainable params: 37,295
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 110.3895 - acc: 0.4533 - val_loss: 54.4061 - val_acc: 0.5177
Epoch 2/40
 - 1s - loss: 29.6538 - acc: 0.6015 - val_loss: 12.1622 - val_acc: 0.4982
Epoch 3/40
 - 1s - loss: 5.5735 - acc: 0.7126 - val_loss: 1.9893 - val_acc: 0.5631
Epoch 4/40
 - 1s - loss: 1.0265 - acc: 0.7854 - val_loss: 1.0319 - val_acc: 0.6806
Epoch 5/40
 - 1s - loss: 0.7283 - acc: 0.8253 - val_loss: 0.7852 - val_acc: 0.8392
Epoch 6/40
 - 1s - loss: 0.6558 - acc: 0.8478 - val_loss: 0.7776 - val_acc: 0.8479
Epoch 7/40
 - 1s - loss: 0.5971 - acc: 0.8694 - val_loss: 0.7920 - val_acc: 0.7426
Epoch 8/40
 - 1s - loss: 0.5576 - acc: 0.8788 - val_loss: 0.7140 - val_acc: 0.8089
Epoch 9/40
 - 1s - loss: 0.5449 - acc: 0.8773 - val_loss: 0.6392 - val_acc: 0.8695
Epoch 10/40
 - 1s - loss: 0.5051 - acc: 0.8922 - val_loss: 0.7129 - val_acc: 0.7859
Epoch 11/40
 - 1s - loss: 0.5250 - acc: 0.8919 - val_loss: 0.7318 - val_acc: 0.8003
Epoch 12/40
 - 1s - loss: 0.4865 - acc: 0.8956 - val_loss: 0.6086 - val_acc: 0.8666
Epoch 13/40
 - 1s - loss: 0.4796 - acc: 0.8913 - val_loss: 0.9209 - val_acc: 0.6453
Epoch 14/40
 - 1s - loss: 0.4736 - acc: 0.8980 - val_loss: 0.6817 - val_acc: 0.8068
Epoch 15/40
 - 1s - loss: 0.4595 - acc: 0.9035 - val_loss: 0.5972 - val_acc: 0.8385
Epoch 16/40
 - 1s - loss: 0.4372 - acc: 0.9087 - val_loss: 0.7706 - val_acc: 0.7578
Epoch 17/40
 - 1s - loss: 0.4203 - acc: 0.9154 - val_loss: 0.5990 - val_acc: 0.8580
Epoch 18/40
 - 1s - loss: 0.4158 - acc: 0.9123 - val_loss: 0.7056 - val_acc: 0.7924
Epoch 19/40
```

```
          - 1s - loss: 0.4275 - acc: 0.9050 - val_loss: 0.5900 - val_acc: 0.8551
Epoch 20/40
          - 1s - loss: 0.3851 - acc: 0.9239 - val_loss: 0.5813 - val_acc: 0.8565
Epoch 21/40
          - 1s - loss: 0.3935 - acc: 0.9218 - val_loss: 0.8509 - val_acc: 0.6835
Epoch 22/40
          - 1s - loss: 0.3777 - acc: 0.9266 - val_loss: 0.6917 - val_acc: 0.7880
Epoch 23/40
          - 1s - loss: 0.3653 - acc: 0.9300 - val_loss: 0.5205 - val_acc: 0.8738
Epoch 24/40
          - 1s - loss: 0.3581 - acc: 0.9315 - val_loss: 0.5129 - val_acc: 0.8839
Epoch 25/40
          - 1s - loss: 0.3670 - acc: 0.9263 - val_loss: 0.5521 - val_acc: 0.8659
Epoch 26/40
          - 1s - loss: 0.3647 - acc: 0.9306 - val_loss: 0.5751 - val_acc: 0.8356
Epoch 27/40
          - 1s - loss: 0.3612 - acc: 0.9269 - val_loss: 0.5441 - val_acc: 0.8738
Epoch 28/40
          - 1s - loss: 0.3673 - acc: 0.9303 - val_loss: 0.5915 - val_acc: 0.8717
Epoch 29/40
          - 1s - loss: 0.3441 - acc: 0.9346 - val_loss: 0.5335 - val_acc: 0.8882
Epoch 30/40
          - 1s - loss: 0.3666 - acc: 0.9257 - val_loss: 0.5452 - val_acc: 0.8609
Epoch 31/40
          - 1s - loss: 0.3228 - acc: 0.9416 - val_loss: 0.7520 - val_acc: 0.7642
Epoch 32/40
          - 1s - loss: 0.3474 - acc: 0.9327 - val_loss: 0.5556 - val_acc: 0.8587
Epoch 33/40
          - 1s - loss: 0.3414 - acc: 0.9391 - val_loss: 0.6686 - val_acc: 0.8025
Epoch 34/40
          - 1s - loss: 0.3279 - acc: 0.9403 - val_loss: 0.4756 - val_acc: 0.9005
Epoch 35/40
          - 1s - loss: 0.3621 - acc: 0.9266 - val_loss: 0.5093 - val_acc: 0.8717
Epoch 36/40
          - 1s - loss: 0.3269 - acc: 0.9388 - val_loss: 0.4909 - val_acc: 0.8933
Epoch 37/40
          - 1s - loss: 0.3297 - acc: 0.9385 - val_loss: 0.6089 - val_acc: 0.8320
Epoch 38/40
          - 1s - loss: 0.3363 - acc: 0.9382 - val_loss: 0.5550 - val_acc: 0.8782
Epoch 39/40
          - 1s - loss: 0.3389 - acc: 0.9379 - val_loss: 0.5478 - val_acc: 0.8515
Epoch 40/40
          - 1s - loss: 0.3204 - acc: 0.9376 - val_loss: 0.5092 - val_acc: 0.8789
```

```
Train accuracy 0.9753424657534246 Test accuracy: 0.878875270582569
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 28)	1288
conv1d_2 (Conv1D)	(None, 122, 16)	1360
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0
dense_1 (Dense)	(None, 64)	24640
dense_2 (Dense)	(None, 3)	195

```
=============================================================
Total params: 27,483
Trainable params: 27,483
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 1s - loss: 45.1911 - acc: 0.6073 - val_loss: 30.1249 - val_acc: 0.8061
Epoch 2/40
 - 1s - loss: 20.8037 - acc: 0.8362 - val_loss: 13.3619 - val_acc: 0.5624
Epoch 3/40
 - 1s - loss: 8.3468 - acc: 0.8865 - val_loss: 5.0720 - val_acc: 0.6136
Epoch 4/40
 - 1s - loss: 2.8116 - acc: 0.9126 - val_loss: 1.8137 - val_acc: 0.7866
Epoch 5/40
 - 1s - loss: 1.0601 - acc: 0.9078 - val_loss: 1.0277 - val_acc: 0.8198
Epoch 6/40
 - 1s - loss: 0.6417 - acc: 0.9227 - val_loss: 0.9219 - val_acc: 0.7686
Epoch 7/40
 - 1s - loss: 0.5000 - acc: 0.9376 - val_loss: 0.7535 - val_acc: 0.8327
Epoch 8/40
 - 1s - loss: 0.4259 - acc: 0.9476 - val_loss: 0.6256 - val_acc: 0.9005
Epoch 9/40
 - 1s - loss: 0.3568 - acc: 0.9519 - val_loss: 0.6102 - val_acc: 0.8652
```

```
Epoch 10/40
 - 1s - loss: 0.3061 - acc: 0.9665 - val_loss: 0.5324 - val_acc: 0.9048
Epoch 11/40
 - 1s - loss: 0.3284 - acc: 0.9479 - val_loss: 0.4444 - val_acc: 0.9373
Epoch 12/40
 - 1s - loss: 0.2833 - acc: 0.9607 - val_loss: 0.4397 - val_acc: 0.9438
Epoch 13/40
 - 1s - loss: 0.2612 - acc: 0.9644 - val_loss: 0.7859 - val_acc: 0.6676
Epoch 14/40
 - 1s - loss: 0.2518 - acc: 0.9623 - val_loss: 0.4443 - val_acc: 0.9243
Epoch 15/40
 - 1s - loss: 0.2452 - acc: 0.9686 - val_loss: 0.6488 - val_acc: 0.7397
Epoch 16/40
 - 1s - loss: 0.2392 - acc: 0.9632 - val_loss: 0.3515 - val_acc: 0.9495
Epoch 17/40
 - 1s - loss: 0.2435 - acc: 0.9629 - val_loss: 0.3507 - val_acc: 0.9524
Epoch 18/40
 - 1s - loss: 0.2235 - acc: 0.9696 - val_loss: 0.3739 - val_acc: 0.9358
Epoch 19/40
 - 1s - loss: 0.2267 - acc: 0.9626 - val_loss: 0.3735 - val_acc: 0.9438
Epoch 20/40
 - 1s - loss: 0.2040 - acc: 0.9753 - val_loss: 0.3250 - val_acc: 0.9416
Epoch 21/40
 - 1s - loss: 0.2165 - acc: 0.9653 - val_loss: 0.3345 - val_acc: 0.9503
Epoch 22/40
 - 1s - loss: 0.1955 - acc: 0.9741 - val_loss: 0.6912 - val_acc: 0.7527
Epoch 23/40
 - 1s - loss: 0.1978 - acc: 0.9729 - val_loss: 0.3146 - val_acc: 0.9531
Epoch 24/40
 - 1s - loss: 0.1914 - acc: 0.9726 - val_loss: 0.3457 - val_acc: 0.9402
Epoch 25/40
 - 1s - loss: 0.1750 - acc: 0.9766 - val_loss: 0.3077 - val_acc: 0.9503
Epoch 26/40
 - 1s - loss: 0.1946 - acc: 0.9699 - val_loss: 0.3061 - val_acc: 0.9474
Epoch 27/40
 - 1s - loss: 0.1742 - acc: 0.9793 - val_loss: 0.2919 - val_acc: 0.9452
Epoch 28/40
 - 1s - loss: 0.1786 - acc: 0.9726 - val_loss: 0.2980 - val_acc: 0.9517
Epoch 29/40
 - 1s - loss: 0.1755 - acc: 0.9756 - val_loss: 0.2903 - val_acc: 0.9517
Epoch 30/40
 - 1s - loss: 0.1890 - acc: 0.9702 - val_loss: 0.4403 - val_acc: 0.8435
Epoch 31/40
```

```
 - 1s - loss: 0.1508 - acc: 0.9823 - val_loss: 0.2797 - val_acc: 0.9481
Epoch 32/40
 - 1s - loss: 0.1678 - acc: 0.9756 - val_loss: 0.3001 - val_acc: 0.9438
Epoch 33/40
 - 1s - loss: 0.1535 - acc: 0.9796 - val_loss: 0.6334 - val_acc: 0.7779
Epoch 34/40
 - 1s - loss: 0.1561 - acc: 0.9787 - val_loss: 0.2916 - val_acc: 0.9402
Epoch 35/40
 - 1s - loss: 0.1607 - acc: 0.9747 - val_loss: 0.2831 - val_acc: 0.9452
Epoch 36/40
 - 1s - loss: 0.1690 - acc: 0.9729 - val_loss: 0.3348 - val_acc: 0.8969
Epoch 37/40
 - 1s - loss: 0.1489 - acc: 0.9790 - val_loss: 0.4172 - val_acc: 0.8558
Epoch 38/40
 - 1s - loss: 0.1318 - acc: 0.9854 - val_loss: 0.3365 - val_acc: 0.9135
Epoch 39/40
 - 1s - loss: 0.1608 - acc: 0.9756 - val_loss: 0.7500 - val_acc: 0.6929
Epoch 40/40
 - 1s - loss: 0.1589 - acc: 0.9747 - val_loss: 0.3143 - val_acc: 0.9301
Train accuracy 0.9960426179604261 Test accuracy: 0.9300648882480173
--------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 126, 42)           1176
_____
conv1d_2 (Conv1D)            (None, 124, 24)           3048
_____
dropout_1 (Dropout)          (None, 124, 24)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 62, 24)            0
_____
flatten_1 (Flatten)          (None, 1488)              0
_____
dense_1 (Dense)              (None, 16)                23824
_____
dense_2 (Dense)              (None, 3)                 51
=================================================================
Total params: 28,099
Trainable params: 28,099
Non-trainable params: 0
_____
None
```

```
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 1s - loss: 47.2083 - acc: 0.4846 - val_loss: 32.2905 - val_acc: 0.5789
Epoch 2/40
 - 1s - loss: 23.4663 - acc: 0.7169 - val_loss: 16.2798 - val_acc: 0.6698
Epoch 3/40
 - 1s - loss: 11.5563 - acc: 0.8454 - val_loss: 8.5430 - val_acc: 0.4441
Epoch 4/40
 - 1s - loss: 5.4709 - acc: 0.8770 - val_loss: 3.8863 - val_acc: 0.7325
Epoch 5/40
 - 1s - loss: 2.4055 - acc: 0.8810 - val_loss: 1.7855 - val_acc: 0.7433
Epoch 6/40
 - 1s - loss: 1.0808 - acc: 0.9005 - val_loss: 1.0112 - val_acc: 0.8104
Epoch 7/40
 - 1s - loss: 0.6484 - acc: 0.9047 - val_loss: 0.8504 - val_acc: 0.7650
Epoch 8/40
 - 1s - loss: 0.5210 - acc: 0.9120 - val_loss: 0.7795 - val_acc: 0.7563
Epoch 9/40
 - 1s - loss: 0.4576 - acc: 0.9245 - val_loss: 0.6697 - val_acc: 0.8205
Epoch 10/40
 - 1s - loss: 0.4249 - acc: 0.9330 - val_loss: 0.6911 - val_acc: 0.7815
Epoch 11/40
 - 1s - loss: 0.4033 - acc: 0.9269 - val_loss: 0.6156 - val_acc: 0.8486
Epoch 12/40
 - 1s - loss: 0.3793 - acc: 0.9358 - val_loss: 0.5302 - val_acc: 0.8911
Epoch 13/40
 - 1s - loss: 0.3625 - acc: 0.9373 - val_loss: 0.8029 - val_acc: 0.7138
Epoch 14/40
 - 1s - loss: 0.3400 - acc: 0.9458 - val_loss: 0.6107 - val_acc: 0.8118
Epoch 15/40
 - 1s - loss: 0.3410 - acc: 0.9440 - val_loss: 0.4748 - val_acc: 0.9128
Epoch 16/40
 - 1s - loss: 0.3166 - acc: 0.9467 - val_loss: 0.5065 - val_acc: 0.8673
Epoch 17/40
 - 1s - loss: 0.3049 - acc: 0.9479 - val_loss: 0.5843 - val_acc: 0.8298
Epoch 18/40
 - 1s - loss: 0.2999 - acc: 0.9507 - val_loss: 0.7523 - val_acc: 0.7296
Epoch 19/40
 - 1s - loss: 0.2987 - acc: 0.9482 - val_loss: 0.4592 - val_acc: 0.9070
Epoch 20/40
 - 1s - loss: 0.2788 - acc: 0.9568 - val_loss: 0.4397 - val_acc: 0.8955
Epoch 21/40
 - 1s - loss: 0.2703 - acc: 0.9586 - val_loss: 0.5512 - val_acc: 0.8385
```

```
Epoch 22/40
 - 1s - loss: 0.2601 - acc: 0.9577 - val_loss: 0.6105 - val_acc: 0.7880
Epoch 23/40
 - 1s - loss: 0.2542 - acc: 0.9607 - val_loss: 0.5178 - val_acc: 0.8724
Epoch 24/40
 - 1s - loss: 0.2435 - acc: 0.9647 - val_loss: 0.4315 - val_acc: 0.8947
Epoch 25/40
 - 1s - loss: 0.2637 - acc: 0.9583 - val_loss: 0.4336 - val_acc: 0.8882
Epoch 26/40
 - 1s - loss: 0.2453 - acc: 0.9671 - val_loss: 0.4929 - val_acc: 0.8738
Epoch 27/40
 - 1s - loss: 0.2342 - acc: 0.9635 - val_loss: 0.9286 - val_acc: 0.7426
Epoch 28/40
 - 1s - loss: 0.2413 - acc: 0.9619 - val_loss: 0.4210 - val_acc: 0.9034
Epoch 29/40
 - 1s - loss: 0.2344 - acc: 0.9629 - val_loss: 0.3855 - val_acc: 0.9344
Epoch 30/40
 - 1s - loss: 0.2267 - acc: 0.9644 - val_loss: 0.4255 - val_acc: 0.9106
Epoch 31/40
 - 1s - loss: 0.2044 - acc: 0.9717 - val_loss: 1.3800 - val_acc: 0.5415
Epoch 32/40
 - 1s - loss: 0.2228 - acc: 0.9659 - val_loss: 0.4959 - val_acc: 0.8753
Epoch 33/40
 - 1s - loss: 0.2148 - acc: 0.9671 - val_loss: 0.4481 - val_acc: 0.8861
Epoch 34/40
 - 1s - loss: 0.1942 - acc: 0.9729 - val_loss: 0.3732 - val_acc: 0.9250
Epoch 35/40
 - 1s - loss: 0.2122 - acc: 0.9702 - val_loss: 0.4508 - val_acc: 0.8818
Epoch 36/40
 - 1s - loss: 0.2015 - acc: 0.9711 - val_loss: 0.5115 - val_acc: 0.8428
Epoch 37/40
 - 1s - loss: 0.2043 - acc: 0.9671 - val_loss: 0.3940 - val_acc: 0.9193
Epoch 38/40
 - 1s - loss: 0.1956 - acc: 0.9741 - val_loss: 0.4137 - val_acc: 0.8998
Epoch 39/40
 - 1s - loss: 0.2001 - acc: 0.9683 - val_loss: 0.3748 - val_acc: 0.9279
Epoch 40/40
 - 1s - loss: 0.1915 - acc: 0.9726 - val_loss: 0.4346 - val_acc: 0.9070
Train accuracy 0.9863013698630136 Test accuracy: 0.9069935111751982
---------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
```

```
conv1d_1 (Conv1D)              (None, 122, 32)              2048
_____
conv1d_2 (Conv1D)              (None, 118, 24)              3864
_____
dropout_1 (Dropout)            (None, 118, 24)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 59, 24)               0
_____
flatten_1 (Flatten)            (None, 1416)                 0
_____
dense_1 (Dense)                (None, 64)                   90688
_____
dense_2 (Dense)                (None, 3)                    195
=================================================================
Total params: 96,795
Trainable params: 96,795
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 3s - loss: 21.5679 - acc: 0.7011 - val_loss: 2.6269 - val_acc: 0.7325
Epoch 2/40
 - 2s - loss: 0.9842 - acc: 0.9367 - val_loss: 0.6518 - val_acc: 0.8933
Epoch 3/40
 - 2s - loss: 0.3407 - acc: 0.9638 - val_loss: 0.4970 - val_acc: 0.8897
Epoch 4/40
 - 2s - loss: 0.2316 - acc: 0.9756 - val_loss: 0.4165 - val_acc: 0.9063
Epoch 5/40
 - 2s - loss: 0.1898 - acc: 0.9766 - val_loss: 0.2826 - val_acc: 0.9596
Epoch 6/40
 - 2s - loss: 0.1644 - acc: 0.9811 - val_loss: 0.3044 - val_acc: 0.9250
Epoch 7/40
 - 2s - loss: 0.1598 - acc: 0.9799 - val_loss: 0.3950 - val_acc: 0.8702
Epoch 8/40
 - 2s - loss: 0.1381 - acc: 0.9814 - val_loss: 0.9953 - val_acc: 0.7022
Epoch 9/40
 - 2s - loss: 0.1439 - acc: 0.9817 - val_loss: 0.3038 - val_acc: 0.9164
Epoch 10/40
 - 2s - loss: 0.1337 - acc: 0.9811 - val_loss: 0.2058 - val_acc: 0.9611
Epoch 11/40
 - 2s - loss: 0.1204 - acc: 0.9851 - val_loss: 0.2451 - val_acc: 0.9351
Epoch 12/40
```

```
            - 2s - loss: 0.1281 - acc: 0.9814 - val_loss: 0.1823 - val_acc: 0.9618
Epoch 13/40
            - 2s - loss: 0.1214 - acc: 0.9805 - val_loss: 0.3392 - val_acc: 0.9193
Epoch 14/40
            - 2s - loss: 0.1246 - acc: 0.9817 - val_loss: 0.1954 - val_acc: 0.9575
Epoch 15/40
            - 2s - loss: 0.1109 - acc: 0.9860 - val_loss: 0.2721 - val_acc: 0.9077
Epoch 16/40
            - 2s - loss: 0.1264 - acc: 0.9784 - val_loss: 0.1795 - val_acc: 0.9611
Epoch 17/40
            - 2s - loss: 0.1154 - acc: 0.9833 - val_loss: 0.3008 - val_acc: 0.9236
Epoch 18/40
            - 2s - loss: 0.1070 - acc: 0.9826 - val_loss: 0.2181 - val_acc: 0.9409
Epoch 19/40
            - 2s - loss: 0.1073 - acc: 0.9848 - val_loss: 0.2587 - val_acc: 0.9200
Epoch 20/40
            - 2s - loss: 0.1035 - acc: 0.9845 - val_loss: 0.1987 - val_acc: 0.9452
Epoch 21/40
            - 2s - loss: 0.0965 - acc: 0.9866 - val_loss: 0.2149 - val_acc: 0.9423
Epoch 22/40
            - 2s - loss: 0.0971 - acc: 0.9851 - val_loss: 0.4646 - val_acc: 0.8955
Epoch 23/40
            - 2s - loss: 0.0967 - acc: 0.9842 - val_loss: 0.1513 - val_acc: 0.9618
Epoch 24/40
            - 2s - loss: 0.0964 - acc: 0.9863 - val_loss: 0.7679 - val_acc: 0.8371
Epoch 25/40
            - 2s - loss: 0.0890 - acc: 0.9896 - val_loss: 0.2906 - val_acc: 0.9005
Epoch 26/40
            - 2s - loss: 0.0963 - acc: 0.9845 - val_loss: 0.1869 - val_acc: 0.9632
Epoch 27/40
            - 2s - loss: 0.0986 - acc: 0.9823 - val_loss: 0.3813 - val_acc: 0.8810
Epoch 28/40
            - 2s - loss: 0.0934 - acc: 0.9860 - val_loss: 0.2272 - val_acc: 0.9438
Epoch 29/40
            - 2s - loss: 0.1042 - acc: 0.9839 - val_loss: 0.1967 - val_acc: 0.9402
Epoch 30/40
            - 2s - loss: 0.0889 - acc: 0.9875 - val_loss: 0.2041 - val_acc: 0.9582
Epoch 31/40
            - 2s - loss: 0.0989 - acc: 0.9836 - val_loss: 0.2014 - val_acc: 0.9402
Epoch 32/40
            - 2s - loss: 0.1046 - acc: 0.9842 - val_loss: 0.2702 - val_acc: 0.9452
Epoch 33/40
            - 2s - loss: 0.0927 - acc: 0.9851 - val_loss: 0.2805 - val_acc: 0.9257
```

```
Epoch 34/40
 - 2s - loss: 0.1095 - acc: 0.9811 - val_loss: 0.1935 - val_acc: 0.9582
Epoch 35/40
 - 2s - loss: 0.0922 - acc: 0.9857 - val_loss: 0.4072 - val_acc: 0.8796
Epoch 36/40
 - 2s - loss: 0.1009 - acc: 0.9839 - val_loss: 0.2082 - val_acc: 0.9438
Epoch 37/40
 - 2s - loss: 0.1028 - acc: 0.9842 - val_loss: 0.2032 - val_acc: 0.9539
Epoch 38/40
 - 2s - loss: 0.0954 - acc: 0.9845 - val_loss: 0.1965 - val_acc: 0.9452
Epoch 39/40
 - 2s - loss: 0.1039 - acc: 0.9851 - val_loss: 3.1968 - val_acc: 0.4888
Epoch 40/40
 - 2s - loss: 0.1015 - acc: 0.9848 - val_loss: 0.2358 - val_acc: 0.9366
Train accuracy 0.9966514459665144 Test accuracy: 0.9365537130497477
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 122, 32)	4064
dropout_1 (Dropout)	(None, 122, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 32)	0
flatten_1 (Flatten)	(None, 768)	0
dense_1 (Dense)	(None, 16)	12304
dense_2 (Dense)	(None, 3)	51

```
Total params: 18,351
Trainable params: 18,351
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 122.6977 - acc: 0.4661 - val_loss: 65.5370 - val_acc: 0.5566
Epoch 2/35
 - 1s - loss: 38.2275 - acc: 0.6545 - val_loss: 18.1775 - val_acc: 0.6042
```

```
Epoch 3/35
 - 1s - loss: 9.7547 - acc: 0.7196 - val_loss: 4.3811 - val_acc: 0.5090
Epoch 4/35
 - 1s - loss: 2.0449 - acc: 0.7896 - val_loss: 1.2230 - val_acc: 0.7030
Epoch 5/35
 - 1s - loss: 0.7770 - acc: 0.8301 - val_loss: 0.8708 - val_acc: 0.7902
Epoch 6/35
 - 1s - loss: 0.6486 - acc: 0.8636 - val_loss: 0.8704 - val_acc: 0.7448
Epoch 7/35
 - 1s - loss: 0.5813 - acc: 0.8840 - val_loss: 0.8644 - val_acc: 0.7383
Epoch 8/35
 - 1s - loss: 0.5302 - acc: 0.8974 - val_loss: 0.7026 - val_acc: 0.8839
Epoch 9/35
 - 1s - loss: 0.5159 - acc: 0.8950 - val_loss: 0.6687 - val_acc: 0.8789
Epoch 10/35
 - 1s - loss: 0.4784 - acc: 0.9111 - val_loss: 0.7717 - val_acc: 0.7397
Epoch 11/35
 - 1s - loss: 0.4820 - acc: 0.9005 - val_loss: 0.6930 - val_acc: 0.8378
Epoch 12/35
 - 1s - loss: 0.4566 - acc: 0.9111 - val_loss: 0.6223 - val_acc: 0.8947
Epoch 13/35
 - 1s - loss: 0.4497 - acc: 0.9181 - val_loss: 0.9459 - val_acc: 0.6172
Epoch 14/35
 - 1s - loss: 0.4320 - acc: 0.9157 - val_loss: 0.6744 - val_acc: 0.7888
Epoch 15/35
 - 1s - loss: 0.4221 - acc: 0.9169 - val_loss: 0.6065 - val_acc: 0.8601
Epoch 16/35
 - 1s - loss: 0.4027 - acc: 0.9257 - val_loss: 0.8023 - val_acc: 0.7109
Epoch 17/35
 - 1s - loss: 0.3956 - acc: 0.9279 - val_loss: 0.6446 - val_acc: 0.8515
Epoch 18/35
 - 1s - loss: 0.3833 - acc: 0.9263 - val_loss: 1.0157 - val_acc: 0.5458
Epoch 19/35
 - 1s - loss: 0.3858 - acc: 0.9260 - val_loss: 0.5656 - val_acc: 0.8818
Epoch 20/35
 - 1s - loss: 0.3513 - acc: 0.9391 - val_loss: 0.5305 - val_acc: 0.8868
Epoch 21/35
 - 1s - loss: 0.3717 - acc: 0.9336 - val_loss: 0.7151 - val_acc: 0.7462
Epoch 22/35
 - 1s - loss: 0.3579 - acc: 0.9336 - val_loss: 0.7154 - val_acc: 0.7397
Epoch 23/35
 - 1s - loss: 0.3556 - acc: 0.9391 - val_loss: 0.5406 - val_acc: 0.8825
Epoch 24/35
```

```
              - 1s - loss: 0.3312 - acc: 0.9434 - val_loss: 0.6510 - val_acc: 0.8161
         Epoch 25/35
              - 1s - loss: 0.3480 - acc: 0.9346 - val_loss: 0.6723 - val_acc: 0.7743
         Epoch 26/35
              - 1s - loss: 0.3428 - acc: 0.9364 - val_loss: 0.4825 - val_acc: 0.9084
         Epoch 27/35
              - 1s - loss: 0.3326 - acc: 0.9388 - val_loss: 0.5982 - val_acc: 0.8212
         Epoch 28/35
              - 1s - loss: 0.3300 - acc: 0.9464 - val_loss: 0.4781 - val_acc: 0.9156
         Epoch 29/35
              - 1s - loss: 0.3266 - acc: 0.9416 - val_loss: 0.4719 - val_acc: 0.9200
         Epoch 30/35
              - 1s - loss: 0.3406 - acc: 0.9324 - val_loss: 0.4931 - val_acc: 0.9070
         Epoch 31/35
              - 1s - loss: 0.2979 - acc: 0.9549 - val_loss: 0.4340 - val_acc: 0.9243
         Epoch 32/35
              - 1s - loss: 0.3308 - acc: 0.9394 - val_loss: 0.5053 - val_acc: 0.8890
         Epoch 33/35
              - 1s - loss: 0.3347 - acc: 0.9333 - val_loss: 0.5325 - val_acc: 0.8789
         Epoch 34/35
              - 1s - loss: 0.2941 - acc: 0.9531 - val_loss: 0.4412 - val_acc: 0.8933
         Epoch 35/35
              - 1s - loss: 0.3399 - acc: 0.9303 - val_loss: 0.4787 - val_acc: 0.8890
         Train accuracy 0.9570776255707762 Test accuracy: 0.8889689978370584
         ----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 42)	1176
conv1d_2 (Conv1D)	(None, 122, 16)	3376
dropout_1 (Dropout)	(None, 122, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 61, 16)	0
flatten_1 (Flatten)	(None, 976)	0
dense_1 (Dense)	(None, 64)	62528
dense_2 (Dense)	(None, 3)	195

```
Total params: 67,275
```

```
Trainable params: 67,275
Non-trainable params: 0

_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 59.8307 - acc: 0.6941 - val_loss: 27.9730 - val_acc: 0.7678
Epoch 2/40
 - 1s - loss: 14.8227 - acc: 0.8947 - val_loss: 6.1851 - val_acc: 0.8327
Epoch 3/40
 - 1s - loss: 2.5884 - acc: 0.9233 - val_loss: 1.1393 - val_acc: 0.8176
Epoch 4/40
 - 1s - loss: 0.5882 - acc: 0.9239 - val_loss: 0.7887 - val_acc: 0.8198
Epoch 5/40
 - 2s - loss: 0.4160 - acc: 0.9376 - val_loss: 0.6296 - val_acc: 0.8277
Epoch 6/40
 - 2s - loss: 0.3433 - acc: 0.9537 - val_loss: 0.6333 - val_acc: 0.8212
Epoch 7/40
 - 1s - loss: 0.3084 - acc: 0.9586 - val_loss: 0.5737 - val_acc: 0.8154
Epoch 8/40
 - 1s - loss: 0.2777 - acc: 0.9616 - val_loss: 0.5316 - val_acc: 0.8392
Epoch 9/40
 - 2s - loss: 0.2673 - acc: 0.9595 - val_loss: 0.4719 - val_acc: 0.8882
Epoch 10/40
 - 2s - loss: 0.2563 - acc: 0.9635 - val_loss: 0.4037 - val_acc: 0.9128
Epoch 11/40
 - 1s - loss: 0.2381 - acc: 0.9680 - val_loss: 0.4937 - val_acc: 0.8291
Epoch 12/40
 - 2s - loss: 0.2182 - acc: 0.9723 - val_loss: 0.3514 - val_acc: 0.9315
Epoch 13/40
 - 2s - loss: 0.2230 - acc: 0.9705 - val_loss: 0.6220 - val_acc: 0.8032
Epoch 14/40
 - 1s - loss: 0.2117 - acc: 0.9720 - val_loss: 0.4664 - val_acc: 0.8479
Epoch 15/40
 - 1s - loss: 0.1958 - acc: 0.9732 - val_loss: 0.3613 - val_acc: 0.9027
Epoch 16/40
 - 1s - loss: 0.1945 - acc: 0.9717 - val_loss: 1.0225 - val_acc: 0.7123
Epoch 17/40
 - 1s - loss: 0.1958 - acc: 0.9717 - val_loss: 0.2897 - val_acc: 0.9438
Epoch 18/40
 - 2s - loss: 0.1802 - acc: 0.9775 - val_loss: 0.3478 - val_acc: 0.9185
Epoch 19/40
 - 1s - loss: 0.1767 - acc: 0.9760 - val_loss: 0.3098 - val_acc: 0.9337
```

```
Epoch 20/40
 - 2s - loss: 0.1714 - acc: 0.9753 - val_loss: 0.6100 - val_acc: 0.7815
Epoch 21/40
 - 2s - loss: 0.1670 - acc: 0.9811 - val_loss: 0.3828 - val_acc: 0.8810
Epoch 22/40
 - 1s - loss: 0.1729 - acc: 0.9729 - val_loss: 0.4481 - val_acc: 0.8572
Epoch 23/40
 - 1s - loss: 0.1638 - acc: 0.9738 - val_loss: 0.3390 - val_acc: 0.9005
Epoch 24/40
 - 1s - loss: 0.1723 - acc: 0.9766 - val_loss: 0.3179 - val_acc: 0.9142
Epoch 25/40
 - 2s - loss: 0.1647 - acc: 0.9738 - val_loss: 0.3051 - val_acc: 0.9308
Epoch 26/40
 - 1s - loss: 0.1621 - acc: 0.9793 - val_loss: 0.3306 - val_acc: 0.9005
Epoch 27/40
 - 2s - loss: 0.1728 - acc: 0.9747 - val_loss: 0.7663 - val_acc: 0.8335
Epoch 28/40
 - 1s - loss: 0.1656 - acc: 0.9763 - val_loss: 0.3004 - val_acc: 0.9243
Epoch 29/40
 - 1s - loss: 0.1515 - acc: 0.9823 - val_loss: 0.2808 - val_acc: 0.9387
Epoch 30/40
 - 1s - loss: 0.1537 - acc: 0.9793 - val_loss: 0.3115 - val_acc: 0.9128
Epoch 31/40
 - 1s - loss: 0.1587 - acc: 0.9766 - val_loss: 0.2581 - val_acc: 0.9445
Epoch 32/40
 - 2s - loss: 0.1702 - acc: 0.9753 - val_loss: 0.2677 - val_acc: 0.9358
Epoch 33/40
 - 2s - loss: 0.1528 - acc: 0.9747 - val_loss: 0.5606 - val_acc: 0.8053
Epoch 34/40
 - 1s - loss: 0.1541 - acc: 0.9775 - val_loss: 0.3035 - val_acc: 0.9366
Epoch 35/40
 - 2s - loss: 0.1524 - acc: 0.9778 - val_loss: 0.2780 - val_acc: 0.9329
Epoch 36/40
 - 1s - loss: 0.1443 - acc: 0.9790 - val_loss: 0.2963 - val_acc: 0.9409
Epoch 37/40
 - 1s - loss: 0.1398 - acc: 0.9842 - val_loss: 0.3007 - val_acc: 0.9178
Epoch 38/40
 - 2s - loss: 0.1562 - acc: 0.9760 - val_loss: 0.2397 - val_acc: 0.9430
Epoch 39/40
 - 2s - loss: 0.1507 - acc: 0.9799 - val_loss: 0.3688 - val_acc: 0.8803
Epoch 40/40
 - 2s - loss: 0.1564 - acc: 0.9756 - val_loss: 0.2803 - val_acc: 0.9315
Train accuracy 0.9917808219178083 Test accuracy: 0.9315068493150684
```

```
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 28)	1288
conv1d_2 (Conv1D)	(None, 118, 24)	4728
dropout_1 (Dropout)	(None, 118, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 24)	0
flatten_1 (Flatten)	(None, 1416)	0
dense_1 (Dense)	(None, 16)	22672
dense_2 (Dense)	(None, 3)	51

```
Total params: 28,739
Trainable params: 28,739
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 25.4551 - acc: 0.6024 - val_loss: 12.1356 - val_acc: 0.7815
Epoch 2/40
 - 1s - loss: 6.1224 - acc: 0.8837 - val_loss: 2.6324 - val_acc: 0.8082
Epoch 3/40
 - 1s - loss: 1.1763 - acc: 0.9349 - val_loss: 0.8378 - val_acc: 0.8601
Epoch 4/40
 - 1s - loss: 0.4566 - acc: 0.9455 - val_loss: 0.5234 - val_acc: 0.9279
Epoch 5/40
 - 1s - loss: 0.3117 - acc: 0.9619 - val_loss: 0.6312 - val_acc: 0.7751
Epoch 6/40
 - 1s - loss: 0.2481 - acc: 0.9729 - val_loss: 0.4204 - val_acc: 0.9344
Epoch 7/40
 - 1s - loss: 0.2187 - acc: 0.9756 - val_loss: 0.4449 - val_acc: 0.9120
Epoch 8/40
 - 1s - loss: 0.1992 - acc: 0.9747 - val_loss: 0.3481 - val_acc: 0.9466
Epoch 9/40
 - 1s - loss: 0.1726 - acc: 0.9808 - val_loss: 0.3168 - val_acc: 0.9351
Epoch 10/40
```

```
         - 1s - loss: 0.1752 - acc: 0.9753 - val_loss: 0.3300 - val_acc: 0.9344
Epoch 11/40
         - 1s - loss: 0.1534 - acc: 0.9799 - val_loss: 0.2678 - val_acc: 0.9589
Epoch 12/40
         - 1s - loss: 0.1522 - acc: 0.9814 - val_loss: 0.2743 - val_acc: 0.9466
Epoch 13/40
         - 1s - loss: 0.1638 - acc: 0.9763 - val_loss: 0.2747 - val_acc: 0.9539
Epoch 14/40
         - 1s - loss: 0.1462 - acc: 0.9793 - val_loss: 0.2298 - val_acc: 0.9618
Epoch 15/40
         - 1s - loss: 0.1502 - acc: 0.9781 - val_loss: 0.2497 - val_acc: 0.9582
Epoch 16/40
         - 1s - loss: 0.1424 - acc: 0.9799 - val_loss: 0.2856 - val_acc: 0.9474
Epoch 17/40
         - 1s - loss: 0.1477 - acc: 0.9781 - val_loss: 0.2942 - val_acc: 0.9466
Epoch 18/40
         - 1s - loss: 0.1385 - acc: 0.9817 - val_loss: 0.3071 - val_acc: 0.9459
Epoch 19/40
         - 1s - loss: 0.1344 - acc: 0.9778 - val_loss: 0.3089 - val_acc: 0.9474
Epoch 20/40
         - 1s - loss: 0.1414 - acc: 0.9778 - val_loss: 0.2510 - val_acc: 0.9618
Epoch 21/40
         - 1s - loss: 0.1333 - acc: 0.9820 - val_loss: 0.2960 - val_acc: 0.9560
Epoch 22/40
         - 1s - loss: 0.1286 - acc: 0.9836 - val_loss: 0.2687 - val_acc: 0.9474
Epoch 23/40
         - 1s - loss: 0.1237 - acc: 0.9839 - val_loss: 0.2106 - val_acc: 0.9647
Epoch 24/40
         - 1s - loss: 0.1295 - acc: 0.9784 - val_loss: 0.1891 - val_acc: 0.9712
Epoch 25/40
         - 1s - loss: 0.1224 - acc: 0.9863 - val_loss: 0.3650 - val_acc: 0.8810
Epoch 26/40
         - 1s - loss: 0.1398 - acc: 0.9778 - val_loss: 0.2510 - val_acc: 0.9575
Epoch 27/40
         - 1s - loss: 0.1178 - acc: 0.9839 - val_loss: 0.3120 - val_acc: 0.9358
Epoch 28/40
         - 1s - loss: 0.1329 - acc: 0.9781 - val_loss: 0.2252 - val_acc: 0.9423
Epoch 29/40
         - 1s - loss: 0.1330 - acc: 0.9814 - val_loss: 0.3192 - val_acc: 0.9416
Epoch 30/40
         - 1s - loss: 0.1217 - acc: 0.9808 - val_loss: 0.5419 - val_acc: 0.8277
Epoch 31/40
         - 1s - loss: 0.1395 - acc: 0.9820 - val_loss: 0.2172 - val_acc: 0.9611
```

```
Epoch 32/40
 - 1s - loss: 0.1300 - acc: 0.9784 - val_loss: 0.2615 - val_acc: 0.9488
Epoch 33/40
 - 1s - loss: 0.1414 - acc: 0.9778 - val_loss: 0.2676 - val_acc: 0.9243
Epoch 34/40
 - 1s - loss: 0.1236 - acc: 0.9842 - val_loss: 0.2377 - val_acc: 0.9596
Epoch 35/40
 - 1s - loss: 0.1308 - acc: 0.9805 - val_loss: 0.2649 - val_acc: 0.9524
Epoch 36/40
 - 1s - loss: 0.1185 - acc: 0.9836 - val_loss: 0.2038 - val_acc: 0.9618
Epoch 37/40
 - 1s - loss: 0.1145 - acc: 0.9863 - val_loss: 0.4353 - val_acc: 0.8904
Epoch 38/40
 - 1s - loss: 0.1288 - acc: 0.9851 - val_loss: 0.2359 - val_acc: 0.9539
Epoch 39/40
 - 1s - loss: 0.1355 - acc: 0.9784 - val_loss: 0.3108 - val_acc: 0.9293
Epoch 40/40
 - 1s - loss: 0.1360 - acc: 0.9811 - val_loss: 0.3337 - val_acc: 0.9416
Train accuracy 0.9899543378995433 Test accuracy: 0.9416005767844268
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 24)	2328
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 24)	0
flatten_1 (Flatten)	(None, 576)	0
dense_1 (Dense)	(None, 32)	18464
dense_2 (Dense)	(None, 3)	99

```
Total params: 22,939
Trainable params: 22,939
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
```

```
Epoch 1/35
 - 1s - loss: 24.2100 - acc: 0.6524 - val_loss: 10.7816 - val_acc: 0.8882
Epoch 2/35
 - 1s - loss: 5.3945 - acc: 0.9023 - val_loss: 2.1393 - val_acc: 0.9481
Epoch 3/35
 - 1s - loss: 1.1129 - acc: 0.9394 - val_loss: 1.1996 - val_acc: 0.6619
Epoch 4/35
 - 1s - loss: 0.5493 - acc: 0.9525 - val_loss: 0.5286 - val_acc: 0.9654
Epoch 5/35
 - 1s - loss: 0.4038 - acc: 0.9610 - val_loss: 0.5076 - val_acc: 0.9034
Epoch 6/35
 - 1s - loss: 0.4597 - acc: 0.9455 - val_loss: 0.4007 - val_acc: 0.9647
Epoch 7/35
 - 1s - loss: 0.2919 - acc: 0.9705 - val_loss: 0.4166 - val_acc: 0.9740
Epoch 8/35
 - 1s - loss: 0.2704 - acc: 0.9729 - val_loss: 0.3041 - val_acc: 0.9776
Epoch 9/35
 - 1s - loss: 0.3007 - acc: 0.9635 - val_loss: 1.2824 - val_acc: 0.4593
Epoch 10/35
 - 1s - loss: 0.2540 - acc: 0.9644 - val_loss: 0.2783 - val_acc: 0.9733
Epoch 11/35
 - 1s - loss: 0.2432 - acc: 0.9726 - val_loss: 0.2698 - val_acc: 0.9740
Epoch 12/35
 - 1s - loss: 0.2322 - acc: 0.9720 - val_loss: 0.2489 - val_acc: 0.9791
Epoch 13/35
 - 1s - loss: 0.1864 - acc: 0.9820 - val_loss: 0.3197 - val_acc: 0.9690
Epoch 14/35
 - 1s - loss: 0.1974 - acc: 0.9793 - val_loss: 0.2389 - val_acc: 0.9589
Epoch 15/35
 - 1s - loss: 0.2220 - acc: 0.9674 - val_loss: 0.2166 - val_acc: 0.9755
Epoch 16/35
 - 1s - loss: 0.1649 - acc: 0.9787 - val_loss: 0.2530 - val_acc: 0.9668
Epoch 17/35
 - 1s - loss: 0.1424 - acc: 0.9851 - val_loss: 0.2289 - val_acc: 0.9719
Epoch 18/35
 - 1s - loss: 0.1607 - acc: 0.9738 - val_loss: 0.2378 - val_acc: 0.9531
Epoch 19/35
 - 1s - loss: 0.1546 - acc: 0.9830 - val_loss: 0.1995 - val_acc: 0.9776
Epoch 20/35
 - 1s - loss: 0.1153 - acc: 0.9863 - val_loss: 0.2158 - val_acc: 0.9647
Epoch 21/35
 - 1s - loss: 0.1259 - acc: 0.9896 - val_loss: 0.4733 - val_acc: 0.8320
Epoch 22/35
```

```
                   - 1s - loss: 0.1093 - acc: 0.9872 - val_loss: 0.4914 - val_acc: 0.8284
        Epoch 23/35
                   - 1s - loss: 0.1318 - acc: 0.9769 - val_loss: 0.2549 - val_acc: 0.9495
        Epoch 24/35
                   - 1s - loss: 0.1439 - acc: 0.9857 - val_loss: 0.1813 - val_acc: 0.9704
        Epoch 25/35
                   - 1s - loss: 0.0739 - acc: 0.9939 - val_loss: 0.1778 - val_acc: 0.9603
        Epoch 26/35
                   - 1s - loss: 0.1163 - acc: 0.9836 - val_loss: 0.2006 - val_acc: 0.9560
        Epoch 27/35
                   - 1s - loss: 0.1000 - acc: 0.9869 - val_loss: 0.1582 - val_acc: 0.9762
        Epoch 28/35
                   - 1s - loss: 0.0883 - acc: 0.9884 - val_loss: 0.1869 - val_acc: 0.9567
        Epoch 29/35
                   - 1s - loss: 0.0974 - acc: 0.9851 - val_loss: 0.1800 - val_acc: 0.9697
        Epoch 30/35
                   - 1s - loss: 0.0653 - acc: 0.9933 - val_loss: 0.2416 - val_acc: 0.9402
        Epoch 31/35
                   - 1s - loss: 0.0945 - acc: 0.9854 - val_loss: 0.2697 - val_acc: 0.9092
        Epoch 32/35
                   - 1s - loss: 0.0901 - acc: 0.9896 - val_loss: 0.1562 - val_acc: 0.9740
        Epoch 33/35
                   - 1s - loss: 0.0824 - acc: 0.9851 - val_loss: 0.1699 - val_acc: 0.9726
        Epoch 34/35
                   - 1s - loss: 0.0889 - acc: 0.9878 - val_loss: 0.1561 - val_acc: 0.9769
        Epoch 35/35
                   - 1s - loss: 0.0561 - acc: 0.9948 - val_loss: 0.1351 - val_acc: 0.9719
        Train accuracy 1.0 Test accuracy: 0.9718817591925017
        ----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 24)	2328
dropout_1 (Dropout)	(None, 120, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 24)	0
flatten_1 (Flatten)	(None, 576)	0
dense_1 (Dense)	(None, 32)	18464

```
_____
dense_2 (Dense)                  (None, 3)                      99
===============================================================
Total params: 22,939
Trainable params: 22,939
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 1s - loss: 93.3506 - acc: 0.5732 - val_loss: 34.1302 - val_acc: 0.5479
Epoch 2/35
 - 1s - loss: 13.9552 - acc: 0.7355 - val_loss: 2.8761 - val_acc: 0.6590
Epoch 3/35
 - 1s - loss: 1.1558 - acc: 0.8055 - val_loss: 1.0204 - val_acc: 0.6381
Epoch 4/35
 - 1s - loss: 0.6533 - acc: 0.8496 - val_loss: 0.8411 - val_acc: 0.7376
Epoch 5/35
 - 1s - loss: 0.5915 - acc: 0.8636 - val_loss: 0.7062 - val_acc: 0.7714
Epoch 6/35
 - 1s - loss: 0.5415 - acc: 0.8697 - val_loss: 0.6687 - val_acc: 0.8767
Epoch 7/35
 - 1s - loss: 0.4996 - acc: 0.8925 - val_loss: 0.7296 - val_acc: 0.7873
Epoch 8/35
 - 1s - loss: 0.4756 - acc: 0.9002 - val_loss: 0.6007 - val_acc: 0.8998
Epoch 9/35
 - 1s - loss: 0.4487 - acc: 0.9053 - val_loss: 0.5356 - val_acc: 0.9236
Epoch 10/35
 - 1s - loss: 0.4344 - acc: 0.9157 - val_loss: 0.5610 - val_acc: 0.8991
Epoch 11/35
 - 1s - loss: 0.4196 - acc: 0.9151 - val_loss: 0.6788 - val_acc: 0.8212
Epoch 12/35
 - 1s - loss: 0.4230 - acc: 0.9175 - val_loss: 0.7549 - val_acc: 0.8147
Epoch 13/35
 - 1s - loss: 0.4118 - acc: 0.9154 - val_loss: 0.8687 - val_acc: 0.7066
Epoch 14/35
 - 1s - loss: 0.3982 - acc: 0.9248 - val_loss: 0.6648 - val_acc: 0.8414
Epoch 15/35
 - 1s - loss: 0.3899 - acc: 0.9239 - val_loss: 0.5691 - val_acc: 0.8385
Epoch 16/35
 - 1s - loss: 0.3839 - acc: 0.9272 - val_loss: 0.4467 - val_acc: 0.9265
Epoch 17/35
 - 1s - loss: 0.3984 - acc: 0.9184 - val_loss: 0.8278 - val_acc: 0.7751
```

```
Epoch 18/35
 - 1s - loss: 0.3849 - acc: 0.9239 - val_loss: 0.9858 - val_acc: 0.6056
Epoch 19/35
 - 1s - loss: 0.3944 - acc: 0.9269 - val_loss: 0.5431 - val_acc: 0.9099
Epoch 20/35
 - 1s - loss: 0.3698 - acc: 0.9312 - val_loss: 0.4867 - val_acc: 0.8998
Epoch 21/35
 - 1s - loss: 0.3712 - acc: 0.9309 - val_loss: 1.1906 - val_acc: 0.5963
Epoch 22/35
 - 1s - loss: 0.3621 - acc: 0.9297 - val_loss: 0.5022 - val_acc: 0.9135
Epoch 23/35
 - 1s - loss: 0.3553 - acc: 0.9412 - val_loss: 0.4268 - val_acc: 0.9380
Epoch 24/35
 - 1s - loss: 0.3639 - acc: 0.9275 - val_loss: 0.4387 - val_acc: 0.9495
Epoch 25/35
 - 1s - loss: 0.3648 - acc: 0.9285 - val_loss: 0.5211 - val_acc: 0.8789
Epoch 26/35
 - 1s - loss: 0.3472 - acc: 0.9382 - val_loss: 0.4858 - val_acc: 0.9120
Epoch 27/35
 - 1s - loss: 0.3588 - acc: 0.9376 - val_loss: 0.5075 - val_acc: 0.8947
Epoch 28/35
 - 1s - loss: 0.3536 - acc: 0.9370 - val_loss: 0.4300 - val_acc: 0.9200
Epoch 29/35
 - 1s - loss: 0.3572 - acc: 0.9318 - val_loss: 0.4750 - val_acc: 0.9092
Epoch 30/35
 - 1s - loss: 0.3533 - acc: 0.9324 - val_loss: 0.4842 - val_acc: 0.8991
Epoch 31/35
 - 1s - loss: 0.3658 - acc: 0.9382 - val_loss: 0.4339 - val_acc: 0.9243
Epoch 32/35
 - 1s - loss: 0.3564 - acc: 0.9352 - val_loss: 0.6305 - val_acc: 0.8594
Epoch 33/35
 - 1s - loss: 0.3417 - acc: 0.9358 - val_loss: 0.4779 - val_acc: 0.8890
Epoch 34/35
 - 1s - loss: 0.3476 - acc: 0.9367 - val_loss: 0.4008 - val_acc: 0.9366
Epoch 35/35
 - 1s - loss: 0.3652 - acc: 0.9285 - val_loss: 0.4601 - val_acc: 0.9106
Train accuracy 0.9613394216133943 Test accuracy: 0.9105984138428262
-------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
```

```
conv1d_2 (Conv1D)              (None, 118, 32)              5152
_____
dropout_1 (Dropout)            (None, 118, 32)              0
_____
max_pooling1d_1 (MaxPooling1   (None, 23, 32)               0
_____
flatten_1 (Flatten)            (None, 736)                  0
_____
dense_1 (Dense)                (None, 32)                   23584
_____
dense_2 (Dense)                (None, 3)                    99
===============================================================
Total params: 30,883
Trainable params: 30,883
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 22.6391 - acc: 0.6728 - val_loss: 0.9765 - val_acc: 0.7578
Epoch 2/35
 - 3s - loss: 0.5255 - acc: 0.8913 - val_loss: 0.6317 - val_acc: 0.8760
Epoch 3/35
 - 3s - loss: 0.4265 - acc: 0.9148 - val_loss: 0.6099 - val_acc: 0.8623
Epoch 4/35
 - 3s - loss: 0.3788 - acc: 0.9303 - val_loss: 0.6150 - val_acc: 0.8955
Epoch 5/35
 - 3s - loss: 0.3487 - acc: 0.9300 - val_loss: 0.5012 - val_acc: 0.9142
Epoch 6/35
 - 3s - loss: 0.3351 - acc: 0.9361 - val_loss: 0.5803 - val_acc: 0.8782
Epoch 7/35
 - 3s - loss: 0.3046 - acc: 0.9479 - val_loss: 0.4639 - val_acc: 0.9027
Epoch 8/35
 - 3s - loss: 0.3055 - acc: 0.9422 - val_loss: 0.8789 - val_acc: 0.7116
Epoch 9/35
 - 3s - loss: 0.3085 - acc: 0.9452 - val_loss: 0.4255 - val_acc: 0.9120
Epoch 10/35
 - 3s - loss: 0.3041 - acc: 0.9440 - val_loss: 0.5680 - val_acc: 0.8486
Epoch 11/35
 - 3s - loss: 0.3039 - acc: 0.9443 - val_loss: 0.3933 - val_acc: 0.9178
Epoch 12/35
 - 3s - loss: 0.2968 - acc: 0.9504 - val_loss: 0.4769 - val_acc: 0.9048
Epoch 13/35
```

```
            - 3s - loss: 0.3041 - acc: 0.9425 - val_loss: 1.1143 - val_acc: 0.6633
Epoch 14/35
            - 3s - loss: 0.2994 - acc: 0.9461 - val_loss: 0.3833 - val_acc: 0.9301
Epoch 15/35
            - 3s - loss: 0.3034 - acc: 0.9476 - val_loss: 0.6340 - val_acc: 0.7743
Epoch 16/35
            - 3s - loss: 0.2947 - acc: 0.9486 - val_loss: 0.6873 - val_acc: 0.7585
Epoch 17/35
            - 3s - loss: 0.2957 - acc: 0.9443 - val_loss: 0.9937 - val_acc: 0.7664
Epoch 18/35
            - 3s - loss: 0.2747 - acc: 0.9543 - val_loss: 0.6555 - val_acc: 0.8075
Epoch 19/35
            - 3s - loss: 0.2898 - acc: 0.9498 - val_loss: 0.4888 - val_acc: 0.9207
Epoch 20/35
            - 3s - loss: 0.2835 - acc: 0.9528 - val_loss: 0.9146 - val_acc: 0.6662
Epoch 21/35
            - 3s - loss: 0.2828 - acc: 0.9522 - val_loss: 0.5297 - val_acc: 0.8594
Epoch 22/35
            - 3s - loss: 0.2793 - acc: 0.9537 - val_loss: 0.4597 - val_acc: 0.8962
Epoch 23/35
            - 3s - loss: 0.2931 - acc: 0.9486 - val_loss: 0.4084 - val_acc: 0.9344
Epoch 24/35
            - 3s - loss: 0.2820 - acc: 0.9501 - val_loss: 0.4658 - val_acc: 0.8709
Epoch 25/35
            - 3s - loss: 0.2739 - acc: 0.9577 - val_loss: 0.5145 - val_acc: 0.8753
Epoch 26/35
            - 3s - loss: 0.2836 - acc: 0.9510 - val_loss: 0.4002 - val_acc: 0.9048
Epoch 27/35
            - 3s - loss: 0.3067 - acc: 0.9489 - val_loss: 0.5540 - val_acc: 0.8544
Epoch 28/35
            - 3s - loss: 0.2745 - acc: 0.9498 - val_loss: 0.3898 - val_acc: 0.9257
Epoch 29/35
            - 3s - loss: 0.2763 - acc: 0.9574 - val_loss: 0.4550 - val_acc: 0.9135
Epoch 30/35
            - 3s - loss: 0.2772 - acc: 0.9504 - val_loss: 1.1746 - val_acc: 0.5775
Epoch 31/35
            - 3s - loss: 0.2891 - acc: 0.9498 - val_loss: 0.3660 - val_acc: 0.9272
Epoch 32/35
            - 3s - loss: 0.2775 - acc: 0.9531 - val_loss: 0.3976 - val_acc: 0.9265
Epoch 33/35
            - 3s - loss: 0.2794 - acc: 0.9519 - val_loss: 0.4643 - val_acc: 0.8897
Epoch 34/35
            - 3s - loss: 0.2898 - acc: 0.9498 - val_loss: 0.4518 - val_acc: 0.8882
```

```
Epoch 35/35
 - 3s - loss: 0.2759 - acc: 0.9498 - val_loss: 0.4738 - val_acc: 0.8897
Train accuracy 0.971689497716895 Test accuracy: 0.889689978370584
------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 16)	1552
dropout_1 (Dropout)	(None, 120, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 16)	0
flatten_1 (Flatten)	(None, 384)	0
dense_1 (Dense)	(None, 32)	12320
dense_2 (Dense)	(None, 3)	99

```
Total params: 16,019
Trainable params: 16,019
Non-trainable params: 0


None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 17.0358 - acc: 0.6143 - val_loss: 1.0074 - val_acc: 0.7808
Epoch 2/35
 - 1s - loss: 0.6429 - acc: 0.8429 - val_loss: 0.8237 - val_acc: 0.6792
Epoch 3/35
 - 2s - loss: 0.4812 - acc: 0.8935 - val_loss: 0.6990 - val_acc: 0.8313
Epoch 4/35
 - 2s - loss: 0.4457 - acc: 0.9062 - val_loss: 0.5225 - val_acc: 0.9265
Epoch 5/35
 - 1s - loss: 0.3863 - acc: 0.9297 - val_loss: 0.7553 - val_acc: 0.7520
Epoch 6/35
 - 1s - loss: 0.3582 - acc: 0.9336 - val_loss: 0.5513 - val_acc: 0.8565
Epoch 7/35
 - 1s - loss: 0.3496 - acc: 0.9358 - val_loss: 0.6841 - val_acc: 0.7787
Epoch 8/35
 - 2s - loss: 0.3543 - acc: 0.9419 - val_loss: 0.4510 - val_acc: 0.9279
```

```
Epoch 9/35
 - 1s - loss: 0.3251 - acc: 0.9452 - val_loss: 0.4339 - val_acc: 0.9402
Epoch 10/35
 - 1s - loss: 0.3263 - acc: 0.9492 - val_loss: 0.6124 - val_acc: 0.8219
Epoch 11/35
 - 2s - loss: 0.3149 - acc: 0.9495 - val_loss: 0.8736 - val_acc: 0.7462
Epoch 12/35
 - 2s - loss: 0.3125 - acc: 0.9516 - val_loss: 0.3905 - val_acc: 0.9344
Epoch 13/35
 - 2s - loss: 0.3042 - acc: 0.9489 - val_loss: 0.4725 - val_acc: 0.9063
Epoch 14/35
 - 1s - loss: 0.3487 - acc: 0.9412 - val_loss: 0.4637 - val_acc: 0.9229
Epoch 15/35
 - 2s - loss: 0.2976 - acc: 0.9534 - val_loss: 0.3872 - val_acc: 0.9329
Epoch 16/35
 - 1s - loss: 0.3066 - acc: 0.9473 - val_loss: 0.5742 - val_acc: 0.8154
Epoch 17/35
 - 2s - loss: 0.3027 - acc: 0.9510 - val_loss: 1.0994 - val_acc: 0.7181
Epoch 18/35
 - 2s - loss: 0.2943 - acc: 0.9540 - val_loss: 0.4034 - val_acc: 0.9351
Epoch 19/35
 - 2s - loss: 0.2950 - acc: 0.9531 - val_loss: 0.4047 - val_acc: 0.9207
Epoch 20/35
 - 2s - loss: 0.3040 - acc: 0.9482 - val_loss: 0.5361 - val_acc: 0.8724
Epoch 21/35
 - 2s - loss: 0.2861 - acc: 0.9553 - val_loss: 0.4115 - val_acc: 0.9135
Epoch 22/35
 - 2s - loss: 0.3048 - acc: 0.9461 - val_loss: 0.4156 - val_acc: 0.9322
Epoch 23/35
 - 2s - loss: 0.2743 - acc: 0.9583 - val_loss: 0.3379 - val_acc: 0.9373
Epoch 24/35
 - 2s - loss: 0.3199 - acc: 0.9482 - val_loss: 0.4091 - val_acc: 0.9308
Epoch 25/35
 - 1s - loss: 0.2870 - acc: 0.9559 - val_loss: 0.8238 - val_acc: 0.7022
Epoch 26/35
 - 1s - loss: 0.3209 - acc: 0.9479 - val_loss: 0.3878 - val_acc: 0.9193
Epoch 27/35
 - 2s - loss: 0.2954 - acc: 0.9528 - val_loss: 0.4181 - val_acc: 0.9120
Epoch 28/35
 - 2s - loss: 0.3082 - acc: 0.9455 - val_loss: 0.4289 - val_acc: 0.9056
Epoch 29/35
 - 1s - loss: 0.2933 - acc: 0.9464 - val_loss: 0.4350 - val_acc: 0.9012
Epoch 30/35
```

```
  - 1s - loss: 0.2855 - acc: 0.9531 - val_loss: 0.3625 - val_acc: 0.9337
Epoch 31/35
  - 1s - loss: 0.2661 - acc: 0.9546 - val_loss: 0.6025 - val_acc: 0.8306
Epoch 32/35
  - 2s - loss: 0.2958 - acc: 0.9492 - val_loss: 0.4122 - val_acc: 0.9056
Epoch 33/35
  - 1s - loss: 0.2778 - acc: 0.9516 - val_loss: 0.5165 - val_acc: 0.8745
Epoch 34/35
  - 2s - loss: 0.2820 - acc: 0.9537 - val_loss: 0.5314 - val_acc: 0.8630
Epoch 35/35
  - 1s - loss: 0.2854 - acc: 0.9583 - val_loss: 0.4735 - val_acc: 0.8789
Train accuracy 0.9382039573820395 Test accuracy: 0.8788752703677001
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 24)	5400
dropout_1 (Dropout)	(None, 116, 24)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 24)	0
flatten_1 (Flatten)	(None, 552)	0
dense_1 (Dense)	(None, 32)	17696
dense_2 (Dense)	(None, 3)	99

```
Total params: 25,243
Trainable params: 25,243
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
  - 3s - loss: 4.7432 - acc: 0.7653 - val_loss: 0.9027 - val_acc: 0.9120
Epoch 2/35
  - 2s - loss: 0.5345 - acc: 0.9559 - val_loss: 0.4788 - val_acc: 0.9279
Epoch 3/35
  - 3s - loss: 0.2873 - acc: 0.9705 - val_loss: 0.3264 - val_acc: 0.9632
Epoch 4/35
```

```
        - 2s - loss: 0.2053 - acc: 0.9775 - val_loss: 0.2739 - val_acc: 0.9668
Epoch 5/35
        - 2s - loss: 0.1575 - acc: 0.9769 - val_loss: 0.3076 - val_acc: 0.9459
Epoch 6/35
        - 2s - loss: 0.1363 - acc: 0.9836 - val_loss: 0.2101 - val_acc: 0.9791
Epoch 7/35
        - 3s - loss: 0.1327 - acc: 0.9808 - val_loss: 0.2254 - val_acc: 0.9632
Epoch 8/35
        - 3s - loss: 0.1210 - acc: 0.9823 - val_loss: 0.2171 - val_acc: 0.9654
Epoch 9/35
        - 2s - loss: 0.1162 - acc: 0.9811 - val_loss: 0.2129 - val_acc: 0.9459
Epoch 10/35
        - 2s - loss: 0.0969 - acc: 0.9863 - val_loss: 0.2158 - val_acc: 0.9438
Epoch 11/35
        - 2s - loss: 0.0930 - acc: 0.9863 - val_loss: 0.4556 - val_acc: 0.8082
Epoch 12/35
        - 3s - loss: 0.0874 - acc: 0.9860 - val_loss: 0.1971 - val_acc: 0.9582
Epoch 13/35
        - 2s - loss: 0.0886 - acc: 0.9869 - val_loss: 0.3235 - val_acc: 0.9257
Epoch 14/35
        - 2s - loss: 0.0883 - acc: 0.9857 - val_loss: 0.1850 - val_acc: 0.9560
Epoch 15/35
        - 2s - loss: 0.0817 - acc: 0.9869 - val_loss: 0.2285 - val_acc: 0.9524
Epoch 16/35
        - 2s - loss: 0.0949 - acc: 0.9848 - val_loss: 0.2265 - val_acc: 0.9459
Epoch 17/35
        - 3s - loss: 0.0802 - acc: 0.9866 - val_loss: 0.2274 - val_acc: 0.9402
Epoch 18/35
        - 2s - loss: 0.0871 - acc: 0.9878 - val_loss: 0.2145 - val_acc: 0.9618
Epoch 19/35
        - 2s - loss: 0.0853 - acc: 0.9866 - val_loss: 0.2000 - val_acc: 0.9625
Epoch 20/35
        - 2s - loss: 0.0842 - acc: 0.9869 - val_loss: 0.2620 - val_acc: 0.9366
Epoch 21/35
        - 3s - loss: 0.0817 - acc: 0.9866 - val_loss: 0.1975 - val_acc: 0.9632
Epoch 22/35
        - 2s - loss: 0.0830 - acc: 0.9875 - val_loss: 0.9242 - val_acc: 0.8399
Epoch 23/35
        - 3s - loss: 0.0836 - acc: 0.9878 - val_loss: 0.2880 - val_acc: 0.8897
Epoch 24/35
        - 2s - loss: 0.0859 - acc: 0.9863 - val_loss: 0.2936 - val_acc: 0.9019
Epoch 25/35
        - 2s - loss: 0.0898 - acc: 0.9857 - val_loss: 0.2472 - val_acc: 0.9229
```

```
Epoch 26/35
 - 2s - loss: 0.0812 - acc: 0.9872 - val_loss: 0.2237 - val_acc: 0.9553
Epoch 27/35
 - 3s - loss: 0.0987 - acc: 0.9854 - val_loss: 0.2209 - val_acc: 0.9452
Epoch 28/35
 - 3s - loss: 0.1038 - acc: 0.9878 - val_loss: 0.4144 - val_acc: 0.8897
Epoch 29/35
 - 2s - loss: 0.0779 - acc: 0.9887 - val_loss: 0.2010 - val_acc: 0.9466
Epoch 30/35
 - 2s - loss: 0.0920 - acc: 0.9863 - val_loss: 0.2401 - val_acc: 0.9373
Epoch 31/35
 - 2s - loss: 0.0941 - acc: 0.9848 - val_loss: 0.2835 - val_acc: 0.9221
Epoch 32/35
 - 2s - loss: 0.0764 - acc: 0.9884 - val_loss: 0.2661 - val_acc: 0.9373
Epoch 33/35
 - 3s - loss: 0.1010 - acc: 0.9839 - val_loss: 0.3560 - val_acc: 0.8882
Epoch 34/35
 - 3s - loss: 0.0815 - acc: 0.9887 - val_loss: 0.2258 - val_acc: 0.9625
Epoch 35/35
 - 2s - loss: 0.0952 - acc: 0.9863 - val_loss: 0.2946 - val_acc: 0.9156
Train accuracy 0.9969558599695586 Test accuracy: 0.9156452775775054
-------------------------------------------------------------------------------
```

```
_____
Layer (type)                  Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)             (None, 122, 42)           2688

conv1d_2 (Conv1D)             (None, 118, 24)           5064

dropout_1 (Dropout)           (None, 118, 24)           0

max_pooling1d_1 (MaxPooling1  (None, 23, 24)            0

flatten_1 (Flatten)           (None, 552)               0

dense_1 (Dense)               (None, 32)                17696

dense_2 (Dense)               (None, 3)                 99
===============================================================
Total params: 25,547
Trainable params: 25,547
Non-trainable params: 0
_____
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 1s - loss: 39.2019 - acc: 0.5799 - val_loss: 12.7552 - val_acc: 0.3850
Epoch 2/35
 - 1s - loss: 5.6189 - acc: 0.7781 - val_loss: 2.4514 - val_acc: 0.6539
Epoch 3/35
 - 1s - loss: 1.2382 - acc: 0.8630 - val_loss: 0.9263 - val_acc: 0.8601
Epoch 4/35
 - 1s - loss: 0.5834 - acc: 0.9023 - val_loss: 0.6787 - val_acc: 0.9214
Epoch 5/35
 - 1s - loss: 0.4584 - acc: 0.9242 - val_loss: 0.6536 - val_acc: 0.8609
Epoch 6/35
 - 1s - loss: 0.3885 - acc: 0.9376 - val_loss: 0.5903 - val_acc: 0.8926
Epoch 7/35
 - 1s - loss: 0.3551 - acc: 0.9434 - val_loss: 0.6376 - val_acc: 0.8169
Epoch 8/35
 - 1s - loss: 0.3068 - acc: 0.9565 - val_loss: 0.4971 - val_acc: 0.9193
Epoch 9/35
 - 1s - loss: 0.2834 - acc: 0.9626 - val_loss: 0.6978 - val_acc: 0.7347
Epoch 10/35
 - 1s - loss: 0.2700 - acc: 0.9619 - val_loss: 0.6538 - val_acc: 0.7332
Epoch 11/35
 - 1s - loss: 0.2714 - acc: 0.9583 - val_loss: 0.4139 - val_acc: 0.9524
Epoch 12/35
 - 1s - loss: 0.2600 - acc: 0.9586 - val_loss: 0.4053 - val_acc: 0.9589
Epoch 13/35
 - 1s - loss: 0.2445 - acc: 0.9610 - val_loss: 0.8558 - val_acc: 0.6438
Epoch 14/35
 - 1s - loss: 0.2236 - acc: 0.9732 - val_loss: 0.3690 - val_acc: 0.9632
Epoch 15/35
 - 1s - loss: 0.2489 - acc: 0.9586 - val_loss: 0.3849 - val_acc: 0.9430
Epoch 16/35
 - 1s - loss: 0.1980 - acc: 0.9772 - val_loss: 0.3483 - val_acc: 0.9416
Epoch 17/35
 - 1s - loss: 0.2352 - acc: 0.9610 - val_loss: 0.3313 - val_acc: 0.9560
Epoch 18/35
 - 1s - loss: 0.1979 - acc: 0.9714 - val_loss: 0.3402 - val_acc: 0.9683
Epoch 19/35
 - 1s - loss: 0.2309 - acc: 0.9659 - val_loss: 0.3487 - val_acc: 0.9582
Epoch 20/35
 - 1s - loss: 0.1898 - acc: 0.9741 - val_loss: 0.3810 - val_acc: 0.9185
Epoch 21/35
```

```
           - 1s - loss: 0.2103 - acc: 0.9674 - val_loss: 0.3658 - val_acc: 0.9301
Epoch 22/35
           - 1s - loss: 0.1889 - acc: 0.9750 - val_loss: 0.5130 - val_acc: 0.8190
Epoch 23/35
           - 1s - loss: 0.1894 - acc: 0.9772 - val_loss: 0.3019 - val_acc: 0.9661
Epoch 24/35
           - 1s - loss: 0.1794 - acc: 0.9741 - val_loss: 0.4933 - val_acc: 0.9063
Epoch 25/35
           - 1s - loss: 0.2074 - acc: 0.9689 - val_loss: 0.3295 - val_acc: 0.9466
Epoch 26/35
           - 1s - loss: 0.1839 - acc: 0.9735 - val_loss: 0.3949 - val_acc: 0.8969
Epoch 27/35
           - 1s - loss: 0.2152 - acc: 0.9702 - val_loss: 0.2828 - val_acc: 0.9668
Epoch 28/35
           - 1s - loss: 0.1765 - acc: 0.9738 - val_loss: 0.4237 - val_acc: 0.8666
Epoch 29/35
           - 1s - loss: 0.1511 - acc: 0.9833 - val_loss: 0.3615 - val_acc: 0.9229
Epoch 30/35
           - 1s - loss: 0.1955 - acc: 0.9635 - val_loss: 0.2946 - val_acc: 0.9531
Epoch 31/35
           - 1s - loss: 0.1538 - acc: 0.9808 - val_loss: 0.3729 - val_acc: 0.9019
Epoch 32/35
           - 1s - loss: 0.1719 - acc: 0.9753 - val_loss: 0.2935 - val_acc: 0.9603
Epoch 33/35
           - 1s - loss: 0.1505 - acc: 0.9805 - val_loss: 0.2718 - val_acc: 0.9625
Epoch 34/35
           - 1s - loss: 0.1748 - acc: 0.9705 - val_loss: 0.2647 - val_acc: 0.9668
Epoch 35/35
           - 1s - loss: 0.1768 - acc: 0.9750 - val_loss: 0.2828 - val_acc: 0.9582
Train accuracy 0.9942161339421614 Test accuracy: 0.9581831290555155
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 120, 32)	3104
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 32)	0
flatten_1 (Flatten)	(None, 768)	0

```
_____
dense_1 (Dense)              (None, 32)                 24608
_____
dense_2 (Dense)              (None, 3)                  99
===============================================================
Total params: 29,859
Trainable params: 29,859
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 27.3881 - acc: 0.6295 - val_loss: 9.9919 - val_acc: 0.8479
Epoch 2/35
 - 1s - loss: 4.4903 - acc: 0.9409 - val_loss: 1.8179 - val_acc: 0.9272
Epoch 3/35
 - 1s - loss: 0.8064 - acc: 0.9811 - val_loss: 0.7335 - val_acc: 0.8940
Epoch 4/35
 - 1s - loss: 0.3321 - acc: 0.9887 - val_loss: 0.5376 - val_acc: 0.9236
Epoch 5/35
 - 1s - loss: 0.2562 - acc: 0.9875 - val_loss: 0.4679 - val_acc: 0.9625
Epoch 6/35
 - 1s - loss: 0.2181 - acc: 0.9890 - val_loss: 0.4439 - val_acc: 0.9308
Epoch 7/35
 - 1s - loss: 0.1874 - acc: 0.9936 - val_loss: 0.4252 - val_acc: 0.9279
Epoch 8/35
 - 1s - loss: 0.1946 - acc: 0.9878 - val_loss: 0.3679 - val_acc: 0.9553
Epoch 9/35
 - 1s - loss: 0.1670 - acc: 0.9933 - val_loss: 0.3540 - val_acc: 0.9517
Epoch 10/35
 - 1s - loss: 0.1828 - acc: 0.9854 - val_loss: 0.3626 - val_acc: 0.9337
Epoch 11/35
 - 1s - loss: 0.1558 - acc: 0.9915 - val_loss: 0.3298 - val_acc: 0.9618
Epoch 12/35
 - 1s - loss: 0.1506 - acc: 0.9918 - val_loss: 0.3803 - val_acc: 0.9358
Epoch 13/35
 - 1s - loss: 0.1551 - acc: 0.9918 - val_loss: 0.3169 - val_acc: 0.9625
Epoch 14/35
 - 1s - loss: 0.1208 - acc: 0.9967 - val_loss: 0.2937 - val_acc: 0.9560
Epoch 15/35
 - 1s - loss: 0.1577 - acc: 0.9845 - val_loss: 0.2826 - val_acc: 0.9596
Epoch 16/35
 - 1s - loss: 0.1437 - acc: 0.9912 - val_loss: 0.2539 - val_acc: 0.9748
```

```
Epoch 17/35
 - 1s - loss: 0.1378 - acc: 0.9900 - val_loss: 0.2871 - val_acc: 0.9539
Epoch 18/35
 - 1s - loss: 0.1154 - acc: 0.9960 - val_loss: 0.2800 - val_acc: 0.9531
Epoch 19/35
 - 1s - loss: 0.1385 - acc: 0.9866 - val_loss: 0.2502 - val_acc: 0.9733
Epoch 20/35
 - 1s - loss: 0.1319 - acc: 0.9912 - val_loss: 0.3112 - val_acc: 0.9438
Epoch 21/35
 - 1s - loss: 0.1021 - acc: 0.9957 - val_loss: 0.2609 - val_acc: 0.9683
Epoch 22/35
 - 1s - loss: 0.1090 - acc: 0.9921 - val_loss: 0.2268 - val_acc: 0.9748
Epoch 23/35
 - 1s - loss: 0.1325 - acc: 0.9872 - val_loss: 0.3965 - val_acc: 0.9373
Epoch 24/35
 - 1s - loss: 0.1320 - acc: 0.9921 - val_loss: 0.2634 - val_acc: 0.9546
Epoch 25/35
 - 1s - loss: 0.1250 - acc: 0.9884 - val_loss: 0.3518 - val_acc: 0.9243
Epoch 26/35
 - 1s - loss: 0.1770 - acc: 0.9842 - val_loss: 0.3506 - val_acc: 0.9012
Epoch 27/35
 - 1s - loss: 0.1345 - acc: 0.9921 - val_loss: 0.2509 - val_acc: 0.9596
Epoch 28/35
 - 1s - loss: 0.1099 - acc: 0.9933 - val_loss: 0.2309 - val_acc: 0.9697
Epoch 29/35
 - 1s - loss: 0.1186 - acc: 0.9881 - val_loss: 0.2837 - val_acc: 0.9704
Epoch 30/35
 - 1s - loss: 0.1277 - acc: 0.9896 - val_loss: 0.2753 - val_acc: 0.9510
Epoch 31/35
 - 1s - loss: 0.0841 - acc: 0.9982 - val_loss: 0.2199 - val_acc: 0.9748
Epoch 32/35
 - 1s - loss: 0.1064 - acc: 0.9896 - val_loss: 0.2785 - val_acc: 0.9676
Epoch 33/35
 - 1s - loss: 0.1141 - acc: 0.9933 - val_loss: 0.2267 - val_acc: 0.9531
Epoch 34/35
 - 1s - loss: 0.0768 - acc: 0.9985 - val_loss: 0.3006 - val_acc: 0.9099
Epoch 35/35
 - 1s - loss: 0.1017 - acc: 0.9903 - val_loss: 0.2049 - val_acc: 0.9726
Train accuracy 0.9939117199391172 Test accuracy: 0.9726027397260274
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
================================================================
```

```
conv1d_1 (Conv1D)                (None, 122, 32)              2048
_____
conv1d_2 (Conv1D)                (None, 120, 32)              3104
_____
dropout_1 (Dropout)              (None, 120, 32)              0
_____
max_pooling1d_1 (MaxPooling1     (None, 24, 32)               0
_____
flatten_1 (Flatten)              (None, 768)                  0
_____
dense_1 (Dense)                  (None, 32)                   24608
_____
dense_2 (Dense)                  (None, 3)                    99
=================================================================
Total params: 29,859
Trainable params: 29,859
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 26.9980 - acc: 0.6356 - val_loss: 9.3638 - val_acc: 0.8565
Epoch 2/35
 - 1s - loss: 4.1172 - acc: 0.9330 - val_loss: 1.6664 - val_acc: 0.9171
Epoch 3/35
 - 1s - loss: 0.7333 - acc: 0.9784 - val_loss: 0.7055 - val_acc: 0.9005
Epoch 4/35
 - 1s - loss: 0.3305 - acc: 0.9851 - val_loss: 0.5455 - val_acc: 0.9236
Epoch 5/35
 - 1s - loss: 0.2649 - acc: 0.9857 - val_loss: 0.4915 - val_acc: 0.9445
Epoch 6/35
 - 1s - loss: 0.2244 - acc: 0.9893 - val_loss: 0.4500 - val_acc: 0.9265
Epoch 7/35
 - 1s - loss: 0.1938 - acc: 0.9918 - val_loss: 0.4114 - val_acc: 0.9387
Epoch 8/35
 - 1s - loss: 0.2048 - acc: 0.9857 - val_loss: 0.3997 - val_acc: 0.9387
Epoch 9/35
 - 1s - loss: 0.1672 - acc: 0.9945 - val_loss: 0.4089 - val_acc: 0.9171
Epoch 10/35
 - 1s - loss: 0.2155 - acc: 0.9753 - val_loss: 0.5617 - val_acc: 0.8226
Epoch 11/35
 - 1s - loss: 0.1889 - acc: 0.9884 - val_loss: 0.3511 - val_acc: 0.9495
Epoch 12/35
```

```
       - 1s - loss: 0.1630 - acc: 0.9900 - val_loss: 0.3568 - val_acc: 0.9510
Epoch 13/35
       - 1s - loss: 0.1549 - acc: 0.9903 - val_loss: 0.3479 - val_acc: 0.9488
Epoch 14/35
       - 1s - loss: 0.1271 - acc: 0.9960 - val_loss: 0.3080 - val_acc: 0.9582
Epoch 15/35
       - 1s - loss: 0.1976 - acc: 0.9766 - val_loss: 0.3502 - val_acc: 0.9445
Epoch 16/35
       - 1s - loss: 0.1934 - acc: 0.9836 - val_loss: 0.3096 - val_acc: 0.9546
Epoch 17/35
       - 1s - loss: 0.1458 - acc: 0.9903 - val_loss: 0.2750 - val_acc: 0.9748
Epoch 18/35
       - 1s - loss: 0.1243 - acc: 0.9924 - val_loss: 0.2979 - val_acc: 0.9488
Epoch 19/35
       - 1s - loss: 0.1268 - acc: 0.9921 - val_loss: 0.2595 - val_acc: 0.9668
Epoch 20/35
       - 1s - loss: 0.1205 - acc: 0.9924 - val_loss: 0.2801 - val_acc: 0.9481
Epoch 21/35
       - 1s - loss: 0.1085 - acc: 0.9954 - val_loss: 0.3436 - val_acc: 0.9250
Epoch 22/35
       - 1s - loss: 0.1347 - acc: 0.9857 - val_loss: 0.3846 - val_acc: 0.9056
Epoch 23/35
       - 1s - loss: 0.1621 - acc: 0.9833 - val_loss: 0.2656 - val_acc: 0.9546
Epoch 24/35
       - 1s - loss: 0.1952 - acc: 0.9741 - val_loss: 0.3170 - val_acc: 0.9337
Epoch 25/35
       - 1s - loss: 0.1166 - acc: 0.9957 - val_loss: 0.2663 - val_acc: 0.9618
Epoch 26/35
       - 1s - loss: 0.1003 - acc: 0.9973 - val_loss: 0.2460 - val_acc: 0.9582
Epoch 27/35
       - 1s - loss: 0.1443 - acc: 0.9787 - val_loss: 0.3404 - val_acc: 0.9539
Epoch 28/35
       - 1s - loss: 0.1427 - acc: 0.9918 - val_loss: 0.2628 - val_acc: 0.9517
Epoch 29/35
       - 1s - loss: 0.0973 - acc: 0.9954 - val_loss: 0.3175 - val_acc: 0.9185
Epoch 30/35
       - 1s - loss: 0.1410 - acc: 0.9851 - val_loss: 0.2311 - val_acc: 0.9603
Epoch 31/35
       - 1s - loss: 0.0940 - acc: 0.9976 - val_loss: 0.2119 - val_acc: 0.9748
Epoch 32/35
       - 1s - loss: 0.0934 - acc: 0.9939 - val_loss: 0.2554 - val_acc: 0.9704
Epoch 33/35
       - 1s - loss: 0.1458 - acc: 0.9799 - val_loss: 0.2549 - val_acc: 0.9466
```

```
Epoch 34/35
 - 1s - loss: 0.1295 - acc: 0.9872 - val_loss: 0.3132 - val_acc: 0.9495
Epoch 35/35
 - 1s - loss: 0.0942 - acc: 0.9967 - val_loss: 0.2192 - val_acc: 0.9640
Train accuracy 0.9981735159817352 Test accuracy: 0.9639509733237203
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
=================================	===================	=========
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0


None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 5.3731 - acc: 0.6849 - val_loss: 3.2950 - val_acc: 0.8558
Epoch 2/35
 - 2s - loss: 1.9720 - acc: 0.9735 - val_loss: 1.4488 - val_acc: 0.9438
Epoch 3/35
 - 2s - loss: 0.8412 - acc: 0.9939 - val_loss: 0.8638 - val_acc: 0.9034
Epoch 4/35
 - 2s - loss: 0.4769 - acc: 0.9936 - val_loss: 0.5343 - val_acc: 0.9740
Epoch 5/35
 - 2s - loss: 0.3366 - acc: 0.9903 - val_loss: 0.5894 - val_acc: 0.9063
Epoch 6/35
 - 2s - loss: 0.2931 - acc: 0.9924 - val_loss: 0.3798 - val_acc: 0.9769
Epoch 7/35
 - 2s - loss: 0.2272 - acc: 0.9970 - val_loss: 0.3377 - val_acc: 0.9784
```

```
Epoch 8/35
 - 2s - loss: 0.1928 - acc: 0.9994 - val_loss: 0.3265 - val_acc: 0.9762
Epoch 9/35
 - 2s - loss: 0.1964 - acc: 0.9924 - val_loss: 0.3172 - val_acc: 0.9748
Epoch 10/35
 - 2s - loss: 0.1537 - acc: 0.9994 - val_loss: 0.2857 - val_acc: 0.9640
Epoch 11/35
 - 2s - loss: 0.1269 - acc: 1.0000 - val_loss: 0.2797 - val_acc: 0.9661
Epoch 12/35
 - 2s - loss: 0.1253 - acc: 0.9957 - val_loss: 0.2250 - val_acc: 0.9813
Epoch 13/35
 - 2s - loss: 0.1120 - acc: 0.9973 - val_loss: 0.2441 - val_acc: 0.9748
Epoch 14/35
 - 2s - loss: 0.0932 - acc: 0.9988 - val_loss: 0.2017 - val_acc: 0.9697
Epoch 15/35
 - 2s - loss: 0.0993 - acc: 0.9954 - val_loss: 0.1939 - val_acc: 0.9820
Epoch 16/35
 - 2s - loss: 0.0837 - acc: 0.9982 - val_loss: 0.2045 - val_acc: 0.9712
Epoch 17/35
 - 2s - loss: 0.0663 - acc: 0.9997 - val_loss: 0.2127 - val_acc: 0.9582
Epoch 18/35
 - 2s - loss: 0.0683 - acc: 0.9982 - val_loss: 0.1605 - val_acc: 0.9733
Epoch 19/35
 - 2s - loss: 0.0562 - acc: 0.9991 - val_loss: 0.2615 - val_acc: 0.9510
Epoch 20/35
 - 2s - loss: 0.0676 - acc: 0.9960 - val_loss: 0.1788 - val_acc: 0.9784
Epoch 21/35
 - 2s - loss: 0.0557 - acc: 0.9997 - val_loss: 0.1802 - val_acc: 0.9769
Epoch 22/35
 - 2s - loss: 0.0556 - acc: 0.9954 - val_loss: 0.1663 - val_acc: 0.9661
Epoch 23/35
 - 2s - loss: 0.0604 - acc: 0.9945 - val_loss: 0.4041 - val_acc: 0.8926
Epoch 24/35
 - 2s - loss: 0.0657 - acc: 0.9970 - val_loss: 0.1509 - val_acc: 0.9625
Epoch 25/35
 - 2s - loss: 0.0416 - acc: 0.9997 - val_loss: 0.1427 - val_acc: 0.9762
Epoch 26/35
 - 2s - loss: 0.0352 - acc: 0.9997 - val_loss: 0.1416 - val_acc: 0.9740
Epoch 27/35
 - 2s - loss: 0.0332 - acc: 0.9991 - val_loss: 0.1580 - val_acc: 0.9740
Epoch 28/35
 - 2s - loss: 0.0303 - acc: 1.0000 - val_loss: 0.1436 - val_acc: 0.9748
Epoch 29/35
```

```
 - 2s - loss: 0.0296 - acc: 1.0000 - val_loss: 0.1641 - val_acc: 0.9567
Epoch 30/35
 - 2s - loss: 0.0589 - acc: 0.9915 - val_loss: 0.2665 - val_acc: 0.9351
Epoch 31/35
 - 2s - loss: 0.0431 - acc: 0.9997 - val_loss: 0.1085 - val_acc: 0.9813
Epoch 32/35
 - 2s - loss: 0.0312 - acc: 0.9994 - val_loss: 0.1131 - val_acc: 0.9798
Epoch 33/35
 - 2s - loss: 0.0246 - acc: 1.0000 - val_loss: 0.1332 - val_acc: 0.9726
Epoch 34/35
 - 2s - loss: 0.0237 - acc: 1.0000 - val_loss: 0.1511 - val_acc: 0.9755
Epoch 35/35
 - 2s - loss: 0.0225 - acc: 1.0000 - val_loss: 0.1268 - val_acc: 0.9776
Train accuracy 1.0 Test accuracy: 0.9776496034607065
-------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

_____
conv1d_2 (Conv1D)            (None, 116, 32)           7200

_____
dropout_1 (Dropout)          (None, 116, 32)           0

_____
max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0

_____
flatten_1 (Flatten)          (None, 736)               0

_____
dense_1 (Dense)              (None, 32)                23584

_____
dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 85.4575 - acc: 0.6320 - val_loss: 46.1363 - val_acc: 0.8017
Epoch 2/35
 - 2s - loss: 26.9283 - acc: 0.9510 - val_loss: 13.8221 - val_acc: 0.8955
Epoch 3/35
```

```
          - 2s - loss: 7.6114 - acc: 0.9836 - val_loss: 3.9835 - val_acc: 0.8435
        Epoch 4/35
          - 2s - loss: 2.0453 - acc: 0.9836 - val_loss: 1.2971 - val_acc: 0.9329
        Epoch 5/35
          - 2s - loss: 0.6617 - acc: 0.9872 - val_loss: 0.7106 - val_acc: 0.9193
        Epoch 6/35
          - 2s - loss: 0.3492 - acc: 0.9826 - val_loss: 0.5492 - val_acc: 0.9164
        Epoch 7/35
          - 2s - loss: 0.2386 - acc: 0.9924 - val_loss: 0.4919 - val_acc: 0.9120
        Epoch 8/35
          - 2s - loss: 0.2221 - acc: 0.9890 - val_loss: 0.4676 - val_acc: 0.9070
        Epoch 9/35
          - 2s - loss: 0.1851 - acc: 0.9912 - val_loss: 0.3643 - val_acc: 0.9430
        Epoch 10/35
          - 2s - loss: 0.1821 - acc: 0.9890 - val_loss: 0.4813 - val_acc: 0.8659
        Epoch 11/35
          - 2s - loss: 0.1754 - acc: 0.9875 - val_loss: 0.3574 - val_acc: 0.9488
        Epoch 12/35
          - 2s - loss: 0.1744 - acc: 0.9851 - val_loss: 0.3037 - val_acc: 0.9618
        Epoch 13/35
          - 2s - loss: 0.1517 - acc: 0.9878 - val_loss: 0.3451 - val_acc: 0.9531
        Epoch 14/35
          - 2s - loss: 0.1404 - acc: 0.9924 - val_loss: 0.3429 - val_acc: 0.9344
        Epoch 15/35
          - 2s - loss: 0.1392 - acc: 0.9887 - val_loss: 0.3014 - val_acc: 0.9567
        Epoch 16/35
          - 2s - loss: 0.1380 - acc: 0.9896 - val_loss: 0.2779 - val_acc: 0.9676
        Epoch 17/35
          - 2s - loss: 0.1209 - acc: 0.9939 - val_loss: 0.2762 - val_acc: 0.9474
        Epoch 18/35
          - 2s - loss: 0.1247 - acc: 0.9942 - val_loss: 0.2498 - val_acc: 0.9762
        Epoch 19/35
          - 2s - loss: 0.2006 - acc: 0.9732 - val_loss: 0.3211 - val_acc: 0.9611
        Epoch 20/35
          - 2s - loss: 0.1352 - acc: 0.9933 - val_loss: 0.2542 - val_acc: 0.9820
        Epoch 21/35
          - 2s - loss: 0.0976 - acc: 0.9976 - val_loss: 0.2657 - val_acc: 0.9676
        Epoch 22/35
          - 2s - loss: 0.1060 - acc: 0.9933 - val_loss: 0.2597 - val_acc: 0.9625
        Epoch 23/35
          - 2s - loss: 0.1031 - acc: 0.9967 - val_loss: 0.2508 - val_acc: 0.9740
        Epoch 24/35
          - 2s - loss: 0.1392 - acc: 0.9848 - val_loss: 0.2772 - val_acc: 0.9661
```

```
Epoch 25/35
 - 2s - loss: 0.1289 - acc: 0.9918 - val_loss: 0.2522 - val_acc: 0.9654
Epoch 26/35
 - 2s - loss: 0.0913 - acc: 0.9963 - val_loss: 0.2534 - val_acc: 0.9539
Epoch 27/35
 - 2s - loss: 0.1134 - acc: 0.9881 - val_loss: 0.2253 - val_acc: 0.9647
Epoch 28/35
 - 2s - loss: 0.1087 - acc: 0.9927 - val_loss: 0.2253 - val_acc: 0.9748
Epoch 29/35
 - 2s - loss: 0.1167 - acc: 0.9854 - val_loss: 0.3669 - val_acc: 0.8774
Epoch 30/35
 - 2s - loss: 0.1727 - acc: 0.9820 - val_loss: 0.2581 - val_acc: 0.9459
Epoch 31/35
 - 2s - loss: 0.0800 - acc: 1.0000 - val_loss: 0.2200 - val_acc: 0.9726
Epoch 32/35
 - 2s - loss: 0.0816 - acc: 0.9948 - val_loss: 0.2120 - val_acc: 0.9798
Epoch 33/35
 - 2s - loss: 0.1219 - acc: 0.9866 - val_loss: 0.2879 - val_acc: 0.9423
Epoch 34/35
 - 2s - loss: 0.1153 - acc: 0.9933 - val_loss: 0.2207 - val_acc: 0.9546
Epoch 35/35
 - 2s - loss: 0.0852 - acc: 0.9957 - val_loss: 0.2346 - val_acc: 0.9596
Train accuracy 0.9872146118721461 Test accuracy: 0.9596250901225667
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 116, 32)	6304
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 31,779
Trainable params: 31,779
```

```
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 97.9907 - acc: 0.6764 - val_loss: 58.6598 - val_acc: 0.8147
Epoch 2/35
 - 1s - loss: 37.1686 - acc: 0.9412 - val_loss: 21.5103 - val_acc: 0.9315
Epoch 3/35
 - 1s - loss: 13.1090 - acc: 0.9729 - val_loss: 7.4712 - val_acc: 0.9214
Epoch 4/35
 - 1s - loss: 4.3327 - acc: 0.9799 - val_loss: 2.6286 - val_acc: 0.9286
Epoch 5/35
 - 1s - loss: 1.4381 - acc: 0.9823 - val_loss: 1.1314 - val_acc: 0.9128
Epoch 6/35
 - 1s - loss: 0.5915 - acc: 0.9799 - val_loss: 0.6916 - val_acc: 0.9409
Epoch 7/35
 - 1s - loss: 0.3416 - acc: 0.9854 - val_loss: 0.5601 - val_acc: 0.9185
Epoch 8/35
 - 1s - loss: 0.2929 - acc: 0.9796 - val_loss: 0.5309 - val_acc: 0.9207
Epoch 9/35
 - 1s - loss: 0.2459 - acc: 0.9866 - val_loss: 0.4629 - val_acc: 0.9265
Epoch 10/35
 - 1s - loss: 0.2521 - acc: 0.9769 - val_loss: 0.4875 - val_acc: 0.9135
Epoch 11/35
 - 1s - loss: 0.2060 - acc: 0.9912 - val_loss: 0.4533 - val_acc: 0.9243
Epoch 12/35
 - 1s - loss: 0.2173 - acc: 0.9802 - val_loss: 0.4253 - val_acc: 0.9380
Epoch 13/35
 - 1s - loss: 0.1830 - acc: 0.9915 - val_loss: 0.4391 - val_acc: 0.9243
Epoch 14/35
 - 1s - loss: 0.1769 - acc: 0.9893 - val_loss: 0.4240 - val_acc: 0.9308
Epoch 15/35
 - 1s - loss: 0.1699 - acc: 0.9887 - val_loss: 0.3923 - val_acc: 0.9265
Epoch 16/35
 - 1s - loss: 0.1712 - acc: 0.9887 - val_loss: 0.3813 - val_acc: 0.9510
Epoch 17/35
 - 1s - loss: 0.1680 - acc: 0.9875 - val_loss: 0.3583 - val_acc: 0.9517
Epoch 18/35
 - 1s - loss: 0.1381 - acc: 0.9967 - val_loss: 0.3887 - val_acc: 0.9185
Epoch 19/35
 - 1s - loss: 0.2130 - acc: 0.9747 - val_loss: 0.4393 - val_acc: 0.9236
Epoch 20/35
```

```
 - 1s - loss: 0.1568 - acc: 0.9918 - val_loss: 0.3781 - val_acc: 0.9257
Epoch 21/35
 - 1s - loss: 0.1368 - acc: 0.9924 - val_loss: 0.3714 - val_acc: 0.9315
Epoch 22/35
 - 1s - loss: 0.1312 - acc: 0.9927 - val_loss: 0.3527 - val_acc: 0.9322
Epoch 23/35
 - 1s - loss: 0.1272 - acc: 0.9927 - val_loss: 0.3251 - val_acc: 0.9387
Epoch 24/35
 - 1s - loss: 0.1499 - acc: 0.9854 - val_loss: 0.4469 - val_acc: 0.8854
Epoch 25/35
 - 1s - loss: 0.1501 - acc: 0.9903 - val_loss: 0.3178 - val_acc: 0.9438
Epoch 26/35
 - 1s - loss: 0.1287 - acc: 0.9912 - val_loss: 0.3378 - val_acc: 0.9459
Epoch 27/35
 - 1s - loss: 0.1163 - acc: 0.9936 - val_loss: 0.3807 - val_acc: 0.9041
Epoch 28/35
 - 1s - loss: 0.1551 - acc: 0.9857 - val_loss: 0.3388 - val_acc: 0.9337
Epoch 29/35
 - 1s - loss: 0.1197 - acc: 0.9930 - val_loss: 0.2921 - val_acc: 0.9676
Epoch 30/35
 - 1s - loss: 0.1227 - acc: 0.9912 - val_loss: 0.3020 - val_acc: 0.9596
Epoch 31/35
 - 1s - loss: 0.1073 - acc: 0.9945 - val_loss: 0.3227 - val_acc: 0.9329
Epoch 32/35
 - 1s - loss: 0.1328 - acc: 0.9863 - val_loss: 0.3564 - val_acc: 0.9301
Epoch 33/35
 - 1s - loss: 0.1018 - acc: 0.9963 - val_loss: 0.3154 - val_acc: 0.9315
Epoch 34/35
 - 1s - loss: 0.1571 - acc: 0.9817 - val_loss: 0.3576 - val_acc: 0.9430
Epoch 35/35
 - 1s - loss: 0.1271 - acc: 0.9912 - val_loss: 0.3063 - val_acc: 0.9423
Train accuracy 0.9917808219178083 Test accuracy: 0.9423215573179524
-------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)            (None, 116, 32)           7200
_____
dropout_1 (Dropout)          (None, 116, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0
```

```
_____
flatten_1 (Flatten)          (None, 736)              0
_____
dense_1 (Dense)              (None, 32)               23584
_____
dense_2 (Dense)              (None, 3)                99
================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 46.4403 - acc: 0.6377 - val_loss: 22.0815 - val_acc: 0.8637
Epoch 2/35
 - 1s - loss: 11.6855 - acc: 0.9534 - val_loss: 5.3694 - val_acc: 0.9048
Epoch 3/35
 - 1s - loss: 2.6445 - acc: 0.9836 - val_loss: 1.4798 - val_acc: 0.8796
Epoch 4/35
 - 1s - loss: 0.6847 - acc: 0.9860 - val_loss: 0.6603 - val_acc: 0.9308
Epoch 5/35
 - 1s - loss: 0.3220 - acc: 0.9857 - val_loss: 0.5053 - val_acc: 0.9358
Epoch 6/35
 - 1s - loss: 0.2333 - acc: 0.9875 - val_loss: 0.4204 - val_acc: 0.9481
Epoch 7/35
 - 1s - loss: 0.1835 - acc: 0.9921 - val_loss: 0.4017 - val_acc: 0.9337
Epoch 8/35
 - 1s - loss: 0.1867 - acc: 0.9881 - val_loss: 0.4119 - val_acc: 0.9243
Epoch 9/35
 - 1s - loss: 0.1581 - acc: 0.9933 - val_loss: 0.3246 - val_acc: 0.9596
Epoch 10/35
 - 1s - loss: 0.1982 - acc: 0.9756 - val_loss: 0.3918 - val_acc: 0.9351
Epoch 11/35
 - 1s - loss: 0.1543 - acc: 0.9936 - val_loss: 0.3503 - val_acc: 0.9344
Epoch 12/35
 - 1s - loss: 0.1395 - acc: 0.9909 - val_loss: 0.3074 - val_acc: 0.9402
Epoch 13/35
 - 1s - loss: 0.1368 - acc: 0.9890 - val_loss: 0.3423 - val_acc: 0.9452
Epoch 14/35
 - 1s - loss: 0.1273 - acc: 0.9930 - val_loss: 0.2923 - val_acc: 0.9524
Epoch 15/35
 - 1s - loss: 0.1284 - acc: 0.9890 - val_loss: 0.3160 - val_acc: 0.9308
```

```
Epoch 16/35
 - 1s - loss: 0.1078 - acc: 0.9954 - val_loss: 0.2734 - val_acc: 0.9690
Epoch 17/35
 - 1s - loss: 0.1333 - acc: 0.9860 - val_loss: 0.2396 - val_acc: 0.9704
Epoch 18/35
 - 1s - loss: 0.1020 - acc: 0.9973 - val_loss: 0.2609 - val_acc: 0.9611
Epoch 19/35
 - 1s - loss: 0.1403 - acc: 0.9851 - val_loss: 0.2301 - val_acc: 0.9697
Epoch 20/35
 - 1s - loss: 0.0893 - acc: 0.9985 - val_loss: 0.2532 - val_acc: 0.9632
Epoch 21/35
 - 1s - loss: 0.1056 - acc: 0.9906 - val_loss: 0.2487 - val_acc: 0.9618
Epoch 22/35
 - 1s - loss: 0.0970 - acc: 0.9933 - val_loss: 0.2644 - val_acc: 0.9553
Epoch 23/35
 - 1s - loss: 0.1006 - acc: 0.9927 - val_loss: 0.2364 - val_acc: 0.9632
Epoch 24/35
 - 1s - loss: 0.1385 - acc: 0.9802 - val_loss: 0.2831 - val_acc: 0.9510
Epoch 25/35
 - 1s - loss: 0.1122 - acc: 0.9957 - val_loss: 0.2170 - val_acc: 0.9668
Epoch 26/35
 - 1s - loss: 0.1101 - acc: 0.9872 - val_loss: 0.3014 - val_acc: 0.9373
Epoch 27/35
 - 1s - loss: 0.2375 - acc: 0.9711 - val_loss: 0.2418 - val_acc: 0.9668
Epoch 28/35
 - 1s - loss: 0.0938 - acc: 0.9979 - val_loss: 0.2356 - val_acc: 0.9611
Epoch 29/35
 - 1s - loss: 0.0933 - acc: 0.9927 - val_loss: 0.2942 - val_acc: 0.9438
Epoch 30/35
 - 1s - loss: 0.1212 - acc: 0.9872 - val_loss: 0.2685 - val_acc: 0.9510
Epoch 31/35
 - 1s - loss: 0.0780 - acc: 0.9985 - val_loss: 0.2305 - val_acc: 0.9661
Epoch 32/35
 - 1s - loss: 0.0739 - acc: 0.9957 - val_loss: 0.2600 - val_acc: 0.9546
Epoch 33/35
 - 1s - loss: 0.0698 - acc: 0.9985 - val_loss: 0.2241 - val_acc: 0.9553
Epoch 34/35
 - 1s - loss: 0.1447 - acc: 0.9775 - val_loss: 0.4226 - val_acc: 0.9120
Epoch 35/35
 - 1s - loss: 0.1761 - acc: 0.9845 - val_loss: 0.2105 - val_acc: 0.9697
Train accuracy 0.9993911720120562 Test accuracy: 0.969718817591925
--------------------------------------------------------------------------------
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 116, 32)           7200

dropout_1 (Dropout)          (None, 116, 32)           0

max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0

flatten_1 (Flatten)          (None, 736)               0

dense_1 (Dense)              (None, 32)                23584

dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 134.1296 - acc: 0.5565 - val_loss: 72.0967 - val_acc: 0.7585
Epoch 2/55
 - 1s - loss: 42.9383 - acc: 0.8846 - val_loss: 22.7547 - val_acc: 0.8753
Epoch 3/55
 - 1s - loss: 13.0977 - acc: 0.9458 - val_loss: 6.9697 - val_acc: 0.8349
Epoch 4/55
 - 1s - loss: 3.8167 - acc: 0.9562 - val_loss: 2.2678 - val_acc: 0.9099
Epoch 5/55
 - 1s - loss: 1.2083 - acc: 0.9601 - val_loss: 1.0682 - val_acc: 0.9070
Epoch 6/55
 - 1s - loss: 0.5562 - acc: 0.9647 - val_loss: 0.7619 - val_acc: 0.9344
Epoch 7/55
 - 1s - loss: 0.3752 - acc: 0.9784 - val_loss: 0.6574 - val_acc: 0.9265
Epoch 8/55
 - 1s - loss: 0.3293 - acc: 0.9811 - val_loss: 0.6133 - val_acc: 0.9366
Epoch 9/55
 - 1s - loss: 0.2897 - acc: 0.9890 - val_loss: 0.5855 - val_acc: 0.9344
Epoch 10/55
 - 1s - loss: 0.2897 - acc: 0.9781 - val_loss: 0.5877 - val_acc: 0.9113
Epoch 11/55
```

```
           - 1s - loss: 0.2674 - acc: 0.9836 - val_loss: 0.5681 - val_acc: 0.9265
Epoch 12/55
           - 1s - loss: 0.2568 - acc: 0.9830 - val_loss: 0.5115 - val_acc: 0.9704
Epoch 13/55
           - 1s - loss: 0.2329 - acc: 0.9878 - val_loss: 0.5245 - val_acc: 0.9279
Epoch 14/55
           - 1s - loss: 0.2167 - acc: 0.9881 - val_loss: 0.4896 - val_acc: 0.9575
Epoch 15/55
           - 1s - loss: 0.2088 - acc: 0.9887 - val_loss: 0.4902 - val_acc: 0.9257
Epoch 16/55
           - 1s - loss: 0.2176 - acc: 0.9857 - val_loss: 0.4495 - val_acc: 0.9517
Epoch 17/55
           - 1s - loss: 0.2311 - acc: 0.9784 - val_loss: 0.4221 - val_acc: 0.9755
Epoch 18/55
           - 1s - loss: 0.1882 - acc: 0.9896 - val_loss: 0.4489 - val_acc: 0.9445
Epoch 19/55
           - 1s - loss: 0.2512 - acc: 0.9702 - val_loss: 0.4964 - val_acc: 0.9229
Epoch 20/55
           - 1s - loss: 0.2122 - acc: 0.9875 - val_loss: 0.4471 - val_acc: 0.9286
Epoch 21/55
           - 1s - loss: 0.1810 - acc: 0.9878 - val_loss: 0.4199 - val_acc: 0.9488
Epoch 22/55
           - 1s - loss: 0.1843 - acc: 0.9820 - val_loss: 0.5054 - val_acc: 0.9012
Epoch 23/55
           - 1s - loss: 0.2122 - acc: 0.9784 - val_loss: 0.4095 - val_acc: 0.9488
Epoch 24/55
           - 1s - loss: 0.1780 - acc: 0.9869 - val_loss: 0.4052 - val_acc: 0.9380
Epoch 25/55
           - 1s - loss: 0.1885 - acc: 0.9830 - val_loss: 0.3812 - val_acc: 0.9553
Epoch 26/55
           - 1s - loss: 0.1829 - acc: 0.9836 - val_loss: 0.3933 - val_acc: 0.9416
Epoch 27/55
           - 1s - loss: 0.1556 - acc: 0.9890 - val_loss: 0.3492 - val_acc: 0.9503
Epoch 28/55
           - 1s - loss: 0.1713 - acc: 0.9863 - val_loss: 0.3846 - val_acc: 0.9322
Epoch 29/55
           - 1s - loss: 0.1570 - acc: 0.9887 - val_loss: 0.3516 - val_acc: 0.9582
Epoch 30/55
           - 1s - loss: 0.1476 - acc: 0.9900 - val_loss: 0.3565 - val_acc: 0.9560
Epoch 31/55
           - 1s - loss: 0.1318 - acc: 0.9948 - val_loss: 0.3471 - val_acc: 0.9445
Epoch 32/55
           - 1s - loss: 0.1863 - acc: 0.9766 - val_loss: 0.3691 - val_acc: 0.9524
```

```
Epoch 33/55
 - 1s - loss: 0.1494 - acc: 0.9881 - val_loss: 0.3860 - val_acc: 0.9221
Epoch 34/55
 - 1s - loss: 0.1575 - acc: 0.9839 - val_loss: 0.3871 - val_acc: 0.9293
Epoch 35/55
 - 1s - loss: 0.1381 - acc: 0.9924 - val_loss: 0.3384 - val_acc: 0.9474
Epoch 36/55
 - 1s - loss: 0.1944 - acc: 0.9778 - val_loss: 0.3306 - val_acc: 0.9466
Epoch 37/55
 - 1s - loss: 0.1345 - acc: 0.9921 - val_loss: 0.3807 - val_acc: 0.9236
Epoch 38/55
 - 1s - loss: 0.1586 - acc: 0.9833 - val_loss: 0.3259 - val_acc: 0.9567
Epoch 39/55
 - 1s - loss: 0.1471 - acc: 0.9854 - val_loss: 0.4042 - val_acc: 0.9034
Epoch 40/55
 - 1s - loss: 0.1360 - acc: 0.9915 - val_loss: 0.3764 - val_acc: 0.9164
Epoch 41/55
 - 1s - loss: 0.1631 - acc: 0.9778 - val_loss: 0.4861 - val_acc: 0.9185
Epoch 42/55
 - 1s - loss: 0.2410 - acc: 0.9683 - val_loss: 0.3421 - val_acc: 0.9495
Epoch 43/55
 - 1s - loss: 0.1256 - acc: 0.9957 - val_loss: 0.3434 - val_acc: 0.9236
Epoch 44/55
 - 1s - loss: 0.1146 - acc: 0.9945 - val_loss: 0.3112 - val_acc: 0.9589
Epoch 45/55
 - 1s - loss: 0.1250 - acc: 0.9887 - val_loss: 0.3400 - val_acc: 0.9214
Epoch 46/55
 - 1s - loss: 0.1427 - acc: 0.9860 - val_loss: 0.3617 - val_acc: 0.9048
Epoch 47/55
 - 1s - loss: 0.1425 - acc: 0.9839 - val_loss: 0.3447 - val_acc: 0.9416
Epoch 48/55
 - 1s - loss: 0.1258 - acc: 0.9912 - val_loss: 0.3318 - val_acc: 0.9481
Epoch 49/55
 - 1s - loss: 0.1771 - acc: 0.9732 - val_loss: 0.3177 - val_acc: 0.9366
Epoch 50/55
 - 1s - loss: 0.1338 - acc: 0.9903 - val_loss: 0.3064 - val_acc: 0.9387
Epoch 51/55
 - 1s - loss: 0.1113 - acc: 0.9948 - val_loss: 0.3050 - val_acc: 0.9373
Epoch 52/55
 - 1s - loss: 0.1137 - acc: 0.9930 - val_loss: 0.2843 - val_acc: 0.9575
Epoch 53/55
 - 1s - loss: 0.1096 - acc: 0.9909 - val_loss: 0.3224 - val_acc: 0.9128
Epoch 54/55
```

```
 - 1s - loss: 0.1334 - acc: 0.9851 - val_loss: 0.3508 - val_acc: 0.9402
Epoch 55/55
 - 1s - loss: 0.2171 - acc: 0.9738 - val_loss: 0.2816 - val_acc: 0.9517
Train accuracy 0.9972602739907472 Test accuracy: 0.9516943042537851
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 116, 32)	6304
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 31,779
Trainable params: 31,779
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 74.3602 - acc: 0.6396 - val_loss: 48.5813 - val_acc: 0.7844
Epoch 2/35
 - 1s - loss: 33.2669 - acc: 0.9157 - val_loss: 21.6680 - val_acc: 0.9063
Epoch 3/35
 - 1s - loss: 14.6154 - acc: 0.9671 - val_loss: 9.5982 - val_acc: 0.9084
Epoch 4/35
 - 1s - loss: 6.3211 - acc: 0.9738 - val_loss: 4.2859 - val_acc: 0.9301
Epoch 5/35
 - 1s - loss: 2.7123 - acc: 0.9830 - val_loss: 2.0179 - val_acc: 0.9178
Epoch 6/35
 - 1s - loss: 1.2117 - acc: 0.9854 - val_loss: 1.0816 - val_acc: 0.9438
Epoch 7/35
 - 1s - loss: 0.6072 - acc: 0.9903 - val_loss: 0.7150 - val_acc: 0.9366
Epoch 8/35
```

```
 - 1s - loss: 0.3851 - acc: 0.9857 - val_loss: 0.5743 - val_acc: 0.9416
Epoch 9/35
 - 1s - loss: 0.2950 - acc: 0.9887 - val_loss: 0.5061 - val_acc: 0.9200
Epoch 10/35
 - 1s - loss: 0.2546 - acc: 0.9887 - val_loss: 0.5021 - val_acc: 0.9099
Epoch 11/35
 - 1s - loss: 0.2318 - acc: 0.9906 - val_loss: 0.4677 - val_acc: 0.9229
Epoch 12/35
 - 1s - loss: 0.2276 - acc: 0.9875 - val_loss: 0.4232 - val_acc: 0.9438
Epoch 13/35
 - 1s - loss: 0.2006 - acc: 0.9942 - val_loss: 0.4390 - val_acc: 0.9387
Epoch 14/35
 - 1s - loss: 0.1907 - acc: 0.9918 - val_loss: 0.4263 - val_acc: 0.9402
Epoch 15/35
 - 1s - loss: 0.1863 - acc: 0.9903 - val_loss: 0.3839 - val_acc: 0.9539
Epoch 16/35
 - 1s - loss: 0.1793 - acc: 0.9927 - val_loss: 0.3652 - val_acc: 0.9625
Epoch 17/35
 - 1s - loss: 0.1835 - acc: 0.9878 - val_loss: 0.3605 - val_acc: 0.9430
Epoch 18/35
 - 1s - loss: 0.1554 - acc: 0.9963 - val_loss: 0.3787 - val_acc: 0.9301
Epoch 19/35
 - 1s - loss: 0.1988 - acc: 0.9814 - val_loss: 0.3221 - val_acc: 0.9640
Epoch 20/35
 - 1s - loss: 0.1506 - acc: 0.9973 - val_loss: 0.3565 - val_acc: 0.9301
Epoch 21/35
 - 1s - loss: 0.1430 - acc: 0.9957 - val_loss: 0.3639 - val_acc: 0.9488
Epoch 22/35
 - 1s - loss: 0.1414 - acc: 0.9948 - val_loss: 0.3575 - val_acc: 0.9394
Epoch 23/35
 - 1s - loss: 0.1422 - acc: 0.9927 - val_loss: 0.3075 - val_acc: 0.9640
Epoch 24/35
 - 1s - loss: 0.1523 - acc: 0.9881 - val_loss: 0.3284 - val_acc: 0.9445
Epoch 25/35
 - 1s - loss: 0.1379 - acc: 0.9939 - val_loss: 0.3184 - val_acc: 0.9409
Epoch 26/35
 - 1s - loss: 0.1387 - acc: 0.9915 - val_loss: 0.3187 - val_acc: 0.9524
Epoch 27/35
 - 1s - loss: 0.1244 - acc: 0.9957 - val_loss: 0.3231 - val_acc: 0.9603
Epoch 28/35
 - 1s - loss: 0.1457 - acc: 0.9927 - val_loss: 0.3073 - val_acc: 0.9553
Epoch 29/35
 - 1s - loss: 0.1216 - acc: 0.9951 - val_loss: 0.2909 - val_acc: 0.9596
```

```
Epoch 30/35
 - 1s - loss: 0.1246 - acc: 0.9945 - val_loss: 0.2983 - val_acc: 0.9603
Epoch 31/35
 - 1s - loss: 0.1120 - acc: 0.9970 - val_loss: 0.2772 - val_acc: 0.9603
Epoch 32/35
 - 1s - loss: 0.1699 - acc: 0.9756 - val_loss: 0.3146 - val_acc: 0.9438
Epoch 33/35
 - 1s - loss: 0.1193 - acc: 0.9954 - val_loss: 0.2886 - val_acc: 0.9567
Epoch 34/35
 - 1s - loss: 0.1091 - acc: 0.9957 - val_loss: 0.2871 - val_acc: 0.9589
Epoch 35/35
 - 1s - loss: 0.1152 - acc: 0.9921 - val_loss: 0.2983 - val_acc: 0.9481
Train accuracy 0.9917808219178083 Test accuracy: 0.9480894015861572
-----------------------------------------------------------------------------

_____
Layer (type)                    Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)               (None, 126, 32)           896
_____
conv1d_2 (Conv1D)               (None, 120, 32)           7200
_____
dropout_1 (Dropout)             (None, 120, 32)           0
_____
max_pooling1d_1 (MaxPooling1    (None, 40, 32)            0
_____
flatten_1 (Flatten)             (None, 1280)              0
_____
dense_1 (Dense)                 (None, 32)                40992
_____
dense_2 (Dense)                 (None, 3)                 99
===============================================================
Total params: 49,187
Trainable params: 49,187
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 13.9091 - acc: 0.7342 - val_loss: 8.5132 - val_acc: 0.8724
Epoch 2/35
 - 2s - loss: 5.3743 - acc: 0.9833 - val_loss: 3.4994 - val_acc: 0.9193
Epoch 3/35
 - 2s - loss: 2.0890 - acc: 0.9936 - val_loss: 1.5080 - val_acc: 0.9142
```

```
Epoch 4/35
 - 2s - loss: 0.8608 - acc: 0.9945 - val_loss: 0.7636 - val_acc: 0.9423
Epoch 5/35
 - 2s - loss: 0.4148 - acc: 0.9951 - val_loss: 0.4959 - val_acc: 0.9488
Epoch 6/35
 - 2s - loss: 0.2585 - acc: 0.9960 - val_loss: 0.3673 - val_acc: 0.9603
Epoch 7/35
 - 2s - loss: 0.2018 - acc: 0.9936 - val_loss: 0.4383 - val_acc: 0.9063
Epoch 8/35
 - 2s - loss: 0.2077 - acc: 0.9884 - val_loss: 0.3149 - val_acc: 0.9546
Epoch 9/35
 - 2s - loss: 0.1410 - acc: 0.9970 - val_loss: 0.3399 - val_acc: 0.9164
Epoch 10/35
 - 2s - loss: 0.1371 - acc: 0.9939 - val_loss: 0.2681 - val_acc: 0.9596
Epoch 11/35
 - 2s - loss: 0.1107 - acc: 0.9982 - val_loss: 0.3367 - val_acc: 0.9056
Epoch 12/35
 - 2s - loss: 0.1036 - acc: 0.9960 - val_loss: 0.2671 - val_acc: 0.9430
Epoch 13/35
 - 2s - loss: 0.0987 - acc: 0.9970 - val_loss: 0.2398 - val_acc: 0.9531
Epoch 14/35
 - 2s - loss: 0.0697 - acc: 1.0000 - val_loss: 0.1904 - val_acc: 0.9726
Epoch 15/35
 - 2s - loss: 0.0687 - acc: 0.9988 - val_loss: 0.1943 - val_acc: 0.9654
Epoch 16/35
 - 2s - loss: 0.0758 - acc: 0.9963 - val_loss: 0.2089 - val_acc: 0.9524
Epoch 17/35
 - 2s - loss: 0.0697 - acc: 0.9945 - val_loss: 0.1990 - val_acc: 0.9582
Epoch 18/35
 - 2s - loss: 0.0792 - acc: 0.9982 - val_loss: 0.1904 - val_acc: 0.9603
Epoch 19/35
 - 2s - loss: 0.0528 - acc: 0.9994 - val_loss: 0.2094 - val_acc: 0.9452
Epoch 20/35
 - 2s - loss: 0.1249 - acc: 0.9836 - val_loss: 0.1641 - val_acc: 0.9683
Epoch 21/35
 - 2s - loss: 0.0594 - acc: 0.9994 - val_loss: 0.1897 - val_acc: 0.9517
Epoch 22/35
 - 2s - loss: 0.0605 - acc: 0.9973 - val_loss: 0.1603 - val_acc: 0.9632
Epoch 23/35
 - 2s - loss: 0.0492 - acc: 0.9988 - val_loss: 0.3031 - val_acc: 0.8983
Epoch 24/35
 - 2s - loss: 0.0495 - acc: 0.9973 - val_loss: 0.1761 - val_acc: 0.9452
Epoch 25/35
```

```
 - 2s - loss: 0.0521 - acc: 0.9985 - val_loss: 0.1439 - val_acc: 0.9719
Epoch 26/35
 - 2s - loss: 0.0798 - acc: 0.9906 - val_loss: 0.1967 - val_acc: 0.9553
Epoch 27/35
 - 2s - loss: 0.0514 - acc: 0.9991 - val_loss: 0.1429 - val_acc: 0.9625
Epoch 28/35
 - 2s - loss: 0.0361 - acc: 0.9997 - val_loss: 0.1443 - val_acc: 0.9690
Epoch 29/35
 - 2s - loss: 0.0697 - acc: 0.9939 - val_loss: 0.1589 - val_acc: 0.9596
Epoch 30/35
 - 2s - loss: 0.0556 - acc: 0.9979 - val_loss: 0.1505 - val_acc: 0.9618
Epoch 31/35
 - 2s - loss: 0.0354 - acc: 1.0000 - val_loss: 0.1499 - val_acc: 0.9640
Epoch 32/35
 - 2s - loss: 0.0558 - acc: 0.9939 - val_loss: 0.2457 - val_acc: 0.9423
Epoch 33/35
 - 2s - loss: 0.0580 - acc: 0.9979 - val_loss: 0.1406 - val_acc: 0.9596
Epoch 34/35
 - 2s - loss: 0.0330 - acc: 1.0000 - val_loss: 0.1574 - val_acc: 0.9596
Epoch 35/35
 - 2s - loss: 0.0529 - acc: 0.9948 - val_loss: 0.3147 - val_acc: 0.9466
Train accuracy 0.9887366818873669 Test accuracy: 0.946647440519106
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
```

```
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 30.8432 - acc: 0.5963 - val_loss: 14.3953 - val_acc: 0.7808
Epoch 2/55
 - 2s - loss: 7.8182 - acc: 0.9212 - val_loss: 4.0796 - val_acc: 0.8947
Epoch 3/55
 - 2s - loss: 2.3093 - acc: 0.9860 - val_loss: 1.6618 - val_acc: 0.8645
Epoch 4/55
 - 2s - loss: 0.9384 - acc: 0.9884 - val_loss: 0.8734 - val_acc: 0.9452
Epoch 5/55
 - 2s - loss: 0.4883 - acc: 0.9933 - val_loss: 0.6100 - val_acc: 0.9459
Epoch 6/55
 - 2s - loss: 0.3021 - acc: 0.9948 - val_loss: 0.4636 - val_acc: 0.9582
Epoch 7/55
 - 2s - loss: 0.2200 - acc: 0.9954 - val_loss: 0.4049 - val_acc: 0.9582
Epoch 8/55
 - 2s - loss: 0.1840 - acc: 0.9942 - val_loss: 0.4251 - val_acc: 0.9070
Epoch 9/55
 - 2s - loss: 0.1601 - acc: 0.9967 - val_loss: 0.3381 - val_acc: 0.9517
Epoch 10/55
 - 2s - loss: 0.1462 - acc: 0.9970 - val_loss: 0.4127 - val_acc: 0.8846
Epoch 11/55
 - 2s - loss: 0.1401 - acc: 0.9948 - val_loss: 0.3049 - val_acc: 0.9611
Epoch 12/55
 - 2s - loss: 0.1285 - acc: 0.9967 - val_loss: 0.3424 - val_acc: 0.9185
Epoch 13/55
 - 2s - loss: 0.1147 - acc: 0.9985 - val_loss: 0.2678 - val_acc: 0.9733
Epoch 14/55
 - 2s - loss: 0.1013 - acc: 0.9997 - val_loss: 0.2622 - val_acc: 0.9726
Epoch 15/55
 - 2s - loss: 0.1051 - acc: 0.9963 - val_loss: 0.2625 - val_acc: 0.9668
Epoch 16/55
 - 2s - loss: 0.0941 - acc: 0.9991 - val_loss: 0.2484 - val_acc: 0.9769
Epoch 17/55
 - 2s - loss: 0.1031 - acc: 0.9954 - val_loss: 0.2558 - val_acc: 0.9466
Epoch 18/55
 - 2s - loss: 0.0975 - acc: 0.9970 - val_loss: 0.2546 - val_acc: 0.9560
Epoch 19/55
 - 2s - loss: 0.1477 - acc: 0.9796 - val_loss: 0.2295 - val_acc: 0.9921
Epoch 20/55
 - 2s - loss: 0.1077 - acc: 0.9979 - val_loss: 0.2145 - val_acc: 0.9791
```

```
Epoch 21/55
 - 2s - loss: 0.0804 - acc: 0.9991 - val_loss: 0.2181 - val_acc: 0.9784
Epoch 22/55
 - 2s - loss: 0.0749 - acc: 0.9994 - val_loss: 0.2241 - val_acc: 0.9697
Epoch 23/55
 - 2s - loss: 0.0774 - acc: 0.9985 - val_loss: 0.2100 - val_acc: 0.9755
Epoch 24/55
 - 2s - loss: 0.0851 - acc: 0.9954 - val_loss: 0.2582 - val_acc: 0.9409
Epoch 25/55
 - 2s - loss: 0.0828 - acc: 0.9970 - val_loss: 0.2166 - val_acc: 0.9719
Epoch 26/55
 - 2s - loss: 0.0685 - acc: 0.9997 - val_loss: 0.2100 - val_acc: 0.9697
Epoch 27/55
 - 2s - loss: 0.0659 - acc: 0.9994 - val_loss: 0.2143 - val_acc: 0.9704
Epoch 28/55
 - 2s - loss: 0.0694 - acc: 0.9991 - val_loss: 0.2011 - val_acc: 0.9733
Epoch 29/55
 - 2s - loss: 0.0644 - acc: 0.9985 - val_loss: 0.2136 - val_acc: 0.9575
Epoch 30/55
 - 2s - loss: 0.0764 - acc: 0.9960 - val_loss: 0.2263 - val_acc: 0.9409
Epoch 31/55
 - 2s - loss: 0.0772 - acc: 0.9963 - val_loss: 0.1797 - val_acc: 0.9798
Epoch 32/55
 - 2s - loss: 0.0625 - acc: 0.9985 - val_loss: 0.2306 - val_acc: 0.9394
Epoch 33/55
 - 2s - loss: 0.0634 - acc: 0.9988 - val_loss: 0.1897 - val_acc: 0.9690
Epoch 34/55
 - 2s - loss: 0.0773 - acc: 0.9939 - val_loss: 0.2155 - val_acc: 0.9553
Epoch 35/55
 - 2s - loss: 0.0762 - acc: 0.9951 - val_loss: 0.1989 - val_acc: 0.9676
Epoch 36/55
 - 2s - loss: 0.0559 - acc: 0.9997 - val_loss: 0.1754 - val_acc: 0.9791
Epoch 37/55
 - 2s - loss: 0.0568 - acc: 0.9985 - val_loss: 0.2360 - val_acc: 0.9474
Epoch 38/55
 - 2s - loss: 0.1049 - acc: 0.9851 - val_loss: 0.2267 - val_acc: 0.9387
Epoch 39/55
 - 2s - loss: 0.0541 - acc: 0.9997 - val_loss: 0.1830 - val_acc: 0.9755
Epoch 40/55
 - 2s - loss: 0.0512 - acc: 0.9994 - val_loss: 0.1914 - val_acc: 0.9719
Epoch 41/55
 - 2s - loss: 0.0473 - acc: 0.9997 - val_loss: 0.1718 - val_acc: 0.9776
Epoch 42/55
```

```
 - 2s - loss: 0.0748 - acc: 0.9933 - val_loss: 0.2307 - val_acc: 0.9466
Epoch 43/55
 - 2s - loss: 0.0778 - acc: 0.9945 - val_loss: 0.1910 - val_acc: 0.9726
Epoch 44/55
 - 2s - loss: 0.0500 - acc: 0.9994 - val_loss: 0.1732 - val_acc: 0.9798
Epoch 45/55
 - 2s - loss: 0.0456 - acc: 1.0000 - val_loss: 0.1595 - val_acc: 0.9805
Epoch 46/55
 - 2s - loss: 0.0462 - acc: 0.9997 - val_loss: 0.1879 - val_acc: 0.9611
Epoch 47/55
 - 2s - loss: 0.0434 - acc: 0.9994 - val_loss: 0.1799 - val_acc: 0.9712
Epoch 48/55
 - 2s - loss: 0.0433 - acc: 0.9997 - val_loss: 0.1789 - val_acc: 0.9668
Epoch 49/55
 - 2s - loss: 0.0412 - acc: 1.0000 - val_loss: 0.1608 - val_acc: 0.9755
Epoch 50/55
 - 2s - loss: 0.0578 - acc: 0.9957 - val_loss: 0.2164 - val_acc: 0.9445
Epoch 51/55
 - 2s - loss: 0.1062 - acc: 0.9863 - val_loss: 0.1680 - val_acc: 0.9690
Epoch 52/55
 - 2s - loss: 0.0526 - acc: 0.9997 - val_loss: 0.1748 - val_acc: 0.9611
Epoch 53/55
 - 2s - loss: 0.0429 - acc: 1.0000 - val_loss: 0.1553 - val_acc: 0.9805
Epoch 54/55
 - 2s - loss: 0.0446 - acc: 0.9991 - val_loss: 0.1530 - val_acc: 0.9798
Epoch 55/55
 - 2s - loss: 0.0382 - acc: 1.0000 - val_loss: 0.1646 - val_acc: 0.9798
Train accuracy 1.0 Test accuracy: 0.9798125450612833
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
=============================	=================	=======
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584

```
_____
dense_2 (Dense)              (None, 3)                99
===============================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 98.0860 - acc: 0.5756 - val_loss: 57.0230 - val_acc: 0.7570
Epoch 2/55
 - 2s - loss: 36.4008 - acc: 0.8718 - val_loss: 21.6007 - val_acc: 0.8068
Epoch 3/55
 - 2s - loss: 13.6639 - acc: 0.9586 - val_loss: 8.2817 - val_acc: 0.8486
Epoch 4/55
 - 2s - loss: 5.1161 - acc: 0.9632 - val_loss: 3.2420 - val_acc: 0.9128
Epoch 5/55
 - 2s - loss: 1.9523 - acc: 0.9717 - val_loss: 1.4428 - val_acc: 0.9337
Epoch 6/55
 - 2s - loss: 0.8338 - acc: 0.9814 - val_loss: 0.8318 - val_acc: 0.9373
Epoch 7/55
 - 2s - loss: 0.4633 - acc: 0.9872 - val_loss: 0.6273 - val_acc: 0.9308
Epoch 8/55
 - 2s - loss: 0.3491 - acc: 0.9860 - val_loss: 0.5490 - val_acc: 0.9373
Epoch 9/55
 - 2s - loss: 0.2937 - acc: 0.9896 - val_loss: 0.4785 - val_acc: 0.9546
Epoch 10/55
 - 2s - loss: 0.2852 - acc: 0.9820 - val_loss: 0.5676 - val_acc: 0.8673
Epoch 11/55
 - 2s - loss: 0.2570 - acc: 0.9860 - val_loss: 0.4621 - val_acc: 0.9510
Epoch 12/55
 - 2s - loss: 0.2428 - acc: 0.9875 - val_loss: 0.4195 - val_acc: 0.9712
Epoch 13/55
 - 2s - loss: 0.2183 - acc: 0.9909 - val_loss: 0.4220 - val_acc: 0.9546
Epoch 14/55
 - 2s - loss: 0.1990 - acc: 0.9933 - val_loss: 0.3993 - val_acc: 0.9531
Epoch 15/55
 - 2s - loss: 0.2012 - acc: 0.9921 - val_loss: 0.3749 - val_acc: 0.9589
Epoch 16/55
 - 2s - loss: 0.1971 - acc: 0.9896 - val_loss: 0.3696 - val_acc: 0.9632
Epoch 17/55
 - 2s - loss: 0.1875 - acc: 0.9933 - val_loss: 0.3405 - val_acc: 0.9697
```

```
Epoch 18/55
 - 2s - loss: 0.1649 - acc: 0.9973 - val_loss: 0.3678 - val_acc: 0.9430
Epoch 19/55
 - 2s - loss: 0.2095 - acc: 0.9781 - val_loss: 0.3421 - val_acc: 0.9647
Epoch 20/55
 - 2s - loss: 0.1738 - acc: 0.9933 - val_loss: 0.3621 - val_acc: 0.9366
Epoch 21/55
 - 2s - loss: 0.1611 - acc: 0.9936 - val_loss: 0.3395 - val_acc: 0.9640
Epoch 22/55
 - 2s - loss: 0.1597 - acc: 0.9890 - val_loss: 0.3559 - val_acc: 0.9394
Epoch 23/55
 - 2s - loss: 0.1565 - acc: 0.9942 - val_loss: 0.3087 - val_acc: 0.9647
Epoch 24/55
 - 2s - loss: 0.1686 - acc: 0.9842 - val_loss: 0.3122 - val_acc: 0.9567
Epoch 25/55
 - 2s - loss: 0.1661 - acc: 0.9875 - val_loss: 0.3118 - val_acc: 0.9488
Epoch 26/55
 - 2s - loss: 0.1435 - acc: 0.9924 - val_loss: 0.3443 - val_acc: 0.9301
Epoch 27/55
 - 2s - loss: 0.1700 - acc: 0.9833 - val_loss: 0.3077 - val_acc: 0.9661
Epoch 28/55
 - 2s - loss: 0.1618 - acc: 0.9887 - val_loss: 0.2861 - val_acc: 0.9632
Epoch 29/55
 - 2s - loss: 0.1312 - acc: 0.9945 - val_loss: 0.3054 - val_acc: 0.9466
Epoch 30/55
 - 2s - loss: 0.1411 - acc: 0.9918 - val_loss: 0.2626 - val_acc: 0.9733
Epoch 31/55
 - 2s - loss: 0.1262 - acc: 0.9960 - val_loss: 0.2612 - val_acc: 0.9704
Epoch 32/55
 - 2s - loss: 0.2283 - acc: 0.9653 - val_loss: 0.3004 - val_acc: 0.9668
Epoch 33/55
 - 2s - loss: 0.1269 - acc: 0.9982 - val_loss: 0.2753 - val_acc: 0.9697
Epoch 34/55
 - 2s - loss: 0.1178 - acc: 0.9970 - val_loss: 0.2613 - val_acc: 0.9618
Epoch 35/55
 - 2s - loss: 0.1184 - acc: 0.9957 - val_loss: 0.2762 - val_acc: 0.9625
Epoch 36/55
 - 2s - loss: 0.1161 - acc: 0.9954 - val_loss: 0.2764 - val_acc: 0.9539
Epoch 37/55
 - 2s - loss: 0.1183 - acc: 0.9936 - val_loss: 0.2642 - val_acc: 0.9625
Epoch 38/55
 - 2s - loss: 0.1114 - acc: 0.9948 - val_loss: 0.2556 - val_acc: 0.9647
Epoch 39/55
```

```
                   - 2s - loss: 0.1871 - acc: 0.9714 - val_loss: 0.3782 - val_acc: 0.9257
          Epoch 40/55
                   - 2s - loss: 0.1543 - acc: 0.9915 - val_loss: 0.2378 - val_acc: 0.9726
          Epoch 41/55
                   - 2s - loss: 0.1042 - acc: 0.9979 - val_loss: 0.2327 - val_acc: 0.9726
          Epoch 42/55
                   - 2s - loss: 0.1094 - acc: 0.9936 - val_loss: 0.2322 - val_acc: 0.9712
          Epoch 43/55
                   - 2s - loss: 0.1216 - acc: 0.9909 - val_loss: 0.2492 - val_acc: 0.9697
          Epoch 44/55
                   - 2s - loss: 0.1138 - acc: 0.9921 - val_loss: 0.2467 - val_acc: 0.9640
          Epoch 45/55
                   - 2s - loss: 0.1037 - acc: 0.9942 - val_loss: 0.2311 - val_acc: 0.9762
          Epoch 46/55
                   - 2s - loss: 0.1016 - acc: 0.9963 - val_loss: 0.2705 - val_acc: 0.9531
          Epoch 47/55
                   - 2s - loss: 0.1257 - acc: 0.9872 - val_loss: 0.2563 - val_acc: 0.9466
          Epoch 48/55
                   - 2s - loss: 0.1119 - acc: 0.9957 - val_loss: 0.2309 - val_acc: 0.9733
          Epoch 49/55
                   - 2s - loss: 0.0981 - acc: 0.9939 - val_loss: 0.2499 - val_acc: 0.9488
          Epoch 50/55
                   - 2s - loss: 0.1047 - acc: 0.9939 - val_loss: 0.2270 - val_acc: 0.9654
          Epoch 51/55
                   - 2s - loss: 0.0883 - acc: 0.9963 - val_loss: 0.2758 - val_acc: 0.9221
          Epoch 52/55
                   - 2s - loss: 0.0936 - acc: 0.9973 - val_loss: 0.2158 - val_acc: 0.9733
          Epoch 53/55
                   - 2s - loss: 0.1000 - acc: 0.9918 - val_loss: 0.2790 - val_acc: 0.9380
          Epoch 54/55
                   - 2s - loss: 0.0944 - acc: 0.9963 - val_loss: 0.2284 - val_acc: 0.9661
          Epoch 55/55
                   - 2s - loss: 0.1015 - acc: 0.9933 - val_loss: 0.3090 - val_acc: 0.9351
          Train accuracy 0.9841704718417047 Test accuracy: 0.9351117519826965
          -------------------------------------------------------------------------------

          _____
          Layer (type)                 Output Shape              Param #
          ================================================================
          conv1d_1 (Conv1D)            (None, 126, 28)           784
          _____
          conv1d_2 (Conv1D)            (None, 120, 32)           6304
          _____
          dropout_1 (Dropout)          (None, 120, 32)           0
```

```
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 32)                0
_____
flatten_1 (Flatten)          (None, 1280)                  0
_____
dense_1 (Dense)              (None, 32)                    40992
_____
dense_2 (Dense)              (None, 3)                     99
================================================================
Total params: 48,179
Trainable params: 48,179
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 7.7747 - acc: 0.6384 - val_loss: 1.2915 - val_acc: 0.8226
Epoch 2/55
 - 1s - loss: 0.5992 - acc: 0.9406 - val_loss: 0.5756 - val_acc: 0.9185
Epoch 3/55
 - 1s - loss: 0.3410 - acc: 0.9589 - val_loss: 0.4868 - val_acc: 0.9041
Epoch 4/55
 - 1s - loss: 0.2780 - acc: 0.9671 - val_loss: 0.5049 - val_acc: 0.8955
Epoch 5/55
 - 1s - loss: 0.2543 - acc: 0.9723 - val_loss: 0.4320 - val_acc: 0.9092
Epoch 6/55
 - 1s - loss: 0.2465 - acc: 0.9683 - val_loss: 0.4105 - val_acc: 0.8991
Epoch 7/55
 - 1s - loss: 0.2094 - acc: 0.9741 - val_loss: 0.4870 - val_acc: 0.8709
Epoch 8/55
 - 1s - loss: 0.2039 - acc: 0.9769 - val_loss: 0.3932 - val_acc: 0.9041
Epoch 9/55
 - 1s - loss: 0.1763 - acc: 0.9839 - val_loss: 0.3367 - val_acc: 0.9452
Epoch 10/55
 - 1s - loss: 0.1745 - acc: 0.9836 - val_loss: 0.3482 - val_acc: 0.9279
Epoch 11/55
 - 1s - loss: 0.1672 - acc: 0.9775 - val_loss: 0.3254 - val_acc: 0.9236
Epoch 12/55
 - 1s - loss: 0.2306 - acc: 0.9668 - val_loss: 0.4703 - val_acc: 0.9027
Epoch 13/55
 - 1s - loss: 0.1691 - acc: 0.9826 - val_loss: 0.3900 - val_acc: 0.8947
Epoch 14/55
 - 1s - loss: 0.1624 - acc: 0.9842 - val_loss: 0.3129 - val_acc: 0.9250
```

```
Epoch 15/55
 - 1s - loss: 0.1531 - acc: 0.9836 - val_loss: 0.3506 - val_acc: 0.9041
Epoch 16/55
 - 1s - loss: 0.1796 - acc: 0.9784 - val_loss: 0.3311 - val_acc: 0.9344
Epoch 17/55
 - 1s - loss: 0.1617 - acc: 0.9805 - val_loss: 0.3021 - val_acc: 0.9459
Epoch 18/55
 - 1s - loss: 0.1319 - acc: 0.9884 - val_loss: 0.3956 - val_acc: 0.8991
Epoch 19/55
 - 1s - loss: 0.1426 - acc: 0.9836 - val_loss: 0.2747 - val_acc: 0.9373
Epoch 20/55
 - 1s - loss: 0.2121 - acc: 0.9659 - val_loss: 0.4720 - val_acc: 0.9250
Epoch 21/55
 - 1s - loss: 0.1730 - acc: 0.9817 - val_loss: 0.4136 - val_acc: 0.9092
Epoch 22/55
 - 1s - loss: 0.1401 - acc: 0.9854 - val_loss: 0.3136 - val_acc: 0.9257
Epoch 23/55
 - 1s - loss: 0.1372 - acc: 0.9854 - val_loss: 0.2984 - val_acc: 0.9438
Epoch 24/55
 - 1s - loss: 0.1470 - acc: 0.9826 - val_loss: 0.2549 - val_acc: 0.9481
Epoch 25/55
 - 1s - loss: 0.1320 - acc: 0.9830 - val_loss: 0.4524 - val_acc: 0.8803
Epoch 26/55
 - 1s - loss: 0.1479 - acc: 0.9814 - val_loss: 0.4383 - val_acc: 0.8774
Epoch 27/55
 - 1s - loss: 0.1193 - acc: 0.9887 - val_loss: 0.3895 - val_acc: 0.8933
Epoch 28/55
 - 1s - loss: 0.1320 - acc: 0.9836 - val_loss: 0.3176 - val_acc: 0.9358
Epoch 29/55
 - 1s - loss: 0.1482 - acc: 0.9778 - val_loss: 0.5657 - val_acc: 0.8457
Epoch 30/55
 - 1s - loss: 0.1709 - acc: 0.9772 - val_loss: 0.3220 - val_acc: 0.9214
Epoch 31/55
 - 1s - loss: 0.0957 - acc: 0.9933 - val_loss: 0.2943 - val_acc: 0.9164
Epoch 32/55
 - 1s - loss: 0.1242 - acc: 0.9848 - val_loss: 0.3496 - val_acc: 0.8991
Epoch 33/55
 - 1s - loss: 0.1157 - acc: 0.9854 - val_loss: 0.3082 - val_acc: 0.9178
Epoch 34/55
 - 1s - loss: 0.1132 - acc: 0.9878 - val_loss: 0.2845 - val_acc: 0.9358
Epoch 35/55
 - 1s - loss: 0.1455 - acc: 0.9790 - val_loss: 0.3278 - val_acc: 0.9315
Epoch 36/55
```

```
         - 1s - loss: 0.1344 - acc: 0.9863 - val_loss: 0.2828 - val_acc: 0.9337
Epoch 37/55
         - 1s - loss: 0.1591 - acc: 0.9796 - val_loss: 0.3178 - val_acc: 0.9272
Epoch 38/55
         - 1s - loss: 0.1295 - acc: 0.9881 - val_loss: 0.4592 - val_acc: 0.9019
Epoch 39/55
         - 1s - loss: 0.1099 - acc: 0.9900 - val_loss: 0.3245 - val_acc: 0.9164
Epoch 40/55
         - 1s - loss: 0.0920 - acc: 0.9915 - val_loss: 0.3050 - val_acc: 0.9200
Epoch 41/55
         - 1s - loss: 0.1197 - acc: 0.9863 - val_loss: 0.3110 - val_acc: 0.9344
Epoch 42/55
         - 1s - loss: 0.1306 - acc: 0.9820 - val_loss: 0.3438 - val_acc: 0.9135
Epoch 43/55
         - 1s - loss: 0.1100 - acc: 0.9887 - val_loss: 0.2969 - val_acc: 0.9358
Epoch 44/55
         - 1s - loss: 0.1120 - acc: 0.9872 - val_loss: 0.3601 - val_acc: 0.9207
Epoch 45/55
         - 1s - loss: 0.1021 - acc: 0.9890 - val_loss: 0.3800 - val_acc: 0.8782
Epoch 46/55
         - 1s - loss: 0.0979 - acc: 0.9893 - val_loss: 0.4270 - val_acc: 0.8854
Epoch 47/55
         - 1s - loss: 0.1452 - acc: 0.9805 - val_loss: 0.4866 - val_acc: 0.8933
Epoch 48/55
         - 1s - loss: 0.0933 - acc: 0.9924 - val_loss: 0.3003 - val_acc: 0.9481
Epoch 49/55
         - 1s - loss: 0.1073 - acc: 0.9866 - val_loss: 0.4197 - val_acc: 0.8933
Epoch 50/55
         - 1s - loss: 0.1101 - acc: 0.9872 - val_loss: 0.2763 - val_acc: 0.9380
Epoch 51/55
         - 1s - loss: 0.0886 - acc: 0.9912 - val_loss: 0.3320 - val_acc: 0.9164
Epoch 52/55
         - 1s - loss: 0.1334 - acc: 0.9814 - val_loss: 0.6968 - val_acc: 0.8032
Epoch 53/55
         - 1s - loss: 0.1591 - acc: 0.9823 - val_loss: 0.3913 - val_acc: 0.9092
Epoch 54/55
         - 1s - loss: 0.1416 - acc: 0.9799 - val_loss: 0.6950 - val_acc: 0.8147
Epoch 55/55
         - 1s - loss: 0.1313 - acc: 0.9836 - val_loss: 0.3751 - val_acc: 0.9012
Train accuracy 0.986910197869102 Test accuracy: 0.9012256669069935
---------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
```

```
=================================================================
conv1d_1 (Conv1D)              (None, 122, 32)           2048

_____
conv1d_2 (Conv1D)              (None, 116, 32)           7200

_____
dropout_1 (Dropout)            (None, 116, 32)           0

_____
max_pooling1d_1 (MaxPooling1   (None, 23, 32)            0

_____
flatten_1 (Flatten)            (None, 736)               0

_____
dense_1 (Dense)                (None, 32)                23584

_____
dense_2 (Dense)                (None, 3)                 99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 24.8588 - acc: 0.5233 - val_loss: 1.5026 - val_acc: 0.6265
Epoch 2/55
 - 2s - loss: 0.7139 - acc: 0.8600 - val_loss: 0.7046 - val_acc: 0.8363
Epoch 3/55
 - 2s - loss: 0.4505 - acc: 0.9181 - val_loss: 0.5498 - val_acc: 0.9185
Epoch 4/55
 - 2s - loss: 0.3511 - acc: 0.9422 - val_loss: 0.5768 - val_acc: 0.8767
Epoch 5/55
 - 2s - loss: 0.3388 - acc: 0.9400 - val_loss: 0.4764 - val_acc: 0.9171
Epoch 6/55
 - 2s - loss: 0.3214 - acc: 0.9495 - val_loss: 0.4510 - val_acc: 0.9236
Epoch 7/55
 - 2s - loss: 0.2492 - acc: 0.9686 - val_loss: 0.4813 - val_acc: 0.8846
Epoch 8/55
 - 2s - loss: 0.2983 - acc: 0.9495 - val_loss: 0.5326 - val_acc: 0.8558
Epoch 9/55
 - 2s - loss: 0.2363 - acc: 0.9711 - val_loss: 0.4440 - val_acc: 0.8818
Epoch 10/55
 - 2s - loss: 0.2265 - acc: 0.9750 - val_loss: 0.5004 - val_acc: 0.8688
Epoch 11/55
 - 2s - loss: 0.2301 - acc: 0.9772 - val_loss: 0.3355 - val_acc: 0.9503
```

```
Epoch 12/55
 - 2s - loss: 0.1772 - acc: 0.9896 - val_loss: 0.3641 - val_acc: 0.9466
Epoch 13/55
 - 2s - loss: 0.2088 - acc: 0.9796 - val_loss: 0.4175 - val_acc: 0.9077
Epoch 14/55
 - 2s - loss: 0.1847 - acc: 0.9805 - val_loss: 0.5665 - val_acc: 0.8551
Epoch 15/55
 - 2s - loss: 0.2889 - acc: 0.9653 - val_loss: 0.3521 - val_acc: 0.9445
Epoch 16/55
 - 2s - loss: 0.1522 - acc: 0.9939 - val_loss: 0.3119 - val_acc: 0.9748
Epoch 17/55
 - 2s - loss: 0.1942 - acc: 0.9763 - val_loss: 0.4319 - val_acc: 0.9012
Epoch 18/55
 - 2s - loss: 0.3080 - acc: 0.9665 - val_loss: 0.3903 - val_acc: 0.9077
Epoch 19/55
 - 2s - loss: 0.1504 - acc: 0.9906 - val_loss: 0.3511 - val_acc: 0.9286
Epoch 20/55
 - 2s - loss: 0.1578 - acc: 0.9854 - val_loss: 0.2859 - val_acc: 0.9589
Epoch 21/55
 - 2s - loss: 0.1422 - acc: 0.9893 - val_loss: 0.4422 - val_acc: 0.8933
Epoch 22/55
 - 2s - loss: 0.2109 - acc: 0.9699 - val_loss: 0.5357 - val_acc: 0.8486
Epoch 23/55
 - 2s - loss: 0.1938 - acc: 0.9814 - val_loss: 0.2750 - val_acc: 0.9654
Epoch 24/55
 - 2s - loss: 0.1804 - acc: 0.9799 - val_loss: 0.5093 - val_acc: 0.8839
Epoch 25/55
 - 2s - loss: 0.1490 - acc: 0.9900 - val_loss: 0.3261 - val_acc: 0.9221
Epoch 26/55
 - 2s - loss: 0.2114 - acc: 0.9720 - val_loss: 0.5730 - val_acc: 0.8738
Epoch 27/55
 - 2s - loss: 0.2146 - acc: 0.9756 - val_loss: 0.3308 - val_acc: 0.9402
Epoch 28/55
 - 2s - loss: 0.1616 - acc: 0.9854 - val_loss: 0.3528 - val_acc: 0.9229
Epoch 29/55
 - 2s - loss: 0.1221 - acc: 0.9957 - val_loss: 0.2810 - val_acc: 0.9488
Epoch 30/55
 - 2s - loss: 0.1715 - acc: 0.9811 - val_loss: 0.4312 - val_acc: 0.9113
Epoch 31/55
 - 2s - loss: 0.1349 - acc: 0.9915 - val_loss: 0.3008 - val_acc: 0.9402
Epoch 32/55
 - 2s - loss: 0.2621 - acc: 0.9601 - val_loss: 0.4196 - val_acc: 0.9221
Epoch 33/55
```

```
          - 2s - loss: 0.1754 - acc: 0.9845 - val_loss: 0.5700 - val_acc: 0.8133
Epoch 34/55
          - 2s - loss: 0.2163 - acc: 0.9772 - val_loss: 0.3576 - val_acc: 0.8998
Epoch 35/55
          - 2s - loss: 0.1326 - acc: 0.9890 - val_loss: 0.4260 - val_acc: 0.9063
Epoch 36/55
          - 2s - loss: 0.1586 - acc: 0.9826 - val_loss: 0.3991 - val_acc: 0.9193
Epoch 37/55
          - 2s - loss: 0.1540 - acc: 0.9836 - val_loss: 0.3442 - val_acc: 0.9135
Epoch 38/55
          - 2s - loss: 0.1277 - acc: 0.9884 - val_loss: 0.4091 - val_acc: 0.8875
Epoch 39/55
          - 2s - loss: 0.3054 - acc: 0.9549 - val_loss: 0.4579 - val_acc: 0.9149
Epoch 40/55
          - 2s - loss: 0.1430 - acc: 0.9942 - val_loss: 0.3050 - val_acc: 0.9286
Epoch 41/55
          - 2s - loss: 0.1093 - acc: 0.9933 - val_loss: 0.4026 - val_acc: 0.8652
Epoch 42/55
          - 2s - loss: 0.2423 - acc: 0.9650 - val_loss: 0.4019 - val_acc: 0.8955
Epoch 43/55
          - 2s - loss: 0.1235 - acc: 0.9927 - val_loss: 0.3978 - val_acc: 0.8832
Epoch 44/55
          - 2s - loss: 0.1354 - acc: 0.9866 - val_loss: 0.4277 - val_acc: 0.8695
Epoch 45/55
          - 2s - loss: 0.2453 - acc: 0.9619 - val_loss: 0.3488 - val_acc: 0.9229
Epoch 46/55
          - 2s - loss: 0.1261 - acc: 0.9951 - val_loss: 0.3298 - val_acc: 0.9113
Epoch 47/55
          - 2s - loss: 0.1468 - acc: 0.9799 - val_loss: 0.3963 - val_acc: 0.9063
Epoch 48/55
          - 2s - loss: 0.2172 - acc: 0.9708 - val_loss: 0.4442 - val_acc: 0.9301
Epoch 49/55
          - 2s - loss: 0.1537 - acc: 0.9896 - val_loss: 0.3751 - val_acc: 0.8962
Epoch 50/55
          - 2s - loss: 0.1314 - acc: 0.9893 - val_loss: 0.3139 - val_acc: 0.9250
Epoch 51/55
          - 2s - loss: 0.1032 - acc: 0.9930 - val_loss: 0.4291 - val_acc: 0.8882
Epoch 52/55
          - 2s - loss: 0.1228 - acc: 0.9893 - val_loss: 0.3309 - val_acc: 0.9070
Epoch 53/55
          - 2s - loss: 0.1441 - acc: 0.9787 - val_loss: 0.5148 - val_acc: 0.8572
Epoch 54/55
          - 2s - loss: 0.2421 - acc: 0.9711 - val_loss: 0.3363 - val_acc: 0.9142
```

```
Epoch 55/55
 - 2s - loss: 0.1141 - acc: 0.9945 - val_loss: 0.2397 - val_acc: 0.9438
Train accuracy 0.9987823439878234 Test accuracy: 0.9437635183850036
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 12.9563 - acc: 0.5769 - val_loss: 1.3726 - val_acc: 0.7945
Epoch 2/55
 - 2s - loss: 0.6045 - acc: 0.9056 - val_loss: 0.6964 - val_acc: 0.8717
Epoch 3/55
 - 2s - loss: 0.3090 - acc: 0.9717 - val_loss: 0.5066 - val_acc: 0.9380
Epoch 4/55
 - 2s - loss: 0.2624 - acc: 0.9769 - val_loss: 0.4605 - val_acc: 0.9265
Epoch 5/55
 - 2s - loss: 0.2046 - acc: 0.9866 - val_loss: 0.4159 - val_acc: 0.9488
Epoch 6/55
 - 2s - loss: 0.2691 - acc: 0.9659 - val_loss: 0.4304 - val_acc: 0.9272
Epoch 7/55
 - 2s - loss: 0.1610 - acc: 0.9927 - val_loss: 0.3746 - val_acc: 0.9322
Epoch 8/55
 - 2s - loss: 0.2126 - acc: 0.9747 - val_loss: 0.3806 - val_acc: 0.9567
```

```
Epoch 9/55
 - 2s - loss: 0.2412 - acc: 0.9708 - val_loss: 0.3701 - val_acc: 0.9394
Epoch 10/55
 - 2s - loss: 0.1689 - acc: 0.9906 - val_loss: 0.4385 - val_acc: 0.9250
Epoch 11/55
 - 2s - loss: 0.1733 - acc: 0.9814 - val_loss: 0.3801 - val_acc: 0.9488
Epoch 12/55
 - 2s - loss: 0.2105 - acc: 0.9711 - val_loss: 0.5535 - val_acc: 0.9034
Epoch 13/55
 - 2s - loss: 0.1502 - acc: 0.9909 - val_loss: 0.3637 - val_acc: 0.9524
Epoch 14/55
 - 2s - loss: 0.1140 - acc: 0.9948 - val_loss: 0.3865 - val_acc: 0.9315
Epoch 15/55
 - 2s - loss: 0.1353 - acc: 0.9875 - val_loss: 0.3257 - val_acc: 0.9200
Epoch 16/55
 - 2s - loss: 0.1305 - acc: 0.9893 - val_loss: 0.3176 - val_acc: 0.9589
Epoch 17/55
 - 2s - loss: 0.1522 - acc: 0.9842 - val_loss: 0.3434 - val_acc: 0.9243
Epoch 18/55
 - 2s - loss: 0.1321 - acc: 0.9930 - val_loss: 0.3180 - val_acc: 0.9337
Epoch 19/55
 - 2s - loss: 0.3041 - acc: 0.9534 - val_loss: 0.5594 - val_acc: 0.9149
Epoch 20/55
 - 2s - loss: 0.1941 - acc: 0.9887 - val_loss: 0.3544 - val_acc: 0.9120
Epoch 21/55
 - 2s - loss: 0.1088 - acc: 0.9967 - val_loss: 0.3097 - val_acc: 0.9560
Epoch 22/55
 - 2s - loss: 0.1162 - acc: 0.9881 - val_loss: 0.4786 - val_acc: 0.9048
Epoch 23/55
 - 2s - loss: 0.1543 - acc: 0.9848 - val_loss: 0.3031 - val_acc: 0.9366
Epoch 24/55
 - 2s - loss: 0.1537 - acc: 0.9826 - val_loss: 0.7018 - val_acc: 0.7527
Epoch 25/55
 - 2s - loss: 0.2051 - acc: 0.9805 - val_loss: 0.2949 - val_acc: 0.9524
Epoch 26/55
 - 2s - loss: 0.1201 - acc: 0.9903 - val_loss: 0.3260 - val_acc: 0.9221
Epoch 27/55
 - 2s - loss: 0.1247 - acc: 0.9872 - val_loss: 0.3796 - val_acc: 0.9286
Epoch 28/55
 - 2s - loss: 0.1838 - acc: 0.9805 - val_loss: 0.2642 - val_acc: 0.9560
Epoch 29/55
 - 2s - loss: 0.0988 - acc: 0.9960 - val_loss: 0.2699 - val_acc: 0.9524
Epoch 30/55
```

```
         - 2s - loss: 0.1907 - acc: 0.9711 - val_loss: 0.3348 - val_acc: 0.9236
Epoch 31/55
         - 2s - loss: 0.1755 - acc: 0.9869 - val_loss: 0.2889 - val_acc: 0.9322
Epoch 32/55
         - 2s - loss: 0.1268 - acc: 0.9869 - val_loss: 0.3945 - val_acc: 0.9135
Epoch 33/55
         - 2s - loss: 0.1409 - acc: 0.9860 - val_loss: 0.3744 - val_acc: 0.9099
Epoch 34/55
         - 2s - loss: 0.1139 - acc: 0.9878 - val_loss: 0.3379 - val_acc: 0.9366
Epoch 35/55
         - 2s - loss: 0.1480 - acc: 0.9836 - val_loss: 0.2780 - val_acc: 0.9337
Epoch 36/55
         - 2s - loss: 0.1224 - acc: 0.9860 - val_loss: 0.4327 - val_acc: 0.8825
Epoch 37/55
         - 2s - loss: 0.1216 - acc: 0.9918 - val_loss: 0.2404 - val_acc: 0.9488
Epoch 38/55
         - 2s - loss: 0.1429 - acc: 0.9814 - val_loss: 0.3606 - val_acc: 0.9012
Epoch 39/55
         - 2s - loss: 0.1254 - acc: 0.9869 - val_loss: 0.4088 - val_acc: 0.8709
Epoch 40/55
         - 2s - loss: 0.0981 - acc: 0.9963 - val_loss: 0.3044 - val_acc: 0.9207
Epoch 41/55
         - 2s - loss: 0.1828 - acc: 0.9787 - val_loss: 0.3144 - val_acc: 0.9452
Epoch 42/55
         - 2s - loss: 0.0904 - acc: 0.9976 - val_loss: 0.2888 - val_acc: 0.9351
Epoch 43/55
         - 2s - loss: 0.0897 - acc: 0.9933 - val_loss: 0.3529 - val_acc: 0.9344
Epoch 44/55
         - 2s - loss: 0.0940 - acc: 0.9909 - val_loss: 0.5145 - val_acc: 0.8774
Epoch 45/55
         - 2s - loss: 0.2916 - acc: 0.9616 - val_loss: 0.4114 - val_acc: 0.9344
Epoch 46/55
         - 2s - loss: 0.1417 - acc: 0.9896 - val_loss: 0.3473 - val_acc: 0.8919
Epoch 47/55
         - 2s - loss: 0.1140 - acc: 0.9915 - val_loss: 0.2943 - val_acc: 0.9531
Epoch 48/55
         - 2s - loss: 0.1469 - acc: 0.9793 - val_loss: 0.4008 - val_acc: 0.9185
Epoch 49/55
         - 2s - loss: 0.1575 - acc: 0.9863 - val_loss: 0.2579 - val_acc: 0.9474
Epoch 50/55
         - 2s - loss: 0.1322 - acc: 0.9845 - val_loss: 0.2644 - val_acc: 0.9495
Epoch 51/55
         - 2s - loss: 0.1085 - acc: 0.9912 - val_loss: 0.2621 - val_acc: 0.9344
```

```
Epoch 52/55
 - 2s - loss: 0.0704 - acc: 0.9988 - val_loss: 0.2722 - val_acc: 0.9286
Epoch 53/55
 - 2s - loss: 0.0801 - acc: 0.9930 - val_loss: 0.5023 - val_acc: 0.8724
Epoch 54/55
 - 2s - loss: 0.1665 - acc: 0.9772 - val_loss: 0.3331 - val_acc: 0.9366
Epoch 55/55
 - 2s - loss: 0.1266 - acc: 0.9893 - val_loss: 0.3140 - val_acc: 0.9279
Train accuracy 0.993607305936073 Test accuracy: 0.9279019466474405
------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 116, 32)           7200

dropout_1 (Dropout)          (None, 116, 32)           0

max_pooling1d_1 (MaxPooling1 (None, 38, 32)            0

flatten_1 (Flatten)          (None, 1216)              0

dense_1 (Dense)              (None, 32)                38944

dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 48,291
Trainable params: 48,291
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 7.0416 - acc: 0.7126 - val_loss: 1.0029 - val_acc: 0.8032
Epoch 2/55
 - 2s - loss: 0.4580 - acc: 0.9419 - val_loss: 0.4853 - val_acc: 0.9358
Epoch 3/55
 - 2s - loss: 0.2770 - acc: 0.9653 - val_loss: 0.3693 - val_acc: 0.9582
Epoch 4/55
 - 2s - loss: 0.1770 - acc: 0.9884 - val_loss: 0.3044 - val_acc: 0.9596
Epoch 5/55
 - 2s - loss: 0.1748 - acc: 0.9836 - val_loss: 0.2859 - val_acc: 0.9690
```

```
Epoch 6/55
 - 2s - loss: 0.2096 - acc: 0.9756 - val_loss: 0.2546 - val_acc: 0.9740
Epoch 7/55
 - 2s - loss: 0.1449 - acc: 0.9842 - val_loss: 0.2840 - val_acc: 0.9394
Epoch 8/55
 - 2s - loss: 0.1339 - acc: 0.9900 - val_loss: 0.2507 - val_acc: 0.9517
Epoch 9/55
 - 2s - loss: 0.1574 - acc: 0.9790 - val_loss: 0.3206 - val_acc: 0.9394
Epoch 10/55
 - 2s - loss: 0.1446 - acc: 0.9893 - val_loss: 0.3977 - val_acc: 0.9012
Epoch 11/55
 - 2s - loss: 0.1392 - acc: 0.9848 - val_loss: 0.2923 - val_acc: 0.9315
Epoch 12/55
 - 2s - loss: 0.1341 - acc: 0.9866 - val_loss: 0.3001 - val_acc: 0.9438
Epoch 13/55
 - 2s - loss: 0.1895 - acc: 0.9735 - val_loss: 0.5303 - val_acc: 0.8745
Epoch 14/55
 - 2s - loss: 0.1423 - acc: 0.9906 - val_loss: 0.3069 - val_acc: 0.9402
Epoch 15/55
 - 2s - loss: 0.1217 - acc: 0.9863 - val_loss: 0.3860 - val_acc: 0.9229
Epoch 16/55
 - 2s - loss: 0.1495 - acc: 0.9839 - val_loss: 0.3447 - val_acc: 0.9380
Epoch 17/55
 - 2s - loss: 0.0974 - acc: 0.9951 - val_loss: 0.2245 - val_acc: 0.9495
Epoch 18/55
 - 2s - loss: 0.1310 - acc: 0.9842 - val_loss: 0.2853 - val_acc: 0.9402
Epoch 19/55
 - 2s - loss: 0.1282 - acc: 0.9839 - val_loss: 0.4234 - val_acc: 0.8760
Epoch 20/55
 - 2s - loss: 0.1697 - acc: 0.9836 - val_loss: 0.2611 - val_acc: 0.9438
Epoch 21/55
 - 2s - loss: 0.0939 - acc: 0.9945 - val_loss: 0.2497 - val_acc: 0.9409
Epoch 22/55
 - 2s - loss: 0.1089 - acc: 0.9869 - val_loss: 0.3894 - val_acc: 0.8983
Epoch 23/55
 - 2s - loss: 0.1123 - acc: 0.9893 - val_loss: 0.2725 - val_acc: 0.9409
Epoch 24/55
 - 2s - loss: 0.0995 - acc: 0.9884 - val_loss: 0.2865 - val_acc: 0.9207
Epoch 25/55
 - 2s - loss: 0.1222 - acc: 0.9866 - val_loss: 0.3125 - val_acc: 0.9214
Epoch 26/55
 - 2s - loss: 0.1081 - acc: 0.9860 - val_loss: 0.3518 - val_acc: 0.9113
Epoch 27/55
```

```
         - 2s - loss: 0.1364 - acc: 0.9845 - val_loss: 0.2543 - val_acc: 0.9366
Epoch 28/55
         - 2s - loss: 0.1912 - acc: 0.9744 - val_loss: 0.2410 - val_acc: 0.9452
Epoch 29/55
         - 2s - loss: 0.1166 - acc: 0.9890 - val_loss: 0.2610 - val_acc: 0.9546
Epoch 30/55
         - 2s - loss: 0.0945 - acc: 0.9918 - val_loss: 0.3574 - val_acc: 0.9344
Epoch 31/55
         - 2s - loss: 0.0982 - acc: 0.9918 - val_loss: 0.2320 - val_acc: 0.9495
Epoch 32/55
         - 2s - loss: 0.0748 - acc: 0.9957 - val_loss: 0.2440 - val_acc: 0.9409
Epoch 33/55
         - 2s - loss: 0.0815 - acc: 0.9915 - val_loss: 0.2981 - val_acc: 0.9394
Epoch 34/55
         - 2s - loss: 0.1641 - acc: 0.9732 - val_loss: 0.5382 - val_acc: 0.9178
Epoch 35/55
         - 2s - loss: 0.1353 - acc: 0.9881 - val_loss: 0.2308 - val_acc: 0.9517
Epoch 36/55
         - 2s - loss: 0.1170 - acc: 0.9869 - val_loss: 0.2597 - val_acc: 0.9250
Epoch 37/55
         - 2s - loss: 0.1394 - acc: 0.9848 - val_loss: 0.2913 - val_acc: 0.9142
Epoch 38/55
         - 2s - loss: 0.1475 - acc: 0.9775 - val_loss: 0.3130 - val_acc: 0.9308
Epoch 39/55
         - 2s - loss: 0.1230 - acc: 0.9848 - val_loss: 0.4036 - val_acc: 0.8832
Epoch 40/55
         - 2s - loss: 0.1353 - acc: 0.9823 - val_loss: 0.2762 - val_acc: 0.9272
Epoch 41/55
         - 2s - loss: 0.1430 - acc: 0.9808 - val_loss: 0.5107 - val_acc: 0.8457
Epoch 42/55
         - 2s - loss: 0.1269 - acc: 0.9848 - val_loss: 0.2661 - val_acc: 0.9337
Epoch 43/55
         - 2s - loss: 0.1275 - acc: 0.9863 - val_loss: 0.2531 - val_acc: 0.9517
Epoch 44/55
         - 2s - loss: 0.1388 - acc: 0.9802 - val_loss: 0.2902 - val_acc: 0.9265
Epoch 45/55
         - 2s - loss: 0.0989 - acc: 0.9884 - val_loss: 0.2624 - val_acc: 0.9322
Epoch 46/55
         - 2s - loss: 0.1053 - acc: 0.9906 - val_loss: 0.3638 - val_acc: 0.9070
Epoch 47/55
         - 2s - loss: 0.0871 - acc: 0.9927 - val_loss: 0.2662 - val_acc: 0.9366
Epoch 48/55
         - 2s - loss: 0.0898 - acc: 0.9915 - val_loss: 0.3073 - val_acc: 0.9380
```

```
Epoch 49/55
 - 2s - loss: 0.1460 - acc: 0.9741 - val_loss: 0.4713 - val_acc: 0.9005
Epoch 50/55
 - 2s - loss: 0.1091 - acc: 0.9927 - val_loss: 0.2388 - val_acc: 0.9416
Epoch 51/55
 - 2s - loss: 0.1188 - acc: 0.9839 - val_loss: 0.3750 - val_acc: 0.9178
Epoch 52/55
 - 2s - loss: 0.0970 - acc: 0.9909 - val_loss: 0.4656 - val_acc: 0.9214
Epoch 53/55
 - 2s - loss: 0.0855 - acc: 0.9909 - val_loss: 0.3124 - val_acc: 0.9099
Epoch 54/55
 - 2s - loss: 0.1467 - acc: 0.9750 - val_loss: 0.3423 - val_acc: 0.9344
Epoch 55/55
 - 2s - loss: 0.1196 - acc: 0.9851 - val_loss: 0.3224 - val_acc: 0.9322
Train accuracy 0.9899543378995433 Test accuracy: 0.9322278298485941
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
=================================	===================	=========
conv1d_1 (Conv1D)	(None, 126, 28)	784
conv1d_2 (Conv1D)	(None, 120, 32)	6304
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 32)	0
flatten_1 (Flatten)	(None, 768)	0
dense_1 (Dense)	(None, 32)	24608
dense_2 (Dense)	(None, 3)	99

```
=================================================================
Total params: 31,795
Trainable params: 31,795
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 127.4787 - acc: 0.4928 - val_loss: 78.9895 - val_acc: 0.6373
Epoch 2/55
 - 1s - loss: 54.2764 - acc: 0.7184 - val_loss: 36.1670 - val_acc: 0.7361
```

```
Epoch 3/55
 - 1s - loss: 26.2325 - acc: 0.8761 - val_loss: 19.0841 - val_acc: 0.7722
Epoch 4/55
 - 1s - loss: 14.3704 - acc: 0.9075 - val_loss: 11.1097 - val_acc: 0.8277
Epoch 5/55
 - 1s - loss: 8.4175 - acc: 0.9297 - val_loss: 6.7636 - val_acc: 0.8104
Epoch 6/55
 - 1s - loss: 5.0178 - acc: 0.9455 - val_loss: 4.1564 - val_acc: 0.8738
Epoch 7/55
 - 1s - loss: 3.0078 - acc: 0.9556 - val_loss: 2.6408 - val_acc: 0.8262
Epoch 8/55
 - 1s - loss: 1.8347 - acc: 0.9580 - val_loss: 1.7423 - val_acc: 0.9070
Epoch 9/55
 - 1s - loss: 1.1723 - acc: 0.9537 - val_loss: 1.2949 - val_acc: 0.8392
Epoch 10/55
 - 1s - loss: 0.8216 - acc: 0.9486 - val_loss: 1.0811 - val_acc: 0.7686
Epoch 11/55
 - 1s - loss: 0.6169 - acc: 0.9556 - val_loss: 0.8366 - val_acc: 0.9164
Epoch 12/55
 - 1s - loss: 0.5018 - acc: 0.9635 - val_loss: 0.7682 - val_acc: 0.8969
Epoch 13/55
 - 1s - loss: 0.4510 - acc: 0.9601 - val_loss: 0.7364 - val_acc: 0.8839
Epoch 14/55
 - 1s - loss: 0.4088 - acc: 0.9623 - val_loss: 0.6839 - val_acc: 0.9185
Epoch 15/55
 - 1s - loss: 0.3900 - acc: 0.9583 - val_loss: 0.6414 - val_acc: 0.9293
Epoch 16/55
 - 1s - loss: 0.3683 - acc: 0.9616 - val_loss: 0.6925 - val_acc: 0.8255
Epoch 17/55
 - 1s - loss: 0.3553 - acc: 0.9650 - val_loss: 0.5912 - val_acc: 0.9344
Epoch 18/55
 - 1s - loss: 0.3294 - acc: 0.9720 - val_loss: 0.6102 - val_acc: 0.9048
Epoch 19/55
 - 1s - loss: 0.3437 - acc: 0.9650 - val_loss: 0.6073 - val_acc: 0.8868
Epoch 20/55
 - 1s - loss: 0.3193 - acc: 0.9735 - val_loss: 0.5734 - val_acc: 0.9084
Epoch 21/55
 - 1s - loss: 0.3015 - acc: 0.9720 - val_loss: 0.5683 - val_acc: 0.9257
Epoch 22/55
 - 1s - loss: 0.2988 - acc: 0.9763 - val_loss: 0.5565 - val_acc: 0.9142
Epoch 23/55
 - 1s - loss: 0.2792 - acc: 0.9769 - val_loss: 0.5253 - val_acc: 0.9272
Epoch 24/55
```

```
            - 1s - loss: 0.2669 - acc: 0.9775 - val_loss: 0.5467 - val_acc: 0.8998
Epoch 25/55
            - 1s - loss: 0.2644 - acc: 0.9756 - val_loss: 0.5272 - val_acc: 0.9135
Epoch 26/55
            - 1s - loss: 0.2680 - acc: 0.9760 - val_loss: 0.4899 - val_acc: 0.9301
Epoch 27/55
            - 1s - loss: 0.2726 - acc: 0.9732 - val_loss: 0.4792 - val_acc: 0.9445
Epoch 28/55
            - 1s - loss: 0.2729 - acc: 0.9693 - val_loss: 0.5061 - val_acc: 0.9092
Epoch 29/55
            - 1s - loss: 0.2439 - acc: 0.9793 - val_loss: 0.4593 - val_acc: 0.9474
Epoch 30/55
            - 1s - loss: 0.2440 - acc: 0.9766 - val_loss: 0.4677 - val_acc: 0.9394
Epoch 31/55
            - 1s - loss: 0.2332 - acc: 0.9799 - val_loss: 0.4315 - val_acc: 0.9546
Epoch 32/55
            - 1s - loss: 0.2480 - acc: 0.9756 - val_loss: 0.4309 - val_acc: 0.9423
Epoch 33/55
            - 1s - loss: 0.2471 - acc: 0.9720 - val_loss: 0.4712 - val_acc: 0.9070
Epoch 34/55
            - 1s - loss: 0.2200 - acc: 0.9820 - val_loss: 0.4916 - val_acc: 0.8818
Epoch 35/55
            - 1s - loss: 0.2124 - acc: 0.9814 - val_loss: 0.4078 - val_acc: 0.9517
Epoch 36/55
            - 1s - loss: 0.2110 - acc: 0.9836 - val_loss: 0.4272 - val_acc: 0.9380
Epoch 37/55
            - 1s - loss: 0.2227 - acc: 0.9766 - val_loss: 0.4558 - val_acc: 0.9164
Epoch 38/55
            - 1s - loss: 0.2109 - acc: 0.9845 - val_loss: 0.4269 - val_acc: 0.9185
Epoch 39/55
            - 1s - loss: 0.2175 - acc: 0.9796 - val_loss: 0.4465 - val_acc: 0.9113
Epoch 40/55
            - 1s - loss: 0.2018 - acc: 0.9842 - val_loss: 0.4697 - val_acc: 0.8983
Epoch 41/55
            - 1s - loss: 0.1949 - acc: 0.9881 - val_loss: 0.3965 - val_acc: 0.9402
Epoch 42/55
            - 1s - loss: 0.1956 - acc: 0.9857 - val_loss: 0.4165 - val_acc: 0.9142
Epoch 43/55
            - 1s - loss: 0.1903 - acc: 0.9860 - val_loss: 0.4023 - val_acc: 0.9286
Epoch 44/55
            - 1s - loss: 0.1860 - acc: 0.9875 - val_loss: 0.4103 - val_acc: 0.9279
Epoch 45/55
            - 1s - loss: 0.1938 - acc: 0.9793 - val_loss: 0.6222 - val_acc: 0.8053
```

```
Epoch 46/55
 - 1s - loss: 0.2138 - acc: 0.9799 - val_loss: 0.3911 - val_acc: 0.9286
Epoch 47/55
 - 1s - loss: 0.1574 - acc: 0.9942 - val_loss: 0.3855 - val_acc: 0.9423
Epoch 48/55
 - 1s - loss: 0.1796 - acc: 0.9851 - val_loss: 0.4130 - val_acc: 0.9178
Epoch 49/55
 - 1s - loss: 0.1885 - acc: 0.9820 - val_loss: 0.3574 - val_acc: 0.9466
Epoch 50/55
 - 1s - loss: 0.1784 - acc: 0.9854 - val_loss: 0.3530 - val_acc: 0.9416
Epoch 51/55
 - 1s - loss: 0.1615 - acc: 0.9860 - val_loss: 0.3983 - val_acc: 0.8998
Epoch 52/55
 - 1s - loss: 0.1663 - acc: 0.9884 - val_loss: 0.3644 - val_acc: 0.9380
Epoch 53/55
 - 1s - loss: 0.1531 - acc: 0.9912 - val_loss: 0.3698 - val_acc: 0.9409
Epoch 54/55
 - 1s - loss: 0.1731 - acc: 0.9836 - val_loss: 0.3621 - val_acc: 0.9322
Epoch 55/55
 - 1s - loss: 0.1482 - acc: 0.9918 - val_loss: 0.3392 - val_acc: 0.9517
Train accuracy 0.9990867579908675 Test accuracy: 0.9516943042537851
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 24.2610 - acc: 0.6654 - val_loss: 12.0453 - val_acc: 0.8933
Epoch 2/55
 - 2s - loss: 6.5776 - acc: 0.9671 - val_loss: 3.3836 - val_acc: 0.9200
Epoch 3/55
 - 2s - loss: 1.7335 - acc: 0.9909 - val_loss: 1.1485 - val_acc: 0.8969
Epoch 4/55
 - 2s - loss: 0.5381 - acc: 0.9881 - val_loss: 0.5616 - val_acc: 0.9517
Epoch 5/55
 - 2s - loss: 0.2641 - acc: 0.9890 - val_loss: 0.4568 - val_acc: 0.9308
Epoch 6/55
 - 2s - loss: 0.1953 - acc: 0.9896 - val_loss: 0.3689 - val_acc: 0.9632
Epoch 7/55
 - 2s - loss: 0.1582 - acc: 0.9924 - val_loss: 0.4338 - val_acc: 0.9193
Epoch 8/55
 - 2s - loss: 0.1699 - acc: 0.9909 - val_loss: 0.3995 - val_acc: 0.8983
Epoch 9/55
 - 2s - loss: 0.1369 - acc: 0.9948 - val_loss: 0.2801 - val_acc: 0.9748
Epoch 10/55
 - 2s - loss: 0.1242 - acc: 0.9957 - val_loss: 0.2946 - val_acc: 0.9575
Epoch 11/55
 - 2s - loss: 0.1174 - acc: 0.9957 - val_loss: 0.2937 - val_acc: 0.9452
Epoch 12/55
 - 2s - loss: 0.1305 - acc: 0.9884 - val_loss: 0.3544 - val_acc: 0.9265
Epoch 13/55
 - 2s - loss: 0.1139 - acc: 0.9942 - val_loss: 0.2651 - val_acc: 0.9589
Epoch 14/55
 - 2s - loss: 0.0931 - acc: 0.9973 - val_loss: 0.2543 - val_acc: 0.9596
Epoch 15/55
 - 2s - loss: 0.1182 - acc: 0.9896 - val_loss: 0.2453 - val_acc: 0.9719
Epoch 16/55
 - 2s - loss: 0.0926 - acc: 0.9982 - val_loss: 0.2264 - val_acc: 0.9755
Epoch 17/55
 - 2s - loss: 0.0947 - acc: 0.9933 - val_loss: 0.2458 - val_acc: 0.9553
Epoch 18/55
 - 2s - loss: 0.0803 - acc: 0.9988 - val_loss: 0.2151 - val_acc: 0.9755
Epoch 19/55
 - 2s - loss: 0.0931 - acc: 0.9915 - val_loss: 0.2643 - val_acc: 0.9481
Epoch 20/55
 - 2s - loss: 0.1049 - acc: 0.9936 - val_loss: 0.2093 - val_acc: 0.9784
Epoch 21/55
```

```
          - 2s - loss: 0.0666 - acc: 0.9994 - val_loss: 0.2250 - val_acc: 0.9683
Epoch 22/55
          - 2s - loss: 0.0722 - acc: 0.9982 - val_loss: 0.2065 - val_acc: 0.9740
Epoch 23/55
          - 2s - loss: 0.0997 - acc: 0.9909 - val_loss: 0.1904 - val_acc: 0.9805
Epoch 24/55
          - 2s - loss: 0.1258 - acc: 0.9854 - val_loss: 0.2518 - val_acc: 0.9416
Epoch 25/55
          - 2s - loss: 0.1222 - acc: 0.9887 - val_loss: 0.1980 - val_acc: 0.9719
Epoch 26/55
          - 2s - loss: 0.0668 - acc: 0.9991 - val_loss: 0.2233 - val_acc: 0.9466
Epoch 27/55
          - 2s - loss: 0.0613 - acc: 0.9997 - val_loss: 0.2042 - val_acc: 0.9733
Epoch 28/55
          - 2s - loss: 0.0872 - acc: 0.9903 - val_loss: 0.2346 - val_acc: 0.9539
Epoch 29/55
          - 2s - loss: 0.0836 - acc: 0.9939 - val_loss: 0.1961 - val_acc: 0.9704
Epoch 30/55
          - 2s - loss: 0.0848 - acc: 0.9939 - val_loss: 0.1701 - val_acc: 0.9776
Epoch 31/55
          - 2s - loss: 0.0578 - acc: 0.9997 - val_loss: 0.1688 - val_acc: 0.9827
Epoch 32/55
          - 2s - loss: 0.0536 - acc: 0.9997 - val_loss: 0.1721 - val_acc: 0.9820
Epoch 33/55
          - 2s - loss: 0.0510 - acc: 0.9994 - val_loss: 0.1908 - val_acc: 0.9654
Epoch 34/55
          - 2s - loss: 0.1275 - acc: 0.9814 - val_loss: 0.5246 - val_acc: 0.8825
Epoch 35/55
          - 2s - loss: 0.1794 - acc: 0.9848 - val_loss: 0.2162 - val_acc: 0.9697
Epoch 36/55
          - 2s - loss: 0.0740 - acc: 0.9994 - val_loss: 0.1895 - val_acc: 0.9654
Epoch 37/55
          - 2s - loss: 0.0570 - acc: 0.9982 - val_loss: 0.1722 - val_acc: 0.9769
Epoch 38/55
          - 2s - loss: 0.1147 - acc: 0.9860 - val_loss: 0.1601 - val_acc: 0.9791
Epoch 39/55
          - 2s - loss: 0.0564 - acc: 0.9997 - val_loss: 0.1655 - val_acc: 0.9805
Epoch 40/55
          - 2s - loss: 0.0487 - acc: 0.9997 - val_loss: 0.1759 - val_acc: 0.9776
Epoch 41/55
          - 2s - loss: 0.0455 - acc: 1.0000 - val_loss: 0.1628 - val_acc: 0.9776
Epoch 42/55
          - 2s - loss: 0.1045 - acc: 0.9845 - val_loss: 0.1860 - val_acc: 0.9769
```

```
Epoch 43/55
 - 2s - loss: 0.0968 - acc: 0.9957 - val_loss: 0.1811 - val_acc: 0.9733
Epoch 44/55
 - 2s - loss: 0.0524 - acc: 1.0000 - val_loss: 0.1792 - val_acc: 0.9762
Epoch 45/55
 - 2s - loss: 0.0503 - acc: 0.9985 - val_loss: 0.1859 - val_acc: 0.9733
Epoch 46/55
 - 2s - loss: 0.0432 - acc: 0.9997 - val_loss: 0.1832 - val_acc: 0.9769
Epoch 47/55
 - 2s - loss: 0.1126 - acc: 0.9817 - val_loss: 0.4094 - val_acc: 0.9394
Epoch 48/55
 - 2s - loss: 0.1503 - acc: 0.9845 - val_loss: 0.1592 - val_acc: 0.9813
Epoch 49/55
 - 2s - loss: 0.0602 - acc: 0.9997 - val_loss: 0.1871 - val_acc: 0.9719
Epoch 50/55
 - 2s - loss: 0.0482 - acc: 1.0000 - val_loss: 0.1717 - val_acc: 0.9769
Epoch 51/55
 - 2s - loss: 0.0430 - acc: 0.9997 - val_loss: 0.1693 - val_acc: 0.9776
Epoch 52/55
 - 2s - loss: 0.0407 - acc: 0.9997 - val_loss: 0.1795 - val_acc: 0.9755
Epoch 53/55
 - 2s - loss: 0.0627 - acc: 0.9924 - val_loss: 0.2183 - val_acc: 0.9582
Epoch 54/55
 - 2s - loss: 0.1270 - acc: 0.9833 - val_loss: 0.2117 - val_acc: 0.9676
Epoch 55/55
 - 2s - loss: 0.0712 - acc: 0.9988 - val_loss: 0.1676 - val_acc: 0.9697
Train accuracy 1.0 Test accuracy: 0.969718817591925
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584

```
dense_2 (Dense)                (None, 3)                    99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 33.8299 - acc: 0.6201 - val_loss: 18.2040 - val_acc: 0.8140
Epoch 2/35
 - 2s - loss: 10.6449 - acc: 0.9549 - val_loss: 5.8735 - val_acc: 0.8789
Epoch 3/35
 - 2s - loss: 3.2984 - acc: 0.9805 - val_loss: 2.0599 - val_acc: 0.8609
Epoch 4/35
 - 2s - loss: 1.0674 - acc: 0.9863 - val_loss: 0.8590 - val_acc: 0.9459
Epoch 5/35
 - 2s - loss: 0.4261 - acc: 0.9924 - val_loss: 0.5510 - val_acc: 0.9481
Epoch 6/35
 - 2s - loss: 0.2629 - acc: 0.9887 - val_loss: 0.4369 - val_acc: 0.9618
Epoch 7/35
 - 2s - loss: 0.1953 - acc: 0.9948 - val_loss: 0.4420 - val_acc: 0.9301
Epoch 8/35
 - 2s - loss: 0.1912 - acc: 0.9927 - val_loss: 0.4204 - val_acc: 0.9193
Epoch 9/35
 - 2s - loss: 0.1792 - acc: 0.9893 - val_loss: 0.3220 - val_acc: 0.9748
Epoch 10/35
 - 2s - loss: 0.1549 - acc: 0.9942 - val_loss: 0.3557 - val_acc: 0.9402
Epoch 11/35
 - 2s - loss: 0.1372 - acc: 0.9967 - val_loss: 0.3288 - val_acc: 0.9517
Epoch 12/35
 - 2s - loss: 0.1446 - acc: 0.9896 - val_loss: 0.3371 - val_acc: 0.9308
Epoch 13/35
 - 2s - loss: 0.1271 - acc: 0.9951 - val_loss: 0.3084 - val_acc: 0.9690
Epoch 14/35
 - 2s - loss: 0.1133 - acc: 0.9960 - val_loss: 0.2901 - val_acc: 0.9531
Epoch 15/35
 - 2s - loss: 0.1421 - acc: 0.9857 - val_loss: 0.2872 - val_acc: 0.9690
Epoch 16/35
 - 2s - loss: 0.1090 - acc: 0.9979 - val_loss: 0.2575 - val_acc: 0.9798
Epoch 17/35
 - 2s - loss: 0.1059 - acc: 0.9951 - val_loss: 0.2560 - val_acc: 0.9654
Epoch 18/35
```

```
           - 2s - loss: 0.0934 - acc: 0.9988 - val_loss: 0.2535 - val_acc: 0.9683
          Epoch 19/35
           - 2s - loss: 0.1594 - acc: 0.9787 - val_loss: 0.3837 - val_acc: 0.9214
          Epoch 20/35
           - 2s - loss: 0.1409 - acc: 0.9924 - val_loss: 0.2385 - val_acc: 0.9748
          Epoch 21/35
           - 2s - loss: 0.0863 - acc: 0.9991 - val_loss: 0.2497 - val_acc: 0.9676
          Epoch 22/35
           - 2s - loss: 0.0820 - acc: 0.9988 - val_loss: 0.2385 - val_acc: 0.9697
          Epoch 23/35
           - 2s - loss: 0.0827 - acc: 0.9979 - val_loss: 0.2227 - val_acc: 0.9791
          Epoch 24/35
           - 2s - loss: 0.0984 - acc: 0.9930 - val_loss: 0.2144 - val_acc: 0.9704
          Epoch 25/35
           - 2s - loss: 0.1146 - acc: 0.9921 - val_loss: 0.2358 - val_acc: 0.9668
          Epoch 26/35
           - 2s - loss: 0.0771 - acc: 1.0000 - val_loss: 0.2416 - val_acc: 0.9546
          Epoch 27/35
           - 2s - loss: 0.0706 - acc: 1.0000 - val_loss: 0.1986 - val_acc: 0.9849
          Epoch 28/35
           - 2s - loss: 0.1028 - acc: 0.9900 - val_loss: 0.2284 - val_acc: 0.9625
          Epoch 29/35
           - 2s - loss: 0.0775 - acc: 0.9991 - val_loss: 0.2125 - val_acc: 0.9647
          Epoch 30/35
           - 2s - loss: 0.0747 - acc: 0.9957 - val_loss: 0.2263 - val_acc: 0.9603
          Epoch 31/35
           - 2s - loss: 0.0717 - acc: 0.9985 - val_loss: 0.1841 - val_acc: 0.9805
          Epoch 32/35
           - 2s - loss: 0.1216 - acc: 0.9854 - val_loss: 0.2781 - val_acc: 0.9236
          Epoch 33/35
           - 2s - loss: 0.0819 - acc: 0.9988 - val_loss: 0.2039 - val_acc: 0.9755
          Epoch 34/35
           - 2s - loss: 0.0636 - acc: 0.9991 - val_loss: 0.1936 - val_acc: 0.9748
          Epoch 35/35
           - 2s - loss: 0.0624 - acc: 0.9979 - val_loss: 0.2231 - val_acc: 0.9640
          Train accuracy 0.9996955859969558 Test accuracy: 0.9639509733237203
          ----------------------------------------------------------------------------

          _____
          Layer (type)                 Output Shape              Param #
          ================================================================
          conv1d_1 (Conv1D)            (None, 122, 32)           2048
          _____
          conv1d_2 (Conv1D)            (None, 116, 32)           7200
```

```
dropout_1 (Dropout)              (None, 116, 32)              0
_____
max_pooling1d_1 (MaxPooling1 (None, 23, 32)                   0
_____
flatten_1 (Flatten)              (None, 736)                  0
_____
dense_1 (Dense)                  (None, 32)                   23584
_____
dense_2 (Dense)                  (None, 3)                    99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 12.4054 - acc: 0.6880 - val_loss: 2.9512 - val_acc: 0.8991
Epoch 2/35
 - 2s - loss: 1.0416 - acc: 0.9799 - val_loss: 0.5244 - val_acc: 0.9510
Epoch 3/35
 - 2s - loss: 0.2410 - acc: 0.9839 - val_loss: 0.4275 - val_acc: 0.9236
Epoch 4/35
 - 2s - loss: 0.1772 - acc: 0.9909 - val_loss: 0.3098 - val_acc: 0.9539
Epoch 5/35
 - 2s - loss: 0.1723 - acc: 0.9866 - val_loss: 0.3970 - val_acc: 0.9481
Epoch 6/35
 - 2s - loss: 0.1348 - acc: 0.9960 - val_loss: 0.2674 - val_acc: 0.9589
Epoch 7/35
 - 2s - loss: 0.1275 - acc: 0.9915 - val_loss: 0.2340 - val_acc: 0.9712
Epoch 8/35
 - 2s - loss: 0.1021 - acc: 0.9979 - val_loss: 0.2558 - val_acc: 0.9567
Epoch 9/35
 - 2s - loss: 0.1390 - acc: 0.9872 - val_loss: 0.2929 - val_acc: 0.9618
Epoch 10/35
 - 2s - loss: 0.0993 - acc: 1.0000 - val_loss: 0.2197 - val_acc: 0.9690
Epoch 11/35
 - 2s - loss: 0.1208 - acc: 0.9939 - val_loss: 0.2199 - val_acc: 0.9654
Epoch 12/35
 - 2s - loss: 0.0836 - acc: 0.9985 - val_loss: 0.4287 - val_acc: 0.8601
Epoch 13/35
 - 2s - loss: 0.1126 - acc: 0.9936 - val_loss: 0.1780 - val_acc: 0.9762
```

```
Epoch 14/35
 - 2s - loss: 0.0804 - acc: 0.9960 - val_loss: 0.2246 - val_acc: 0.9603
Epoch 15/35
 - 2s - loss: 0.0809 - acc: 0.9967 - val_loss: 0.2218 - val_acc: 0.9625
Epoch 16/35
 - 2s - loss: 0.0822 - acc: 0.9948 - val_loss: 0.1725 - val_acc: 0.9733
Epoch 17/35
 - 2s - loss: 0.1170 - acc: 0.9890 - val_loss: 0.2205 - val_acc: 0.9791
Epoch 18/35
 - 2s - loss: 0.0730 - acc: 0.9991 - val_loss: 0.1871 - val_acc: 0.9712
Epoch 19/35
 - 2s - loss: 0.0549 - acc: 0.9991 - val_loss: 0.1535 - val_acc: 0.9740
Epoch 20/35
 - 2s - loss: 0.0585 - acc: 0.9985 - val_loss: 0.1716 - val_acc: 0.9733
Epoch 21/35
 - 2s - loss: 0.0578 - acc: 0.9960 - val_loss: 0.2746 - val_acc: 0.9293
Epoch 22/35
 - 2s - loss: 0.0880 - acc: 0.9960 - val_loss: 0.1761 - val_acc: 0.9640
Epoch 23/35
 - 2s - loss: 0.0687 - acc: 0.9967 - val_loss: 0.2233 - val_acc: 0.9611
Epoch 24/35
 - 2s - loss: 0.0599 - acc: 0.9963 - val_loss: 0.2014 - val_acc: 0.9582
Epoch 25/35
 - 2s - loss: 0.0595 - acc: 0.9982 - val_loss: 0.2330 - val_acc: 0.9589
Epoch 26/35
 - 2s - loss: 0.0738 - acc: 0.9951 - val_loss: 0.1452 - val_acc: 0.9740
Epoch 27/35
 - 2s - loss: 0.0546 - acc: 0.9970 - val_loss: 0.2822 - val_acc: 0.9524
Epoch 28/35
 - 2s - loss: 0.0627 - acc: 0.9985 - val_loss: 0.1997 - val_acc: 0.9510
Epoch 29/35
 - 2s - loss: 0.0446 - acc: 0.9979 - val_loss: 0.2828 - val_acc: 0.9106
Epoch 30/35
 - 2s - loss: 0.0537 - acc: 0.9957 - val_loss: 0.2731 - val_acc: 0.9358
Epoch 31/35
 - 2s - loss: 0.0638 - acc: 0.9973 - val_loss: 0.1536 - val_acc: 0.9769
Epoch 32/35
 - 2s - loss: 0.0382 - acc: 0.9994 - val_loss: 0.1363 - val_acc: 0.9769
Epoch 33/35
 - 2s - loss: 0.0401 - acc: 0.9988 - val_loss: 0.1391 - val_acc: 0.9697
Epoch 34/35
 - 2s - loss: 0.0415 - acc: 0.9976 - val_loss: 0.1227 - val_acc: 0.9769
Epoch 35/35
```

```
 - 2s - loss: 0.0338 - acc: 0.9997 - val_loss: 0.2562 - val_acc: 0.9402
Train accuracy 0.9929984779481292 Test accuracy: 0.9401586157173756
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 118, 32)	5152
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
=================================================================
Total params: 30,883
Trainable params: 30,883
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 30.0575 - acc: 0.5872 - val_loss: 12.1152 - val_acc: 0.8652
Epoch 2/55
 - 1s - loss: 5.6932 - acc: 0.9534 - val_loss: 2.3814 - val_acc: 0.9344
Epoch 3/55
 - 1s - loss: 1.0691 - acc: 0.9842 - val_loss: 0.7974 - val_acc: 0.9156
Epoch 4/55
 - 1s - loss: 0.3638 - acc: 0.9863 - val_loss: 0.5032 - val_acc: 0.9560
Epoch 5/55
 - 1s - loss: 0.2435 - acc: 0.9872 - val_loss: 0.4398 - val_acc: 0.9387
Epoch 6/55
 - 1s - loss: 0.1944 - acc: 0.9912 - val_loss: 0.3969 - val_acc: 0.9582
Epoch 7/55
 - 1s - loss: 0.1620 - acc: 0.9963 - val_loss: 0.3830 - val_acc: 0.9358
Epoch 8/55
 - 1s - loss: 0.2009 - acc: 0.9830 - val_loss: 0.3909 - val_acc: 0.9286
Epoch 9/55
```

```
                 - 1s - loss: 0.1693 - acc: 0.9900 - val_loss: 0.2936 - val_acc: 0.9712
          Epoch 10/55
                 - 1s - loss: 0.1812 - acc: 0.9823 - val_loss: 0.4286 - val_acc: 0.9041
          Epoch 11/55
                 - 1s - loss: 0.1438 - acc: 0.9939 - val_loss: 0.3309 - val_acc: 0.9481
          Epoch 12/55
                 - 1s - loss: 0.1416 - acc: 0.9881 - val_loss: 0.3438 - val_acc: 0.9293
          Epoch 13/55
                 - 1s - loss: 0.1245 - acc: 0.9924 - val_loss: 0.3138 - val_acc: 0.9488
          Epoch 14/55
                 - 1s - loss: 0.1335 - acc: 0.9896 - val_loss: 0.3081 - val_acc: 0.9474
          Epoch 15/55
                 - 1s - loss: 0.1384 - acc: 0.9878 - val_loss: 0.2589 - val_acc: 0.9726
          Epoch 16/55
                 - 1s - loss: 0.1192 - acc: 0.9924 - val_loss: 0.2488 - val_acc: 0.9762
          Epoch 17/55
                 - 1s - loss: 0.1166 - acc: 0.9890 - val_loss: 0.2562 - val_acc: 0.9654
          Epoch 18/55
                 - 1s - loss: 0.1190 - acc: 0.9906 - val_loss: 0.2675 - val_acc: 0.9488
          Epoch 19/55
                 - 1s - loss: 0.2077 - acc: 0.9677 - val_loss: 0.4630 - val_acc: 0.9092
          Epoch 20/55
                 - 1s - loss: 0.1670 - acc: 0.9909 - val_loss: 0.2331 - val_acc: 0.9726
          Epoch 21/55
                 - 1s - loss: 0.0956 - acc: 0.9973 - val_loss: 0.2826 - val_acc: 0.9553
          Epoch 22/55
                 - 1s - loss: 0.0888 - acc: 0.9960 - val_loss: 0.2486 - val_acc: 0.9654
          Epoch 23/55
                 - 1s - loss: 0.1057 - acc: 0.9906 - val_loss: 0.3201 - val_acc: 0.9142
          Epoch 24/55
                 - 1s - loss: 0.1493 - acc: 0.9830 - val_loss: 0.2374 - val_acc: 0.9676
          Epoch 25/55
                 - 1s - loss: 0.0972 - acc: 0.9942 - val_loss: 0.2333 - val_acc: 0.9654
          Epoch 26/55
                 - 1s - loss: 0.0801 - acc: 0.9976 - val_loss: 0.2245 - val_acc: 0.9632
          Epoch 27/55
                 - 1s - loss: 0.0749 - acc: 0.9982 - val_loss: 0.2245 - val_acc: 0.9748
          Epoch 28/55
                 - 1s - loss: 0.1147 - acc: 0.9851 - val_loss: 0.4022 - val_acc: 0.9012
          Epoch 29/55
                 - 1s - loss: 0.2274 - acc: 0.9717 - val_loss: 0.2786 - val_acc: 0.9582
          Epoch 30/55
                 - 1s - loss: 0.0912 - acc: 0.9982 - val_loss: 0.2470 - val_acc: 0.9495
```

```
Epoch 31/55
 - 1s - loss: 0.0718 - acc: 0.9985 - val_loss: 0.2468 - val_acc: 0.9647
Epoch 32/55
 - 1s - loss: 0.0700 - acc: 0.9982 - val_loss: 0.2151 - val_acc: 0.9676
Epoch 33/55
 - 1s - loss: 0.1409 - acc: 0.9805 - val_loss: 0.3086 - val_acc: 0.9387
Epoch 34/55
 - 1s - loss: 0.0795 - acc: 0.9988 - val_loss: 0.2519 - val_acc: 0.9596
Epoch 35/55
 - 1s - loss: 0.0678 - acc: 0.9973 - val_loss: 0.2300 - val_acc: 0.9596
Epoch 36/55
 - 1s - loss: 0.0679 - acc: 0.9979 - val_loss: 0.2563 - val_acc: 0.9560
Epoch 37/55
 - 1s - loss: 0.1323 - acc: 0.9866 - val_loss: 0.2214 - val_acc: 0.9625
Epoch 38/55
 - 1s - loss: 0.0722 - acc: 0.9963 - val_loss: 0.2683 - val_acc: 0.9308
Epoch 39/55
 - 1s - loss: 0.2114 - acc: 0.9677 - val_loss: 0.2797 - val_acc: 0.9510
Epoch 40/55
 - 1s - loss: 0.1066 - acc: 0.9948 - val_loss: 0.2120 - val_acc: 0.9625
Epoch 41/55
 - 1s - loss: 0.0696 - acc: 0.9994 - val_loss: 0.2382 - val_acc: 0.9495
Epoch 42/55
 - 1s - loss: 0.0602 - acc: 0.9994 - val_loss: 0.2280 - val_acc: 0.9495
Epoch 43/55
 - 1s - loss: 0.0672 - acc: 0.9976 - val_loss: 0.2233 - val_acc: 0.9632
Epoch 44/55
 - 1s - loss: 0.0768 - acc: 0.9933 - val_loss: 0.2257 - val_acc: 0.9618
Epoch 45/55
 - 1s - loss: 0.0836 - acc: 0.9921 - val_loss: 0.4462 - val_acc: 0.8342
Epoch 46/55
 - 1s - loss: 0.1921 - acc: 0.9763 - val_loss: 0.2439 - val_acc: 0.9517
Epoch 47/55
 - 1s - loss: 0.0740 - acc: 0.9988 - val_loss: 0.2807 - val_acc: 0.9416
Epoch 48/55
 - 1s - loss: 0.0850 - acc: 0.9921 - val_loss: 0.2659 - val_acc: 0.9358
Epoch 49/55
 - 1s - loss: 0.0888 - acc: 0.9933 - val_loss: 0.2086 - val_acc: 0.9683
Epoch 50/55
 - 1s - loss: 0.0752 - acc: 0.9954 - val_loss: 0.2088 - val_acc: 0.9676
Epoch 51/55
 - 1s - loss: 0.1111 - acc: 0.9866 - val_loss: 0.2327 - val_acc: 0.9647
Epoch 52/55
```

```
 - 1s - loss: 0.0739 - acc: 0.9967 - val_loss: 0.1805 - val_acc: 0.9712
Epoch 53/55
 - 1s - loss: 0.0908 - acc: 0.9887 - val_loss: 0.2454 - val_acc: 0.9495
Epoch 54/55
 - 1s - loss: 0.0988 - acc: 0.9918 - val_loss: 0.3255 - val_acc: 0.8983
Epoch 55/55
 - 1s - loss: 0.1113 - acc: 0.9900 - val_loss: 0.2279 - val_acc: 0.9524
Train accuracy 0.9984779299847792 Test accuracy: 0.9524152847873107
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 70.6791 - acc: 0.5756 - val_loss: 38.3261 - val_acc: 0.7765
Epoch 2/35
 - 1s - loss: 23.4649 - acc: 0.8743 - val_loss: 13.4407 - val_acc: 0.7895
Epoch 3/35
 - 1s - loss: 8.3101 - acc: 0.9559 - val_loss: 5.1595 - val_acc: 0.8472
Epoch 4/35
 - 1s - loss: 3.1539 - acc: 0.9638 - val_loss: 2.1823 - val_acc: 0.9178
Epoch 5/35
 - 1s - loss: 1.2929 - acc: 0.9778 - val_loss: 1.1255 - val_acc: 0.9329
Epoch 6/35
```

```
        - 1s - loss: 0.6270 - acc: 0.9830 - val_loss: 0.7440 - val_acc: 0.9387
Epoch 7/35
        - 1s - loss: 0.3914 - acc: 0.9903 - val_loss: 0.6129 - val_acc: 0.9250
Epoch 8/35
        - 1s - loss: 0.3157 - acc: 0.9893 - val_loss: 0.5490 - val_acc: 0.9329
Epoch 9/35
        - 1s - loss: 0.2709 - acc: 0.9924 - val_loss: 0.4815 - val_acc: 0.9503
Epoch 10/35
        - 1s - loss: 0.2625 - acc: 0.9857 - val_loss: 0.5425 - val_acc: 0.8832
Epoch 11/35
        - 1s - loss: 0.2370 - acc: 0.9900 - val_loss: 0.4596 - val_acc: 0.9560
Epoch 12/35
        - 1s - loss: 0.2260 - acc: 0.9878 - val_loss: 0.4211 - val_acc: 0.9690
Epoch 13/35
        - 1s - loss: 0.2071 - acc: 0.9918 - val_loss: 0.4161 - val_acc: 0.9582
Epoch 14/35
        - 1s - loss: 0.1857 - acc: 0.9957 - val_loss: 0.3968 - val_acc: 0.9582
Epoch 15/35
        - 1s - loss: 0.1903 - acc: 0.9927 - val_loss: 0.3718 - val_acc: 0.9712
Epoch 16/35
        - 1s - loss: 0.1816 - acc: 0.9930 - val_loss: 0.3703 - val_acc: 0.9690
Epoch 17/35
        - 1s - loss: 0.1738 - acc: 0.9942 - val_loss: 0.3362 - val_acc: 0.9762
Epoch 18/35
        - 1s - loss: 0.1583 - acc: 0.9967 - val_loss: 0.3643 - val_acc: 0.9488
Epoch 19/35
        - 1s - loss: 0.2171 - acc: 0.9763 - val_loss: 0.3535 - val_acc: 0.9640
Epoch 20/35
        - 1s - loss: 0.1754 - acc: 0.9924 - val_loss: 0.3488 - val_acc: 0.9546
Epoch 21/35
        - 1s - loss: 0.1424 - acc: 0.9976 - val_loss: 0.3295 - val_acc: 0.9733
Epoch 22/35
        - 1s - loss: 0.1398 - acc: 0.9963 - val_loss: 0.3283 - val_acc: 0.9625
Epoch 23/35
        - 1s - loss: 0.1405 - acc: 0.9967 - val_loss: 0.2996 - val_acc: 0.9769
Epoch 24/35
        - 1s - loss: 0.1535 - acc: 0.9893 - val_loss: 0.3000 - val_acc: 0.9668
Epoch 25/35
        - 1s - loss: 0.1387 - acc: 0.9936 - val_loss: 0.3070 - val_acc: 0.9531
Epoch 26/35
        - 1s - loss: 0.1352 - acc: 0.9930 - val_loss: 0.3288 - val_acc: 0.9445
Epoch 27/35
        - 1s - loss: 0.1318 - acc: 0.9939 - val_loss: 0.2590 - val_acc: 0.9748
```

```
Epoch 28/35
 - 1s - loss: 0.1591 - acc: 0.9848 - val_loss: 0.3034 - val_acc: 0.9567
Epoch 29/35
 - 1s - loss: 0.1210 - acc: 0.9957 - val_loss: 0.2993 - val_acc: 0.9539
Epoch 30/35
 - 1s - loss: 0.1226 - acc: 0.9957 - val_loss: 0.2751 - val_acc: 0.9704
Epoch 31/35
 - 1s - loss: 0.1132 - acc: 0.9963 - val_loss: 0.2688 - val_acc: 0.9611
Epoch 32/35
 - 1s - loss: 0.2361 - acc: 0.9662 - val_loss: 0.3697 - val_acc: 0.9488
Epoch 33/35
 - 1s - loss: 0.1433 - acc: 0.9948 - val_loss: 0.2660 - val_acc: 0.9726
Epoch 34/35
 - 1s - loss: 0.1096 - acc: 0.9973 - val_loss: 0.2511 - val_acc: 0.9791
Epoch 35/35
 - 1s - loss: 0.1080 - acc: 0.9967 - val_loss: 0.2602 - val_acc: 0.9740
Train accuracy 1.0 Test accuracy: 0.9740447007930786
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 68.5268 - acc: 0.5869 - val_loss: 28.5923 - val_acc: 0.7505
```

```
Epoch 2/55
 - 1s - loss: 15.0941 - acc: 0.8810 - val_loss: 7.1496 - val_acc: 0.8234
Epoch 3/55
 - 1s - loss: 3.8607 - acc: 0.9391 - val_loss: 2.1828 - val_acc: 0.8522
Epoch 4/55
 - 1s - loss: 1.1669 - acc: 0.9641 - val_loss: 0.9338 - val_acc: 0.9279
Epoch 5/55
 - 1s - loss: 0.5158 - acc: 0.9726 - val_loss: 0.6667 - val_acc: 0.9185
Epoch 6/55
 - 1s - loss: 0.3637 - acc: 0.9781 - val_loss: 0.5614 - val_acc: 0.9329
Epoch 7/55
 - 1s - loss: 0.2938 - acc: 0.9890 - val_loss: 0.4998 - val_acc: 0.9293
Epoch 8/55
 - 1s - loss: 0.2792 - acc: 0.9845 - val_loss: 0.4622 - val_acc: 0.9531
Epoch 9/55
 - 1s - loss: 0.2464 - acc: 0.9890 - val_loss: 0.4670 - val_acc: 0.9329
Epoch 10/55
 - 1s - loss: 0.2446 - acc: 0.9857 - val_loss: 0.4752 - val_acc: 0.9092
Epoch 11/55
 - 1s - loss: 0.2297 - acc: 0.9857 - val_loss: 0.4182 - val_acc: 0.9387
Epoch 12/55
 - 1s - loss: 0.2303 - acc: 0.9836 - val_loss: 0.4456 - val_acc: 0.9149
Epoch 13/55
 - 1s - loss: 0.2006 - acc: 0.9906 - val_loss: 0.4089 - val_acc: 0.9358
Epoch 14/55
 - 1s - loss: 0.1790 - acc: 0.9912 - val_loss: 0.3701 - val_acc: 0.9611
Epoch 15/55
 - 1s - loss: 0.1954 - acc: 0.9869 - val_loss: 0.3411 - val_acc: 0.9647
Epoch 16/55
 - 1s - loss: 0.1785 - acc: 0.9881 - val_loss: 0.3401 - val_acc: 0.9632
Epoch 17/55
 - 1s - loss: 0.1866 - acc: 0.9869 - val_loss: 0.3123 - val_acc: 0.9683
Epoch 18/55
 - 1s - loss: 0.1544 - acc: 0.9948 - val_loss: 0.3460 - val_acc: 0.9481
Epoch 19/55
 - 1s - loss: 0.2052 - acc: 0.9784 - val_loss: 0.3648 - val_acc: 0.9495
Epoch 20/55
 - 1s - loss: 0.1895 - acc: 0.9869 - val_loss: 0.3354 - val_acc: 0.9402
Epoch 21/55
 - 1s - loss: 0.1510 - acc: 0.9927 - val_loss: 0.3350 - val_acc: 0.9423
Epoch 22/55
 - 1s - loss: 0.1482 - acc: 0.9918 - val_loss: 0.3567 - val_acc: 0.9351
Epoch 23/55
```

```
        - 1s - loss: 0.1536 - acc: 0.9927 - val_loss: 0.2985 - val_acc: 0.9546
Epoch 24/55
        - 1s - loss: 0.1860 - acc: 0.9778 - val_loss: 0.3128 - val_acc: 0.9560
Epoch 25/55
        - 1s - loss: 0.1463 - acc: 0.9912 - val_loss: 0.3144 - val_acc: 0.9394
Epoch 26/55
        - 1s - loss: 0.1387 - acc: 0.9909 - val_loss: 0.3460 - val_acc: 0.9250
Epoch 27/55
        - 1s - loss: 0.1514 - acc: 0.9863 - val_loss: 0.2619 - val_acc: 0.9697
Epoch 28/55
        - 1s - loss: 0.1522 - acc: 0.9887 - val_loss: 0.2828 - val_acc: 0.9481
Epoch 29/55
        - 1s - loss: 0.1175 - acc: 0.9954 - val_loss: 0.2857 - val_acc: 0.9589
Epoch 30/55
        - 1s - loss: 0.1317 - acc: 0.9918 - val_loss: 0.2707 - val_acc: 0.9575
Epoch 31/55
        - 1s - loss: 0.1177 - acc: 0.9951 - val_loss: 0.2788 - val_acc: 0.9466
Epoch 32/55
        - 1s - loss: 0.1787 - acc: 0.9781 - val_loss: 0.2763 - val_acc: 0.9582
Epoch 33/55
        - 1s - loss: 0.1150 - acc: 0.9970 - val_loss: 0.2666 - val_acc: 0.9618
Epoch 34/55
        - 1s - loss: 0.1135 - acc: 0.9939 - val_loss: 0.2404 - val_acc: 0.9704
Epoch 35/55
        - 1s - loss: 0.1118 - acc: 0.9951 - val_loss: 0.2910 - val_acc: 0.9387
Epoch 36/55
        - 1s - loss: 0.1319 - acc: 0.9881 - val_loss: 0.2419 - val_acc: 0.9697
Epoch 37/55
        - 1s - loss: 0.1010 - acc: 0.9967 - val_loss: 0.2559 - val_acc: 0.9560
Epoch 38/55
        - 1s - loss: 0.1490 - acc: 0.9820 - val_loss: 0.3134 - val_acc: 0.9142
Epoch 39/55
        - 1s - loss: 0.2256 - acc: 0.9686 - val_loss: 0.4581 - val_acc: 0.8904
Epoch 40/55
        - 1s - loss: 0.1351 - acc: 0.9942 - val_loss: 0.2442 - val_acc: 0.9704
Epoch 41/55
        - 1s - loss: 0.0979 - acc: 0.9979 - val_loss: 0.2374 - val_acc: 0.9654
Epoch 42/55
        - 1s - loss: 0.1542 - acc: 0.9787 - val_loss: 0.3136 - val_acc: 0.9236
Epoch 43/55
        - 1s - loss: 0.1723 - acc: 0.9860 - val_loss: 0.2451 - val_acc: 0.9748
Epoch 44/55
        - 1s - loss: 0.0950 - acc: 0.9985 - val_loss: 0.2617 - val_acc: 0.9668
```

```
Epoch 45/55
 - 1s - loss: 0.0914 - acc: 0.9973 - val_loss: 0.2413 - val_acc: 0.9748
Epoch 46/55
 - 1s - loss: 0.0915 - acc: 0.9970 - val_loss: 0.2641 - val_acc: 0.9589
Epoch 47/55
 - 1s - loss: 0.1132 - acc: 0.9884 - val_loss: 0.3052 - val_acc: 0.9430
Epoch 48/55
 - 1s - loss: 0.1023 - acc: 0.9957 - val_loss: 0.2329 - val_acc: 0.9740
Epoch 49/55
 - 1s - loss: 0.0961 - acc: 0.9945 - val_loss: 0.2479 - val_acc: 0.9539
Epoch 50/55
 - 1s - loss: 0.1503 - acc: 0.9823 - val_loss: 0.3036 - val_acc: 0.9380
Epoch 51/55
 - 1s - loss: 0.0942 - acc: 0.9960 - val_loss: 0.2843 - val_acc: 0.9351
Epoch 52/55
 - 1s - loss: 0.1695 - acc: 0.9729 - val_loss: 0.3425 - val_acc: 0.9481
Epoch 53/55
 - 1s - loss: 0.1568 - acc: 0.9875 - val_loss: 0.2240 - val_acc: 0.9640
Epoch 54/55
 - 1s - loss: 0.1076 - acc: 0.9906 - val_loss: 0.2328 - val_acc: 0.9567
Epoch 55/55
 - 1s - loss: 0.0904 - acc: 0.9960 - val_loss: 0.2556 - val_acc: 0.9358
Train accuracy 0.9908675799086758 Test accuracy: 0.935832732516222
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584
dense_2 (Dense)	(None, 3)	99

```
Total params: 32,931
Trainable params: 32,931
```

```
        Non-trainable params: 0

_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 47.1620 - acc: 0.5833 - val_loss: 23.1930 - val_acc: 0.7736
Epoch 2/35
 - 1s - loss: 13.2359 - acc: 0.8855 - val_loss: 7.1029 - val_acc: 0.8226
Epoch 3/35
 - 1s - loss: 4.1596 - acc: 0.9699 - val_loss: 2.7097 - val_acc: 0.8508
Epoch 4/35
 - 1s - loss: 1.5831 - acc: 0.9790 - val_loss: 1.2738 - val_acc: 0.9358
Epoch 5/35
 - 1s - loss: 0.7208 - acc: 0.9875 - val_loss: 0.7887 - val_acc: 0.9387
Epoch 6/35
 - 1s - loss: 0.4091 - acc: 0.9896 - val_loss: 0.5885 - val_acc: 0.9531
Epoch 7/35
 - 1s - loss: 0.2893 - acc: 0.9918 - val_loss: 0.5150 - val_acc: 0.9423
Epoch 8/35
 - 1s - loss: 0.2429 - acc: 0.9924 - val_loss: 0.4907 - val_acc: 0.9236
Epoch 9/35
 - 1s - loss: 0.2166 - acc: 0.9936 - val_loss: 0.4149 - val_acc: 0.9517
Epoch 10/35
 - 1s - loss: 0.2045 - acc: 0.9939 - val_loss: 0.4684 - val_acc: 0.8919
Epoch 11/35
 - 1s - loss: 0.1843 - acc: 0.9933 - val_loss: 0.3945 - val_acc: 0.9575
Epoch 12/35
 - 1s - loss: 0.1846 - acc: 0.9918 - val_loss: 0.3713 - val_acc: 0.9603
Epoch 13/35
 - 1s - loss: 0.1555 - acc: 0.9979 - val_loss: 0.3550 - val_acc: 0.9640
Epoch 14/35
 - 1s - loss: 0.1453 - acc: 0.9976 - val_loss: 0.3405 - val_acc: 0.9618
Epoch 15/35
 - 1s - loss: 0.1686 - acc: 0.9869 - val_loss: 0.3129 - val_acc: 0.9748
Epoch 16/35
 - 1s - loss: 0.1437 - acc: 0.9954 - val_loss: 0.3288 - val_acc: 0.9503
Epoch 17/35
 - 1s - loss: 0.1369 - acc: 0.9951 - val_loss: 0.3001 - val_acc: 0.9784
Epoch 18/35
 - 1s - loss: 0.1232 - acc: 0.9982 - val_loss: 0.2939 - val_acc: 0.9769
Epoch 19/35
 - 1s - loss: 0.1350 - acc: 0.9918 - val_loss: 0.2713 - val_acc: 0.9704
Epoch 20/35
```

```
        - 1s - loss: 0.1164 - acc: 0.9979 - val_loss: 0.2963 - val_acc: 0.9582
    Epoch 21/35
        - 1s - loss: 0.1104 - acc: 0.9985 - val_loss: 0.2877 - val_acc: 0.9719
    Epoch 22/35
        - 1s - loss: 0.1107 - acc: 0.9967 - val_loss: 0.2949 - val_acc: 0.9517
    Epoch 23/35
        - 1s - loss: 0.1136 - acc: 0.9963 - val_loss: 0.2730 - val_acc: 0.9632
    Epoch 24/35
        - 1s - loss: 0.1278 - acc: 0.9915 - val_loss: 0.2600 - val_acc: 0.9755
    Epoch 25/35
        - 1s - loss: 0.1038 - acc: 0.9973 - val_loss: 0.2705 - val_acc: 0.9582
    Epoch 26/35
        - 1s - loss: 0.1028 - acc: 0.9960 - val_loss: 0.3131 - val_acc: 0.9279
    Epoch 27/35
        - 1s - loss: 0.1055 - acc: 0.9954 - val_loss: 0.2441 - val_acc: 0.9647
    Epoch 28/35
        - 1s - loss: 0.1317 - acc: 0.9887 - val_loss: 0.2317 - val_acc: 0.9798
    Epoch 29/35
        - 1s - loss: 0.0919 - acc: 0.9982 - val_loss: 0.2565 - val_acc: 0.9575
    Epoch 30/35
        - 1s - loss: 0.0922 - acc: 0.9970 - val_loss: 0.2404 - val_acc: 0.9712
    Epoch 31/35
        - 1s - loss: 0.0856 - acc: 0.9994 - val_loss: 0.2177 - val_acc: 0.9769
    Epoch 32/35
        - 1s - loss: 0.1173 - acc: 0.9912 - val_loss: 0.2199 - val_acc: 0.9762
    Epoch 33/35
        - 1s - loss: 0.0840 - acc: 0.9991 - val_loss: 0.2322 - val_acc: 0.9719
    Epoch 34/35
        - 1s - loss: 0.1013 - acc: 0.9921 - val_loss: 0.2009 - val_acc: 0.9791
    Epoch 35/35
        - 1s - loss: 0.0993 - acc: 0.9933 - val_loss: 0.2392 - val_acc: 0.9661
    Train accuracy 0.9996955859969558 Test accuracy: 0.966113914924297
    -------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 16)	3600
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 16)	0

```
_____
flatten_1 (Flatten)              (None, 368)              0
_____
dense_1 (Dense)                  (None, 32)               11808
_____
dense_2 (Dense)                  (None, 3)                99
================================================================
Total params: 17,555
Trainable params: 17,555
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 26.0256 - acc: 0.5592 - val_loss: 10.9857 - val_acc: 0.7275
Epoch 2/35
 - 2s - loss: 5.7352 - acc: 0.9005 - val_loss: 2.9695 - val_acc: 0.9178
Epoch 3/35
 - 2s - loss: 1.6942 - acc: 0.9735 - val_loss: 1.2948 - val_acc: 0.9351
Epoch 4/35
 - 2s - loss: 0.7384 - acc: 0.9909 - val_loss: 0.7685 - val_acc: 0.9596
Epoch 5/35
 - 2s - loss: 0.4166 - acc: 0.9924 - val_loss: 0.5881 - val_acc: 0.9445
Epoch 6/35
 - 2s - loss: 0.2842 - acc: 0.9936 - val_loss: 0.4709 - val_acc: 0.9546
Epoch 7/35
 - 2s - loss: 0.2260 - acc: 0.9951 - val_loss: 0.4287 - val_acc: 0.9474
Epoch 8/35
 - 2s - loss: 0.1964 - acc: 0.9948 - val_loss: 0.4140 - val_acc: 0.9279
Epoch 9/35
 - 2s - loss: 0.1732 - acc: 0.9976 - val_loss: 0.3476 - val_acc: 0.9531
Epoch 10/35
 - 2s - loss: 0.1646 - acc: 0.9957 - val_loss: 0.4298 - val_acc: 0.8890
Epoch 11/35
 - 2s - loss: 0.1526 - acc: 0.9973 - val_loss: 0.3264 - val_acc: 0.9575
Epoch 12/35
 - 2s - loss: 0.1515 - acc: 0.9942 - val_loss: 0.3729 - val_acc: 0.9257
Epoch 13/35
 - 2s - loss: 0.1390 - acc: 0.9963 - val_loss: 0.3167 - val_acc: 0.9567
Epoch 14/35
 - 2s - loss: 0.1183 - acc: 0.9988 - val_loss: 0.2893 - val_acc: 0.9654
Epoch 15/35
 - 2s - loss: 0.1248 - acc: 0.9957 - val_loss: 0.2685 - val_acc: 0.9762
```

```
Epoch 16/35
 - 2s - loss: 0.1305 - acc: 0.9915 - val_loss: 0.2639 - val_acc: 0.9748
Epoch 17/35
 - 2s - loss: 0.1160 - acc: 0.9963 - val_loss: 0.2522 - val_acc: 0.9733
Epoch 18/35
 - 2s - loss: 0.1003 - acc: 0.9991 - val_loss: 0.2884 - val_acc: 0.9373
Epoch 19/35
 - 2s - loss: 0.1062 - acc: 0.9957 - val_loss: 0.2848 - val_acc: 0.9618
Epoch 20/35
 - 2s - loss: 0.1029 - acc: 0.9960 - val_loss: 0.2242 - val_acc: 0.9820
Epoch 21/35
 - 2s - loss: 0.0928 - acc: 0.9988 - val_loss: 0.2478 - val_acc: 0.9618
Epoch 22/35
 - 2s - loss: 0.0968 - acc: 0.9954 - val_loss: 0.2317 - val_acc: 0.9726
Epoch 23/35
 - 2s - loss: 0.1094 - acc: 0.9933 - val_loss: 0.2238 - val_acc: 0.9784
Epoch 24/35
 - 2s - loss: 0.0940 - acc: 0.9973 - val_loss: 0.2295 - val_acc: 0.9690
Epoch 25/35
 - 2s - loss: 0.0849 - acc: 0.9976 - val_loss: 0.2230 - val_acc: 0.9661
Epoch 26/35
 - 2s - loss: 0.0836 - acc: 0.9982 - val_loss: 0.2236 - val_acc: 0.9704
Epoch 27/35
 - 2s - loss: 0.0768 - acc: 0.9991 - val_loss: 0.1917 - val_acc: 0.9748
Epoch 28/35
 - 2s - loss: 0.1731 - acc: 0.9796 - val_loss: 0.2107 - val_acc: 0.9791
Epoch 29/35
 - 2s - loss: 0.0816 - acc: 0.9997 - val_loss: 0.2004 - val_acc: 0.9762
Epoch 30/35
 - 2s - loss: 0.0748 - acc: 0.9988 - val_loss: 0.2015 - val_acc: 0.9784
Epoch 31/35
 - 2s - loss: 0.0705 - acc: 0.9979 - val_loss: 0.1972 - val_acc: 0.9733
Epoch 32/35
 - 2s - loss: 0.0704 - acc: 0.9982 - val_loss: 0.2548 - val_acc: 0.9394
Epoch 33/35
 - 2s - loss: 0.0897 - acc: 0.9918 - val_loss: 0.1882 - val_acc: 0.9654
Epoch 34/35
 - 2s - loss: 0.1054 - acc: 0.9903 - val_loss: 0.1833 - val_acc: 0.9791
Epoch 35/35
 - 2s - loss: 0.0869 - acc: 0.9954 - val_loss: 0.1849 - val_acc: 0.9733
Train accuracy 0.9996955859969558 Test accuracy: 0.9733237202595529
-------------------------------------------------------------------------------
```

```
Layer (type)                    Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)               (None, 122, 32)           2048

conv1d_2 (Conv1D)               (None, 116, 32)           7200

dropout_1 (Dropout)             (None, 116, 32)           0

max_pooling1d_1 (MaxPooling1    (None, 38, 32)            0

flatten_1 (Flatten)             (None, 1216)              0

dense_1 (Dense)                 (None, 32)                38944

dense_2 (Dense)                 (None, 3)                 99
=================================================================
Total params: 48,291
Trainable params: 48,291
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 4s - loss: 57.4970 - acc: 0.6064 - val_loss: 15.8464 - val_acc: 0.7383
Epoch 2/55
 - 2s - loss: 6.9257 - acc: 0.9059 - val_loss: 2.7177 - val_acc: 0.8125
Epoch 3/55
 - 2s - loss: 1.2632 - acc: 0.9482 - val_loss: 0.8784 - val_acc: 0.8947
Epoch 4/55
 - 2s - loss: 0.4735 - acc: 0.9632 - val_loss: 0.6392 - val_acc: 0.8991
Epoch 5/55
 - 2s - loss: 0.3344 - acc: 0.9799 - val_loss: 0.5286 - val_acc: 0.9402
Epoch 6/55
 - 2s - loss: 0.3083 - acc: 0.9744 - val_loss: 0.4808 - val_acc: 0.9409
Epoch 7/55
 - 2s - loss: 0.3054 - acc: 0.9726 - val_loss: 0.5816 - val_acc: 0.8572
Epoch 8/55
 - 2s - loss: 0.2712 - acc: 0.9775 - val_loss: 0.4293 - val_acc: 0.9546
Epoch 9/55
 - 2s - loss: 0.2222 - acc: 0.9884 - val_loss: 0.4103 - val_acc: 0.9301
Epoch 10/55
 - 2s - loss: 0.2168 - acc: 0.9863 - val_loss: 0.3725 - val_acc: 0.9524
Epoch 11/55
```

```
         - 2s - loss: 0.2198 - acc: 0.9842 - val_loss: 0.3440 - val_acc: 0.9611
Epoch 12/55
         - 2s - loss: 0.2035 - acc: 0.9851 - val_loss: 0.3777 - val_acc: 0.9495
Epoch 13/55
         - 2s - loss: 0.2070 - acc: 0.9790 - val_loss: 0.3319 - val_acc: 0.9704
Epoch 14/55
         - 2s - loss: 0.1999 - acc: 0.9808 - val_loss: 0.3269 - val_acc: 0.9575
Epoch 15/55
         - 2s - loss: 0.1695 - acc: 0.9900 - val_loss: 0.2941 - val_acc: 0.9668
Epoch 16/55
         - 2s - loss: 0.1582 - acc: 0.9909 - val_loss: 0.2947 - val_acc: 0.9546
Epoch 17/55
         - 2s - loss: 0.1811 - acc: 0.9826 - val_loss: 0.3099 - val_acc: 0.9430
Epoch 18/55
         - 2s - loss: 0.1524 - acc: 0.9906 - val_loss: 0.3233 - val_acc: 0.9495
Epoch 19/55
         - 2s - loss: 0.1518 - acc: 0.9896 - val_loss: 0.2815 - val_acc: 0.9539
Epoch 20/55
         - 2s - loss: 0.1577 - acc: 0.9887 - val_loss: 0.2656 - val_acc: 0.9661
Epoch 21/55
         - 2s - loss: 0.1574 - acc: 0.9826 - val_loss: 0.3773 - val_acc: 0.9293
Epoch 22/55
         - 2s - loss: 0.1438 - acc: 0.9909 - val_loss: 0.2730 - val_acc: 0.9582
Epoch 23/55
         - 2s - loss: 0.1253 - acc: 0.9948 - val_loss: 0.2499 - val_acc: 0.9625
Epoch 24/55
         - 2s - loss: 0.1492 - acc: 0.9842 - val_loss: 0.3273 - val_acc: 0.9416
Epoch 25/55
         - 2s - loss: 0.1757 - acc: 0.9802 - val_loss: 0.3768 - val_acc: 0.9344
Epoch 26/55
         - 2s - loss: 0.1164 - acc: 0.9973 - val_loss: 0.2685 - val_acc: 0.9524
Epoch 27/55
         - 2s - loss: 0.1625 - acc: 0.9814 - val_loss: 0.2321 - val_acc: 0.9676
Epoch 28/55
         - 2s - loss: 0.1138 - acc: 0.9960 - val_loss: 0.2443 - val_acc: 0.9697
Epoch 29/55
         - 2s - loss: 0.1348 - acc: 0.9863 - val_loss: 0.8768 - val_acc: 0.7678
Epoch 30/55
         - 2s - loss: 0.1836 - acc: 0.9799 - val_loss: 0.2684 - val_acc: 0.9373
Epoch 31/55
         - 2s - loss: 0.1101 - acc: 0.9963 - val_loss: 0.2112 - val_acc: 0.9784
Epoch 32/55
         - 2s - loss: 0.1240 - acc: 0.9915 - val_loss: 0.2290 - val_acc: 0.9661
```

```
Epoch 33/55
 - 2s - loss: 0.1217 - acc: 0.9909 - val_loss: 0.2647 - val_acc: 0.9452
Epoch 34/55
 - 2s - loss: 0.1008 - acc: 0.9976 - val_loss: 0.2634 - val_acc: 0.9567
Epoch 35/55
 - 2s - loss: 0.1245 - acc: 0.9890 - val_loss: 0.2488 - val_acc: 0.9430
Epoch 36/55
 - 2s - loss: 0.1252 - acc: 0.9900 - val_loss: 0.2620 - val_acc: 0.9683
Epoch 37/55
 - 2s - loss: 0.0927 - acc: 0.9973 - val_loss: 0.2169 - val_acc: 0.9733
Epoch 38/55
 - 2s - loss: 0.1540 - acc: 0.9820 - val_loss: 0.2586 - val_acc: 0.9553
Epoch 39/55
 - 2s - loss: 0.1315 - acc: 0.9857 - val_loss: 0.3045 - val_acc: 0.9459
Epoch 40/55
 - 2s - loss: 0.1117 - acc: 0.9948 - val_loss: 0.2454 - val_acc: 0.9654
Epoch 41/55
 - 2s - loss: 0.1126 - acc: 0.9878 - val_loss: 0.2682 - val_acc: 0.9668
Epoch 42/55
 - 2s - loss: 0.1112 - acc: 0.9939 - val_loss: 0.2188 - val_acc: 0.9676
Epoch 43/55
 - 2s - loss: 0.1014 - acc: 0.9915 - val_loss: 0.2874 - val_acc: 0.9466
Epoch 44/55
 - 2s - loss: 0.0999 - acc: 0.9954 - val_loss: 0.2068 - val_acc: 0.9596
Epoch 45/55
 - 2s - loss: 0.1060 - acc: 0.9890 - val_loss: 0.2042 - val_acc: 0.9654
Epoch 46/55
 - 2s - loss: 0.1836 - acc: 0.9744 - val_loss: 0.4512 - val_acc: 0.9092
Epoch 47/55
 - 2s - loss: 0.1095 - acc: 0.9942 - val_loss: 0.2335 - val_acc: 0.9704
Epoch 48/55
 - 2s - loss: 0.1001 - acc: 0.9948 - val_loss: 0.2726 - val_acc: 0.9668
Epoch 49/55
 - 2s - loss: 0.1107 - acc: 0.9875 - val_loss: 0.2767 - val_acc: 0.9524
Epoch 50/55
 - 2s - loss: 0.1221 - acc: 0.9893 - val_loss: 0.2280 - val_acc: 0.9603
Epoch 51/55
 - 2s - loss: 0.1006 - acc: 0.9893 - val_loss: 0.2894 - val_acc: 0.9409
Epoch 52/55
 - 2s - loss: 0.1624 - acc: 0.9842 - val_loss: 0.1883 - val_acc: 0.9661
Epoch 53/55
 - 2s - loss: 0.0781 - acc: 0.9988 - val_loss: 0.2179 - val_acc: 0.9668
Epoch 54/55
```

```
 - 2s - loss: 0.0719 - acc: 0.9988 - val_loss: 0.2511 - val_acc: 0.9632
Epoch 55/55
 - 2s - loss: 0.0824 - acc: 0.9945 - val_loss: 0.4337 - val_acc: 0.8753
Train accuracy 0.9470319634703196 Test accuracy: 0.875270367700072
----------------------------------------------------------------------
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)            (None, 116, 32)           7200
_____
dropout_1 (Dropout)          (None, 116, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0
_____
flatten_1 (Flatten)          (None, 736)               0
_____
dense_1 (Dense)              (None, 32)                23584
_____
dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 88.0710 - acc: 0.5330 - val_loss: 51.7343 - val_acc: 0.6929
Epoch 2/35
 - 1s - loss: 33.3994 - acc: 0.8457 - val_loss: 20.3058 - val_acc: 0.7880
Epoch 3/35
 - 1s - loss: 13.2721 - acc: 0.9470 - val_loss: 8.5835 - val_acc: 0.8176
Epoch 4/35
 - 1s - loss: 5.6171 - acc: 0.9531 - val_loss: 3.8872 - val_acc: 0.9005
Epoch 5/35
 - 1s - loss: 2.5066 - acc: 0.9647 - val_loss: 1.9472 - val_acc: 0.9063
Epoch 6/35
 - 1s - loss: 1.1884 - acc: 0.9805 - val_loss: 1.1184 - val_acc: 0.9272
Epoch 7/35
 - 1s - loss: 0.6467 - acc: 0.9875 - val_loss: 0.7939 - val_acc: 0.9142
Epoch 8/35
```

```
         - 1s - loss: 0.4357 - acc: 0.9854 - val_loss: 0.6486 - val_acc: 0.9178
Epoch 9/35
         - 1s - loss: 0.3412 - acc: 0.9896 - val_loss: 0.5491 - val_acc: 0.9474
Epoch 10/35
         - 1s - loss: 0.3044 - acc: 0.9863 - val_loss: 0.5745 - val_acc: 0.8962
Epoch 11/35
         - 1s - loss: 0.2736 - acc: 0.9912 - val_loss: 0.5110 - val_acc: 0.9539
Epoch 12/35
         - 1s - loss: 0.2564 - acc: 0.9900 - val_loss: 0.4725 - val_acc: 0.9596
Epoch 13/35
         - 1s - loss: 0.2371 - acc: 0.9921 - val_loss: 0.4568 - val_acc: 0.9575
Epoch 14/35
         - 1s - loss: 0.2178 - acc: 0.9948 - val_loss: 0.4416 - val_acc: 0.9560
Epoch 15/35
         - 1s - loss: 0.2197 - acc: 0.9921 - val_loss: 0.4154 - val_acc: 0.9618
Epoch 16/35
         - 1s - loss: 0.2058 - acc: 0.9945 - val_loss: 0.4134 - val_acc: 0.9589
Epoch 17/35
         - 1s - loss: 0.2009 - acc: 0.9927 - val_loss: 0.3766 - val_acc: 0.9755
Epoch 18/35
         - 1s - loss: 0.1821 - acc: 0.9957 - val_loss: 0.3897 - val_acc: 0.9553
Epoch 19/35
         - 1s - loss: 0.1979 - acc: 0.9866 - val_loss: 0.3604 - val_acc: 0.9697
Epoch 20/35
         - 1s - loss: 0.1784 - acc: 0.9930 - val_loss: 0.3977 - val_acc: 0.9329
Epoch 21/35
         - 1s - loss: 0.1714 - acc: 0.9942 - val_loss: 0.3581 - val_acc: 0.9733
Epoch 22/35
         - 1s - loss: 0.1663 - acc: 0.9939 - val_loss: 0.3785 - val_acc: 0.9416
Epoch 23/35
         - 1s - loss: 0.1637 - acc: 0.9954 - val_loss: 0.3348 - val_acc: 0.9683
Epoch 24/35
         - 1s - loss: 0.1726 - acc: 0.9893 - val_loss: 0.3466 - val_acc: 0.9459
Epoch 25/35
         - 1s - loss: 0.1582 - acc: 0.9930 - val_loss: 0.3395 - val_acc: 0.9510
Epoch 26/35
         - 1s - loss: 0.1533 - acc: 0.9927 - val_loss: 0.3488 - val_acc: 0.9524
Epoch 27/35
         - 1s - loss: 0.1508 - acc: 0.9939 - val_loss: 0.2830 - val_acc: 0.9748
Epoch 28/35
         - 1s - loss: 0.1489 - acc: 0.9915 - val_loss: 0.3176 - val_acc: 0.9603
Epoch 29/35
         - 1s - loss: 0.1380 - acc: 0.9948 - val_loss: 0.3255 - val_acc: 0.9517
```

```
Epoch 30/35
 - 1s - loss: 0.1411 - acc: 0.9936 - val_loss: 0.3003 - val_acc: 0.9676
Epoch 31/35
 - 1s - loss: 0.1285 - acc: 0.9970 - val_loss: 0.2944 - val_acc: 0.9632
Epoch 32/35
 - 1s - loss: 0.1950 - acc: 0.9760 - val_loss: 0.3334 - val_acc: 0.9618
Epoch 33/35
 - 1s - loss: 0.1392 - acc: 0.9954 - val_loss: 0.2958 - val_acc: 0.9625
Epoch 34/35
 - 1s - loss: 0.1286 - acc: 0.9936 - val_loss: 0.2811 - val_acc: 0.9719
Epoch 35/35
 - 1s - loss: 0.1250 - acc: 0.9942 - val_loss: 0.2910 - val_acc: 0.9618
Train accuracy 0.995738203957382 Test accuracy: 0.9617880317231434
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 120, 32)	7200
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 32)	0
flatten_1 (Flatten)	(None, 768)	0
dense_1 (Dense)	(None, 32)	24608
dense_2 (Dense)	(None, 3)	99

```
Total params: 32,803
Trainable params: 32,803
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 66.5345 - acc: 0.6414 - val_loss: 26.0567 - val_acc: 0.7866
Epoch 2/55
 - 1s - loss: 13.9297 - acc: 0.9078 - val_loss: 6.5261 - val_acc: 0.8089
Epoch 3/55
 - 1s - loss: 3.3686 - acc: 0.9315 - val_loss: 1.8112 - val_acc: 0.9019
```

```
Epoch 4/55
 - 1s - loss: 0.9589 - acc: 0.9568 - val_loss: 0.9207 - val_acc: 0.8399
Epoch 5/55
 - 1s - loss: 0.5110 - acc: 0.9562 - val_loss: 0.7577 - val_acc: 0.8198
Epoch 6/55
 - 1s - loss: 0.4269 - acc: 0.9574 - val_loss: 0.6574 - val_acc: 0.8594
Epoch 7/55
 - 1s - loss: 0.3728 - acc: 0.9720 - val_loss: 0.5376 - val_acc: 0.9481
Epoch 8/55
 - 1s - loss: 0.3874 - acc: 0.9565 - val_loss: 0.6158 - val_acc: 0.8572
Epoch 9/55
 - 1s - loss: 0.3220 - acc: 0.9717 - val_loss: 0.5100 - val_acc: 0.9358
Epoch 10/55
 - 1s - loss: 0.3054 - acc: 0.9744 - val_loss: 0.5724 - val_acc: 0.8983
Epoch 11/55
 - 1s - loss: 0.3025 - acc: 0.9772 - val_loss: 0.4511 - val_acc: 0.9603
Epoch 12/55
 - 1s - loss: 0.2844 - acc: 0.9741 - val_loss: 0.4715 - val_acc: 0.9221
Epoch 13/55
 - 1s - loss: 0.2566 - acc: 0.9811 - val_loss: 0.4395 - val_acc: 0.9366
Epoch 14/55
 - 1s - loss: 0.2459 - acc: 0.9790 - val_loss: 0.4444 - val_acc: 0.9510
Epoch 15/55
 - 1s - loss: 0.2234 - acc: 0.9869 - val_loss: 0.4302 - val_acc: 0.9207
Epoch 16/55
 - 1s - loss: 0.2127 - acc: 0.9872 - val_loss: 0.4226 - val_acc: 0.9019
Epoch 17/55
 - 1s - loss: 0.3064 - acc: 0.9598 - val_loss: 0.4006 - val_acc: 0.9546
Epoch 18/55
 - 1s - loss: 0.2107 - acc: 0.9851 - val_loss: 0.3774 - val_acc: 0.9611
Epoch 19/55
 - 1s - loss: 0.2227 - acc: 0.9814 - val_loss: 0.3752 - val_acc: 0.9337
Epoch 20/55
 - 1s - loss: 0.1856 - acc: 0.9893 - val_loss: 0.5023 - val_acc: 0.8327
Epoch 21/55
 - 1s - loss: 0.2469 - acc: 0.9656 - val_loss: 0.5149 - val_acc: 0.9207
Epoch 22/55
 - 1s - loss: 0.2097 - acc: 0.9811 - val_loss: 0.3650 - val_acc: 0.9293
Epoch 23/55
 - 1s - loss: 0.1832 - acc: 0.9875 - val_loss: 0.2918 - val_acc: 0.9690
Epoch 24/55
 - 1s - loss: 0.1711 - acc: 0.9875 - val_loss: 0.3080 - val_acc: 0.9632
Epoch 25/55
```

```
       - 1s - loss: 0.1784 - acc: 0.9851 - val_loss: 0.3080 - val_acc: 0.9611
Epoch 26/55
       - 1s - loss: 0.1622 - acc: 0.9887 - val_loss: 0.3501 - val_acc: 0.9229
Epoch 27/55
       - 1s - loss: 0.1897 - acc: 0.9826 - val_loss: 0.3444 - val_acc: 0.9229
Epoch 28/55
       - 1s - loss: 0.1725 - acc: 0.9860 - val_loss: 0.5234 - val_acc: 0.8443
Epoch 29/55
       - 1s - loss: 0.1769 - acc: 0.9830 - val_loss: 0.2998 - val_acc: 0.9488
Epoch 30/55
       - 1s - loss: 0.1673 - acc: 0.9875 - val_loss: 0.2628 - val_acc: 0.9640
Epoch 31/55
       - 1s - loss: 0.1763 - acc: 0.9811 - val_loss: 0.2993 - val_acc: 0.9567
Epoch 32/55
       - 1s - loss: 0.1950 - acc: 0.9775 - val_loss: 0.3056 - val_acc: 0.9668
Epoch 33/55
       - 1s - loss: 0.1670 - acc: 0.9848 - val_loss: 0.2929 - val_acc: 0.9337
Epoch 34/55
       - 1s - loss: 0.1387 - acc: 0.9890 - val_loss: 0.3786 - val_acc: 0.8890
Epoch 35/55
       - 1s - loss: 0.2102 - acc: 0.9760 - val_loss: 0.3294 - val_acc: 0.9409
Epoch 36/55
       - 1s - loss: 0.1491 - acc: 0.9924 - val_loss: 0.2775 - val_acc: 0.9438
Epoch 37/55
       - 1s - loss: 0.1547 - acc: 0.9823 - val_loss: 0.2807 - val_acc: 0.9726
Epoch 38/55
       - 1s - loss: 0.1523 - acc: 0.9887 - val_loss: 0.2410 - val_acc: 0.9712
Epoch 39/55
       - 1s - loss: 0.1577 - acc: 0.9842 - val_loss: 0.2982 - val_acc: 0.9474
Epoch 40/55
       - 1s - loss: 0.1417 - acc: 0.9872 - val_loss: 0.3376 - val_acc: 0.9214
Epoch 41/55
       - 1s - loss: 0.1171 - acc: 0.9930 - val_loss: 0.3441 - val_acc: 0.8983
Epoch 42/55
       - 1s - loss: 0.1646 - acc: 0.9775 - val_loss: 0.3191 - val_acc: 0.9618
Epoch 43/55
       - 1s - loss: 0.1425 - acc: 0.9893 - val_loss: 0.2315 - val_acc: 0.9647
Epoch 44/55
       - 1s - loss: 0.1279 - acc: 0.9918 - val_loss: 0.3356 - val_acc: 0.9077
Epoch 45/55
       - 1s - loss: 0.1307 - acc: 0.9878 - val_loss: 0.3211 - val_acc: 0.9337
Epoch 46/55
       - 1s - loss: 0.1579 - acc: 0.9814 - val_loss: 0.2722 - val_acc: 0.9596
```

```
Epoch 47/55
 - 1s - loss: 0.1878 - acc: 0.9708 - val_loss: 0.3955 - val_acc: 0.9358
Epoch 48/55
 - 1s - loss: 0.1472 - acc: 0.9890 - val_loss: 0.2255 - val_acc: 0.9668
Epoch 49/55
 - 1s - loss: 0.1275 - acc: 0.9875 - val_loss: 0.2283 - val_acc: 0.9589
Epoch 50/55
 - 1s - loss: 0.1230 - acc: 0.9896 - val_loss: 0.2491 - val_acc: 0.9358
Epoch 51/55
 - 1s - loss: 0.1232 - acc: 0.9881 - val_loss: 0.2380 - val_acc: 0.9481
Epoch 52/55
 - 1s - loss: 0.1528 - acc: 0.9802 - val_loss: 0.2679 - val_acc: 0.9481
Epoch 53/55
 - 1s - loss: 0.1375 - acc: 0.9872 - val_loss: 0.2876 - val_acc: 0.9200
Epoch 54/55
 - 1s - loss: 0.1360 - acc: 0.9857 - val_loss: 0.2461 - val_acc: 0.9409
Epoch 55/55
 - 1s - loss: 0.1243 - acc: 0.9890 - val_loss: 0.2481 - val_acc: 0.9430
Train accuracy 0.9984779299847792 Test accuracy: 0.943042537851478
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 16)	3600
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 16)	0
flatten_1 (Flatten)	(None, 368)	0
dense_1 (Dense)	(None, 32)	11808
dense_2 (Dense)	(None, 3)	99

```
Total params: 17,555
Trainable params: 17,555
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
```

```
Epoch 1/35
 - 2s - loss: 26.5752 - acc: 0.5321 - val_loss: 1.2807 - val_acc: 0.6280
Epoch 2/35
 - 1s - loss: 0.7391 - acc: 0.8502 - val_loss: 0.6879 - val_acc: 0.8998
Epoch 3/35
 - 1s - loss: 0.4494 - acc: 0.9248 - val_loss: 0.6523 - val_acc: 0.8356
Epoch 4/35
 - 1s - loss: 0.3951 - acc: 0.9333 - val_loss: 0.6194 - val_acc: 0.8558
Epoch 5/35
 - 1s - loss: 0.3236 - acc: 0.9607 - val_loss: 0.4957 - val_acc: 0.8998
Epoch 6/35
 - 1s - loss: 0.3225 - acc: 0.9543 - val_loss: 0.5858 - val_acc: 0.8551
Epoch 7/35
 - 1s - loss: 0.2733 - acc: 0.9641 - val_loss: 0.7998 - val_acc: 0.7282
Epoch 8/35
 - 1s - loss: 0.3384 - acc: 0.9537 - val_loss: 0.5695 - val_acc: 0.8868
Epoch 9/35
 - 1s - loss: 0.3391 - acc: 0.9479 - val_loss: 0.5731 - val_acc: 0.8616
Epoch 10/35
 - 1s - loss: 0.3216 - acc: 0.9546 - val_loss: 0.5629 - val_acc: 0.8717
Epoch 11/35
 - 1s - loss: 0.2785 - acc: 0.9659 - val_loss: 0.4446 - val_acc: 0.9229
Epoch 12/35
 - 1s - loss: 0.2493 - acc: 0.9699 - val_loss: 0.3798 - val_acc: 0.9344
Epoch 13/35
 - 1s - loss: 0.2704 - acc: 0.9607 - val_loss: 0.5078 - val_acc: 0.9099
Epoch 14/35
 - 1s - loss: 0.3202 - acc: 0.9577 - val_loss: 0.6360 - val_acc: 0.8277
Epoch 15/35
 - 1s - loss: 0.2962 - acc: 0.9592 - val_loss: 0.4518 - val_acc: 0.9084
Epoch 16/35
 - 1s - loss: 0.2060 - acc: 0.9823 - val_loss: 0.3917 - val_acc: 0.9293
Epoch 17/35
 - 1s - loss: 0.3320 - acc: 0.9540 - val_loss: 0.4050 - val_acc: 0.9445
Epoch 18/35
 - 1s - loss: 0.2095 - acc: 0.9854 - val_loss: 0.5467 - val_acc: 0.8616
Epoch 19/35
 - 1s - loss: 0.2285 - acc: 0.9705 - val_loss: 0.3853 - val_acc: 0.9380
Epoch 20/35
 - 1s - loss: 0.2948 - acc: 0.9580 - val_loss: 0.3945 - val_acc: 0.9279
Epoch 21/35
 - 1s - loss: 0.2311 - acc: 0.9738 - val_loss: 0.4746 - val_acc: 0.9070
Epoch 22/35
```

```
 - 1s - loss: 0.2784 - acc: 0.9604 - val_loss: 0.4976 - val_acc: 0.9092
Epoch 23/35
 - 1s - loss: 0.2841 - acc: 0.9607 - val_loss: 0.4825 - val_acc: 0.8724
Epoch 24/35
 - 1s - loss: 0.3092 - acc: 0.9565 - val_loss: 0.7474 - val_acc: 0.7859
Epoch 25/35
 - 1s - loss: 0.3801 - acc: 0.9607 - val_loss: 0.4244 - val_acc: 0.9351
Epoch 26/35
 - 1s - loss: 0.2565 - acc: 0.9677 - val_loss: 0.4607 - val_acc: 0.9257
Epoch 27/35
 - 1s - loss: 0.3247 - acc: 0.9543 - val_loss: 0.7980 - val_acc: 0.8443
Epoch 28/35
 - 1s - loss: 0.3151 - acc: 0.9732 - val_loss: 0.5430 - val_acc: 0.8572
Epoch 29/35
 - 1s - loss: 0.2327 - acc: 0.9683 - val_loss: 1.2830 - val_acc: 0.7541
Epoch 30/35
 - 1s - loss: 0.3364 - acc: 0.9616 - val_loss: 0.5026 - val_acc: 0.8825
Epoch 31/35
 - 1s - loss: 0.3263 - acc: 0.9482 - val_loss: 0.7585 - val_acc: 0.8212
Epoch 32/35
 - 1s - loss: 0.2349 - acc: 0.9753 - val_loss: 0.5829 - val_acc: 0.8594
Epoch 33/35
 - 1s - loss: 0.2314 - acc: 0.9693 - val_loss: 0.6747 - val_acc: 0.8363
Epoch 34/35
 - 1s - loss: 0.2437 - acc: 0.9744 - val_loss: 0.5027 - val_acc: 0.8947
Epoch 35/35
 - 1s - loss: 0.2642 - acc: 0.9619 - val_loss: 0.5761 - val_acc: 0.8486
Train accuracy 0.9181126331811263 Test accuracy: 0.8485940879596251
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 116, 32)	6304
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 32)	23584

```
_____
dense_2 (Dense)                (None, 3)                99
=======================================================
Total params: 31,779
Trainable params: 31,779
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 33.2984 - acc: 0.7336 - val_loss: 1.8914 - val_acc: 0.7851
Epoch 2/35
 - 2s - loss: 0.7319 - acc: 0.9181 - val_loss: 0.7281 - val_acc: 0.8753
Epoch 3/35
 - 2s - loss: 0.4238 - acc: 0.9470 - val_loss: 0.6094 - val_acc: 0.8962
Epoch 4/35
 - 2s - loss: 0.3594 - acc: 0.9534 - val_loss: 0.5441 - val_acc: 0.9221
Epoch 5/35
 - 2s - loss: 0.3170 - acc: 0.9629 - val_loss: 0.5004 - val_acc: 0.9279
Epoch 6/35
 - 2s - loss: 0.2758 - acc: 0.9714 - val_loss: 0.5287 - val_acc: 0.8767
Epoch 7/35
 - 2s - loss: 0.3241 - acc: 0.9577 - val_loss: 0.5364 - val_acc: 0.8753
Epoch 8/35
 - 2s - loss: 0.2694 - acc: 0.9677 - val_loss: 0.5514 - val_acc: 0.9207
Epoch 9/35
 - 2s - loss: 0.2204 - acc: 0.9823 - val_loss: 0.4260 - val_acc: 0.9200
Epoch 10/35
 - 2s - loss: 0.2483 - acc: 0.9705 - val_loss: 0.4417 - val_acc: 0.9409
Epoch 11/35
 - 2s - loss: 0.2958 - acc: 0.9598 - val_loss: 0.4637 - val_acc: 0.9286
Epoch 12/35
 - 2s - loss: 0.2074 - acc: 0.9805 - val_loss: 0.4391 - val_acc: 0.9229
Epoch 13/35
 - 2s - loss: 0.2382 - acc: 0.9689 - val_loss: 0.8106 - val_acc: 0.8673
Epoch 14/35
 - 2s - loss: 0.2157 - acc: 0.9790 - val_loss: 0.3906 - val_acc: 0.9380
Epoch 15/35
 - 2s - loss: 0.1979 - acc: 0.9772 - val_loss: 0.3768 - val_acc: 0.9358
Epoch 16/35
 - 2s - loss: 0.2173 - acc: 0.9744 - val_loss: 0.3631 - val_acc: 0.9394
Epoch 17/35
 - 2s - loss: 0.2535 - acc: 0.9689 - val_loss: 0.3599 - val_acc: 0.9351
```

```
Epoch 18/35
 - 2s - loss: 0.1681 - acc: 0.9872 - val_loss: 0.4044 - val_acc: 0.9344
Epoch 19/35
 - 2s - loss: 0.2695 - acc: 0.9586 - val_loss: 0.4775 - val_acc: 0.9214
Epoch 20/35
 - 2s - loss: 0.1699 - acc: 0.9900 - val_loss: 0.3850 - val_acc: 0.9106
Epoch 21/35
 - 2s - loss: 0.1624 - acc: 0.9854 - val_loss: 0.3389 - val_acc: 0.9503
Epoch 22/35
 - 2s - loss: 0.2166 - acc: 0.9714 - val_loss: 0.3548 - val_acc: 0.9409
Epoch 23/35
 - 2s - loss: 0.1860 - acc: 0.9799 - val_loss: 0.3200 - val_acc: 0.9539
Epoch 24/35
 - 2s - loss: 0.2098 - acc: 0.9723 - val_loss: 0.3924 - val_acc: 0.9394
Epoch 25/35
 - 2s - loss: 0.2098 - acc: 0.9763 - val_loss: 0.3871 - val_acc: 0.9387
Epoch 26/35
 - 2s - loss: 0.1480 - acc: 0.9900 - val_loss: 0.3321 - val_acc: 0.9149
Epoch 27/35
 - 2s - loss: 0.2112 - acc: 0.9683 - val_loss: 0.3969 - val_acc: 0.9315
Epoch 28/35
 - 2s - loss: 0.1634 - acc: 0.9833 - val_loss: 0.4958 - val_acc: 0.8839
Epoch 29/35
 - 2s - loss: 0.2182 - acc: 0.9760 - val_loss: 0.3182 - val_acc: 0.9293
Epoch 30/35
 - 2s - loss: 0.1970 - acc: 0.9738 - val_loss: 0.4005 - val_acc: 0.9048
Epoch 31/35
 - 2s - loss: 0.1573 - acc: 0.9851 - val_loss: 0.3957 - val_acc: 0.9019
Epoch 32/35
 - 2s - loss: 0.2038 - acc: 0.9693 - val_loss: 0.5161 - val_acc: 0.8904
Epoch 33/35
 - 2s - loss: 0.2087 - acc: 0.9763 - val_loss: 0.3565 - val_acc: 0.9149
Epoch 34/35
 - 2s - loss: 0.1707 - acc: 0.9790 - val_loss: 0.3654 - val_acc: 0.9077
Epoch 35/35
 - 2s - loss: 0.1925 - acc: 0.9732 - val_loss: 0.5267 - val_acc: 0.9012
Train accuracy 0.9881278538812786 Test accuracy: 0.9012256669069935
-----------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
```

```
conv1d_2 (Conv1D)              (None, 118, 32)            5152
_____
dropout_1 (Dropout)            (None, 118, 32)            0
_____
max_pooling1d_1 (MaxPooling1   (None, 39, 32)             0
_____
flatten_1 (Flatten)            (None, 1248)               0
_____
dense_1 (Dense)                (None, 32)                 39968
_____
dense_2 (Dense)                (None, 3)                  99
=================================================================
Total params: 47,267
Trainable params: 47,267
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 84.9849 - acc: 0.4798 - val_loss: 30.2096 - val_acc: 0.5854
Epoch 2/55
 - 2s - loss: 14.0525 - acc: 0.7766 - val_loss: 5.1948 - val_acc: 0.7376
Epoch 3/55
 - 2s - loss: 2.4103 - acc: 0.8877 - val_loss: 1.2967 - val_acc: 0.7779
Epoch 4/55
 - 2s - loss: 0.6878 - acc: 0.9297 - val_loss: 0.7648 - val_acc: 0.8479
Epoch 5/55
 - 2s - loss: 0.4692 - acc: 0.9282 - val_loss: 0.7042 - val_acc: 0.8558
Epoch 6/55
 - 2s - loss: 0.4104 - acc: 0.9486 - val_loss: 0.6351 - val_acc: 0.8616
Epoch 7/55
 - 2s - loss: 0.3419 - acc: 0.9738 - val_loss: 0.5470 - val_acc: 0.9041
Epoch 8/55
 - 2s - loss: 0.3173 - acc: 0.9750 - val_loss: 0.5085 - val_acc: 0.9380
Epoch 9/55
 - 2s - loss: 0.2970 - acc: 0.9763 - val_loss: 0.4823 - val_acc: 0.9272
Epoch 10/55
 - 2s - loss: 0.3058 - acc: 0.9680 - val_loss: 0.5204 - val_acc: 0.8890
Epoch 11/55
 - 2s - loss: 0.2736 - acc: 0.9808 - val_loss: 0.4361 - val_acc: 0.9402
Epoch 12/55
 - 2s - loss: 0.2612 - acc: 0.9808 - val_loss: 0.4578 - val_acc: 0.9164
Epoch 13/55
```

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           - 2s - loss: 0.2824 - acc: 0.9674 - val_loss: 0.4196 - val_acc: 0.9409
Epoch 14/55
           - 2s - loss: 0.2412 - acc: 0.9826 - val_loss: 0.3856 - val_acc: 0.9503
Epoch 15/55
           - 2s - loss: 0.2408 - acc: 0.9775 - val_loss: 0.3727 - val_acc: 0.9560
Epoch 16/55
           - 2s - loss: 0.2158 - acc: 0.9872 - val_loss: 0.4013 - val_acc: 0.9358
Epoch 17/55
           - 2s - loss: 0.2325 - acc: 0.9814 - val_loss: 0.3420 - val_acc: 0.9690
Epoch 18/55
           - 2s - loss: 0.1852 - acc: 0.9912 - val_loss: 0.3642 - val_acc: 0.9380
Epoch 19/55
           - 2s - loss: 0.2799 - acc: 0.9632 - val_loss: 0.3817 - val_acc: 0.9510
Epoch 20/55
           - 2s - loss: 0.2108 - acc: 0.9845 - val_loss: 0.3402 - val_acc: 0.9603
Epoch 21/55
           - 2s - loss: 0.1819 - acc: 0.9881 - val_loss: 0.3506 - val_acc: 0.9567
Epoch 22/55
           - 2s - loss: 0.1726 - acc: 0.9890 - val_loss: 0.3258 - val_acc: 0.9676
Epoch 23/55
           - 2s - loss: 0.1674 - acc: 0.9887 - val_loss: 0.3298 - val_acc: 0.9589
Epoch 24/55
           - 2s - loss: 0.2056 - acc: 0.9766 - val_loss: 0.3552 - val_acc: 0.9452
Epoch 25/55
           - 2s - loss: 0.2224 - acc: 0.9756 - val_loss: 0.4055 - val_acc: 0.9156
Epoch 26/55
           - 2s - loss: 0.2465 - acc: 0.9714 - val_loss: 0.3511 - val_acc: 0.9481
Epoch 27/55
           - 2s - loss: 0.1753 - acc: 0.9875 - val_loss: 0.3218 - val_acc: 0.9510
Epoch 28/55
           - 2s - loss: 0.1848 - acc: 0.9866 - val_loss: 0.3037 - val_acc: 0.9618
Epoch 29/55
           - 2s - loss: 0.1371 - acc: 0.9982 - val_loss: 0.2908 - val_acc: 0.9697
Epoch 30/55
           - 2s - loss: 0.1490 - acc: 0.9900 - val_loss: 0.2868 - val_acc: 0.9582
Epoch 31/55
           - 2s - loss: 0.1716 - acc: 0.9820 - val_loss: 0.3332 - val_acc: 0.9438
Epoch 32/55
           - 2s - loss: 0.1989 - acc: 0.9787 - val_loss: 0.2628 - val_acc: 0.9748
Epoch 33/55
           - 2s - loss: 0.1873 - acc: 0.9811 - val_loss: 0.5150 - val_acc: 0.8962
Epoch 34/55
           - 2s - loss: 0.2537 - acc: 0.9720 - val_loss: 0.3835 - val_acc: 0.9149
```

```
Epoch 35/55
 - 2s - loss: 0.1493 - acc: 0.9903 - val_loss: 0.2866 - val_acc: 0.9647
Epoch 36/55
 - 2s - loss: 0.1414 - acc: 0.9921 - val_loss: 0.2833 - val_acc: 0.9640
Epoch 37/55
 - 2s - loss: 0.1297 - acc: 0.9936 - val_loss: 0.3054 - val_acc: 0.9539
Epoch 38/55
 - 2s - loss: 0.1494 - acc: 0.9860 - val_loss: 0.3141 - val_acc: 0.9423
Epoch 39/55
 - 2s - loss: 0.2089 - acc: 0.9766 - val_loss: 0.3268 - val_acc: 0.9301
Epoch 40/55
 - 2s - loss: 0.1487 - acc: 0.9887 - val_loss: 0.4908 - val_acc: 0.8320
Epoch 41/55
 - 2s - loss: 0.1829 - acc: 0.9790 - val_loss: 0.3412 - val_acc: 0.9510
Epoch 42/55
 - 2s - loss: 0.2176 - acc: 0.9763 - val_loss: 0.3136 - val_acc: 0.9596
Epoch 43/55
 - 2s - loss: 0.1323 - acc: 0.9954 - val_loss: 0.2601 - val_acc: 0.9618
Epoch 44/55
 - 2s - loss: 0.1246 - acc: 0.9936 - val_loss: 0.2613 - val_acc: 0.9611
Epoch 45/55
 - 2s - loss: 0.1312 - acc: 0.9924 - val_loss: 0.2610 - val_acc: 0.9567
Epoch 46/55
 - 2s - loss: 0.1235 - acc: 0.9930 - val_loss: 0.2527 - val_acc: 0.9560
Epoch 47/55
 - 2s - loss: 0.1582 - acc: 0.9830 - val_loss: 0.3716 - val_acc: 0.9156
Epoch 48/55
 - 2s - loss: 0.1378 - acc: 0.9900 - val_loss: 0.2629 - val_acc: 0.9488
Epoch 49/55
 - 2s - loss: 0.1692 - acc: 0.9805 - val_loss: 0.3277 - val_acc: 0.9524
Epoch 50/55
 - 2s - loss: 0.1633 - acc: 0.9860 - val_loss: 0.2851 - val_acc: 0.9503
Epoch 51/55
 - 2s - loss: 0.1089 - acc: 0.9960 - val_loss: 0.2913 - val_acc: 0.9474
Epoch 52/55
 - 2s - loss: 0.1560 - acc: 0.9796 - val_loss: 0.3366 - val_acc: 0.9366
Epoch 53/55
 - 2s - loss: 0.1536 - acc: 0.9884 - val_loss: 0.3652 - val_acc: 0.8911
Epoch 54/55
 - 2s - loss: 0.1505 - acc: 0.9842 - val_loss: 0.2622 - val_acc: 0.9596
Epoch 55/55
 - 2s - loss: 0.1248 - acc: 0.9896 - val_loss: 0.3493 - val_acc: 0.9301
Train accuracy 0.9792998477929985 Test accuracy: 0.9300648882480173
```

```
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 120, 32)	7200
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 24, 32)	0
flatten_1 (Flatten)	(None, 768)	0
dense_1 (Dense)	(None, 64)	49216
dense_2 (Dense)	(None, 3)	195

```
=================================================================
Total params: 57,507
Trainable params: 57,507
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 61.9289 - acc: 0.7434 - val_loss: 31.5040 - val_acc: 0.8594
Epoch 2/35
 - 2s - loss: 19.5066 - acc: 0.9522 - val_loss: 11.5553 - val_acc: 0.8219
Epoch 3/35
 - 2s - loss: 7.1339 - acc: 0.9656 - val_loss: 4.3558 - val_acc: 0.9358
Epoch 4/35
 - 2s - loss: 2.5993 - acc: 0.9702 - val_loss: 1.7722 - val_acc: 0.9286
Epoch 5/35
 - 2s - loss: 1.0276 - acc: 0.9708 - val_loss: 0.9580 - val_acc: 0.8911
Epoch 6/35
 - 2s - loss: 0.5159 - acc: 0.9787 - val_loss: 0.7202 - val_acc: 0.8457
Epoch 7/35
 - 2s - loss: 0.3905 - acc: 0.9708 - val_loss: 0.5576 - val_acc: 0.9308
Epoch 8/35
 - 2s - loss: 0.3298 - acc: 0.9750 - val_loss: 0.5118 - val_acc: 0.9315
Epoch 9/35
 - 2s - loss: 0.2802 - acc: 0.9820 - val_loss: 0.4767 - val_acc: 0.9380
Epoch 10/35
```

```
         - 2s - loss: 0.2636 - acc: 0.9826 - val_loss: 0.4563 - val_acc: 0.9329
Epoch 11/35
         - 2s - loss: 0.2577 - acc: 0.9842 - val_loss: 0.4307 - val_acc: 0.9380
Epoch 12/35
         - 2s - loss: 0.2392 - acc: 0.9823 - val_loss: 0.4447 - val_acc: 0.9135
Epoch 13/35
         - 2s - loss: 0.2225 - acc: 0.9863 - val_loss: 0.4120 - val_acc: 0.9423
Epoch 14/35
         - 2s - loss: 0.1998 - acc: 0.9909 - val_loss: 0.3562 - val_acc: 0.9647
Epoch 15/35
         - 2s - loss: 0.1931 - acc: 0.9866 - val_loss: 0.4689 - val_acc: 0.8753
Epoch 16/35
         - 2s - loss: 0.2090 - acc: 0.9842 - val_loss: 0.4996 - val_acc: 0.8248
Epoch 17/35
         - 2s - loss: 0.2163 - acc: 0.9833 - val_loss: 0.3756 - val_acc: 0.9394
Epoch 18/35
         - 2s - loss: 0.1800 - acc: 0.9903 - val_loss: 0.3692 - val_acc: 0.9445
Epoch 19/35
         - 2s - loss: 0.1871 - acc: 0.9845 - val_loss: 0.4578 - val_acc: 0.8976
Epoch 20/35
         - 2s - loss: 0.1638 - acc: 0.9924 - val_loss: 0.3847 - val_acc: 0.9019
Epoch 21/35
         - 2s - loss: 0.1718 - acc: 0.9854 - val_loss: 0.3571 - val_acc: 0.9445
Epoch 22/35
         - 2s - loss: 0.1725 - acc: 0.9830 - val_loss: 0.3832 - val_acc: 0.9329
Epoch 23/35
         - 2s - loss: 0.1671 - acc: 0.9893 - val_loss: 0.3157 - val_acc: 0.9625
Epoch 24/35
         - 2s - loss: 0.1790 - acc: 0.9823 - val_loss: 0.3117 - val_acc: 0.9596
Epoch 25/35
         - 2s - loss: 0.1382 - acc: 0.9960 - val_loss: 0.2875 - val_acc: 0.9510
Epoch 26/35
         - 2s - loss: 0.1505 - acc: 0.9875 - val_loss: 0.3194 - val_acc: 0.9452
Epoch 27/35
         - 2s - loss: 0.1566 - acc: 0.9839 - val_loss: 0.3554 - val_acc: 0.9214
Epoch 28/35
         - 2s - loss: 0.1331 - acc: 0.9939 - val_loss: 0.2711 - val_acc: 0.9661
Epoch 29/35
         - 2s - loss: 0.1544 - acc: 0.9857 - val_loss: 0.3961 - val_acc: 0.8897
Epoch 30/35
         - 2s - loss: 0.1626 - acc: 0.9872 - val_loss: 0.2571 - val_acc: 0.9690
Epoch 31/35
         - 2s - loss: 0.1518 - acc: 0.9845 - val_loss: 0.3051 - val_acc: 0.9567
```

```
Epoch 32/35
 - 2s - loss: 0.1354 - acc: 0.9945 - val_loss: 0.2588 - val_acc: 0.9647
Epoch 33/35
 - 2s - loss: 0.1228 - acc: 0.9933 - val_loss: 0.2451 - val_acc: 0.9654
Epoch 34/35
 - 2s - loss: 0.1250 - acc: 0.9915 - val_loss: 0.3148 - val_acc: 0.9337
Epoch 35/35
 - 2s - loss: 0.1655 - acc: 0.9823 - val_loss: 0.2391 - val_acc: 0.9704
Train accuracy 0.9990867579908675 Test accuracy: 0.9704397981254506
------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 16)	3600
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 16)	0
flatten_1 (Flatten)	(None, 368)	0
dense_1 (Dense)	(None, 32)	11808
dense_2 (Dense)	(None, 3)	99

```
Total params: 17,555
Trainable params: 17,555
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 26.0067 - acc: 0.5686 - val_loss: 5.4353 - val_acc: 0.7851
Epoch 2/35
 - 2s - loss: 2.1143 - acc: 0.9056 - val_loss: 0.9471 - val_acc: 0.9034
Epoch 3/35
 - 2s - loss: 0.4410 - acc: 0.9729 - val_loss: 0.5537 - val_acc: 0.9279
Epoch 4/35
 - 2s - loss: 0.3186 - acc: 0.9766 - val_loss: 0.4684 - val_acc: 0.9495
Epoch 5/35
 - 2s - loss: 0.2542 - acc: 0.9802 - val_loss: 0.4509 - val_acc: 0.9344
```

```
Epoch 6/35
 - 2s - loss: 0.2291 - acc: 0.9814 - val_loss: 0.4334 - val_acc: 0.9308
Epoch 7/35
 - 2s - loss: 0.2055 - acc: 0.9817 - val_loss: 0.4379 - val_acc: 0.9084
Epoch 8/35
 - 2s - loss: 0.2157 - acc: 0.9799 - val_loss: 0.3888 - val_acc: 0.9560
Epoch 9/35
 - 2s - loss: 0.1782 - acc: 0.9881 - val_loss: 0.3432 - val_acc: 0.9488
Epoch 10/35
 - 2s - loss: 0.2061 - acc: 0.9790 - val_loss: 0.4806 - val_acc: 0.8681
Epoch 11/35
 - 2s - loss: 0.1728 - acc: 0.9863 - val_loss: 0.3193 - val_acc: 0.9546
Epoch 12/35
 - 2s - loss: 0.2246 - acc: 0.9714 - val_loss: 0.3512 - val_acc: 0.9531
Epoch 13/35
 - 2s - loss: 0.1908 - acc: 0.9802 - val_loss: 0.4023 - val_acc: 0.9329
Epoch 14/35
 - 2s - loss: 0.1425 - acc: 0.9933 - val_loss: 0.3587 - val_acc: 0.9445
Epoch 15/35
 - 2s - loss: 0.1684 - acc: 0.9814 - val_loss: 0.3347 - val_acc: 0.9329
Epoch 16/35
 - 2s - loss: 0.1606 - acc: 0.9875 - val_loss: 0.2951 - val_acc: 0.9387
Epoch 17/35
 - 2s - loss: 0.1573 - acc: 0.9839 - val_loss: 0.2964 - val_acc: 0.9618
Epoch 18/35
 - 2s - loss: 0.1269 - acc: 0.9933 - val_loss: 0.3427 - val_acc: 0.9193
Epoch 19/35
 - 2s - loss: 0.2529 - acc: 0.9623 - val_loss: 0.4386 - val_acc: 0.9272
Epoch 20/35
 - 2s - loss: 0.1839 - acc: 0.9903 - val_loss: 0.3160 - val_acc: 0.9308
Epoch 21/35
 - 2s - loss: 0.1134 - acc: 0.9963 - val_loss: 0.3186 - val_acc: 0.9387
Epoch 22/35
 - 2s - loss: 0.1187 - acc: 0.9918 - val_loss: 0.3964 - val_acc: 0.9012
Epoch 23/35
 - 2s - loss: 0.1335 - acc: 0.9857 - val_loss: 0.3176 - val_acc: 0.9344
Epoch 24/35
 - 2s - loss: 0.1497 - acc: 0.9836 - val_loss: 0.3261 - val_acc: 0.9503
Epoch 25/35
 - 2s - loss: 0.1322 - acc: 0.9881 - val_loss: 0.2992 - val_acc: 0.9430
Epoch 26/35
 - 2s - loss: 0.1574 - acc: 0.9830 - val_loss: 0.3393 - val_acc: 0.9034
Epoch 27/35
```

```
 - 2s - loss: 0.1497 - acc: 0.9869 - val_loss: 0.3149 - val_acc: 0.9438
Epoch 28/35
 - 2s - loss: 0.1239 - acc: 0.9900 - val_loss: 0.2950 - val_acc: 0.9337
Epoch 29/35
 - 2s - loss: 0.1672 - acc: 0.9772 - val_loss: 0.2781 - val_acc: 0.9387
Epoch 30/35
 - 2s - loss: 0.1204 - acc: 0.9927 - val_loss: 0.3214 - val_acc: 0.9301
Epoch 31/35
 - 2s - loss: 0.1023 - acc: 0.9924 - val_loss: 0.3047 - val_acc: 0.9250
Epoch 32/35
 - 2s - loss: 0.1048 - acc: 0.9906 - val_loss: 0.3555 - val_acc: 0.9099
Epoch 33/35
 - 2s - loss: 0.2256 - acc: 0.9714 - val_loss: 0.3411 - val_acc: 0.9106
Epoch 34/35
 - 2s - loss: 0.1159 - acc: 0.9918 - val_loss: 0.3403 - val_acc: 0.9120
Epoch 35/35
 - 2s - loss: 0.1137 - acc: 0.9896 - val_loss: 0.2675 - val_acc: 0.9423
Train accuracy 0.9881278538812786 Test accuracy: 0.9423215573179524
--------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 116, 32)           7200

dropout_1 (Dropout)          (None, 116, 32)           0

max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0

flatten_1 (Flatten)          (None, 736)               0

dense_1 (Dense)              (None, 32)                23584

dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
```

```
       - 4s - loss: 27.3055 - acc: 0.6843 - val_loss: 3.6043 - val_acc: 0.7347
   Epoch 2/55
       - 3s - loss: 1.2981 - acc: 0.9449 - val_loss: 0.8110 - val_acc: 0.8818
   Epoch 3/55
       - 3s - loss: 0.3955 - acc: 0.9689 - val_loss: 0.6277 - val_acc: 0.8861
   Epoch 4/55
       - 3s - loss: 0.3063 - acc: 0.9775 - val_loss: 0.5536 - val_acc: 0.9445
   Epoch 5/55
       - 3s - loss: 0.2680 - acc: 0.9784 - val_loss: 0.5028 - val_acc: 0.9301
   Epoch 6/55
       - 3s - loss: 0.2534 - acc: 0.9753 - val_loss: 0.4591 - val_acc: 0.9351
   Epoch 7/55
       - 3s - loss: 0.2596 - acc: 0.9769 - val_loss: 0.5203 - val_acc: 0.8832
   Epoch 8/55
       - 3s - loss: 0.2243 - acc: 0.9826 - val_loss: 0.4407 - val_acc: 0.9243
   Epoch 9/55
       - 3s - loss: 0.1819 - acc: 0.9881 - val_loss: 0.3835 - val_acc: 0.9430
   Epoch 10/55
       - 3s - loss: 0.1912 - acc: 0.9857 - val_loss: 0.3531 - val_acc: 0.9582
   Epoch 11/55
       - 3s - loss: 0.2183 - acc: 0.9772 - val_loss: 0.3504 - val_acc: 0.9495
   Epoch 12/55
       - 3s - loss: 0.1637 - acc: 0.9881 - val_loss: 0.3654 - val_acc: 0.9423
   Epoch 13/55
       - 3s - loss: 0.1487 - acc: 0.9893 - val_loss: 0.4071 - val_acc: 0.9315
   Epoch 14/55
       - 3s - loss: 0.1896 - acc: 0.9817 - val_loss: 0.3207 - val_acc: 0.9531
   Epoch 15/55
       - 3s - loss: 0.1388 - acc: 0.9930 - val_loss: 0.3134 - val_acc: 0.9488
   Epoch 16/55
       - 3s - loss: 0.1317 - acc: 0.9924 - val_loss: 0.3283 - val_acc: 0.9503
   Epoch 17/55
       - 3s - loss: 0.1721 - acc: 0.9836 - val_loss: 0.2906 - val_acc: 0.9654
   Epoch 18/55
       - 3s - loss: 0.1361 - acc: 0.9875 - val_loss: 0.4564 - val_acc: 0.8969
   Epoch 19/55
       - 3s - loss: 0.1584 - acc: 0.9857 - val_loss: 0.2769 - val_acc: 0.9726
   Epoch 20/55
       - 3s - loss: 0.1212 - acc: 0.9927 - val_loss: 0.2725 - val_acc: 0.9603
   Epoch 21/55
       - 3s - loss: 0.1527 - acc: 0.9823 - val_loss: 0.3542 - val_acc: 0.9402
   Epoch 22/55
       - 3s - loss: 0.1233 - acc: 0.9918 - val_loss: 0.2862 - val_acc: 0.9640
```

```
Epoch 23/55
 - 3s - loss: 0.0968 - acc: 0.9967 - val_loss: 0.2734 - val_acc: 0.9582
Epoch 24/55
 - 3s - loss: 0.1921 - acc: 0.9735 - val_loss: 0.4369 - val_acc: 0.9301
Epoch 25/55
 - 3s - loss: 0.1437 - acc: 0.9875 - val_loss: 0.3561 - val_acc: 0.9236
Epoch 26/55
 - 3s - loss: 0.1060 - acc: 0.9957 - val_loss: 0.2973 - val_acc: 0.9481
Epoch 27/55
 - 3s - loss: 0.1393 - acc: 0.9863 - val_loss: 0.2855 - val_acc: 0.9387
Epoch 28/55
 - 3s - loss: 0.1533 - acc: 0.9839 - val_loss: 0.2781 - val_acc: 0.9596
Epoch 29/55
 - 3s - loss: 0.0996 - acc: 0.9945 - val_loss: 0.3370 - val_acc: 0.9286
Epoch 30/55
 - 3s - loss: 0.0886 - acc: 0.9960 - val_loss: 0.3112 - val_acc: 0.9164
Epoch 31/55
 - 3s - loss: 0.1211 - acc: 0.9890 - val_loss: 0.2562 - val_acc: 0.9452
Epoch 32/55
 - 3s - loss: 0.1138 - acc: 0.9875 - val_loss: 0.3837 - val_acc: 0.8998
Epoch 33/55
 - 3s - loss: 0.1521 - acc: 0.9796 - val_loss: 0.4394 - val_acc: 0.9048
Epoch 34/55
 - 3s - loss: 0.1251 - acc: 0.9930 - val_loss: 0.2909 - val_acc: 0.9358
Epoch 35/55
 - 3s - loss: 0.1184 - acc: 0.9887 - val_loss: 0.3634 - val_acc: 0.8882
Epoch 36/55
 - 3s - loss: 0.1015 - acc: 0.9939 - val_loss: 0.3331 - val_acc: 0.9164
Epoch 37/55
 - 3s - loss: 0.1371 - acc: 0.9854 - val_loss: 0.3038 - val_acc: 0.9250
Epoch 38/55
 - 3s - loss: 0.1044 - acc: 0.9948 - val_loss: 0.2698 - val_acc: 0.9503
Epoch 39/55
 - 3s - loss: 0.1098 - acc: 0.9915 - val_loss: 0.3248 - val_acc: 0.9149
Epoch 40/55
 - 3s - loss: 0.0926 - acc: 0.9942 - val_loss: 0.3294 - val_acc: 0.9337
Epoch 41/55
 - 3s - loss: 0.0964 - acc: 0.9903 - val_loss: 0.3177 - val_acc: 0.9257
Epoch 42/55
 - 3s - loss: 0.1724 - acc: 0.9775 - val_loss: 0.4256 - val_acc: 0.8789
Epoch 43/55
 - 3s - loss: 0.0872 - acc: 0.9979 - val_loss: 0.2935 - val_acc: 0.9236
Epoch 44/55
```

```
 - 3s - loss: 0.1139 - acc: 0.9884 - val_loss: 0.3017 - val_acc: 0.9567
Epoch 45/55
 - 3s - loss: 0.1283 - acc: 0.9863 - val_loss: 0.3306 - val_acc: 0.9344
Epoch 46/55
 - 3s - loss: 0.0963 - acc: 0.9933 - val_loss: 0.2862 - val_acc: 0.9409
Epoch 47/55
 - 3s - loss: 0.1049 - acc: 0.9903 - val_loss: 0.2764 - val_acc: 0.9423
Epoch 48/55
 - 3s - loss: 0.1044 - acc: 0.9900 - val_loss: 0.3101 - val_acc: 0.9185
Epoch 49/55
 - 3s - loss: 0.0852 - acc: 0.9930 - val_loss: 0.2861 - val_acc: 0.9214
Epoch 50/55
 - 3s - loss: 0.1026 - acc: 0.9884 - val_loss: 0.2790 - val_acc: 0.9265
Epoch 51/55
 - 3s - loss: 0.1151 - acc: 0.9860 - val_loss: 0.3267 - val_acc: 0.9301
Epoch 52/55
 - 3s - loss: 0.0991 - acc: 0.9924 - val_loss: 0.2539 - val_acc: 0.9423
Epoch 53/55
 - 3s - loss: 0.0893 - acc: 0.9924 - val_loss: 0.5798 - val_acc: 0.8536
Epoch 54/55
 - 3s - loss: 0.1682 - acc: 0.9778 - val_loss: 0.2594 - val_acc: 0.9351
Epoch 55/55
 - 3s - loss: 0.1001 - acc: 0.9909 - val_loss: 0.3277 - val_acc: 0.9221
Train accuracy 0.9917808219178083 Test accuracy: 0.9221341023792358
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 118, 32)	4512
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 16)	11792
dense_2 (Dense)	(None, 3)	51

```
Total params: 18,147
```

```
Trainable params: 18,147
Non-trainable params: 0

_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 27.7874 - acc: 0.4810 - val_loss: 12.2849 - val_acc: 0.6208
Epoch 2/35
 - 1s - loss: 6.3928 - acc: 0.8265 - val_loss: 3.1274 - val_acc: 0.8803
Epoch 3/35
 - 1s - loss: 1.5989 - acc: 0.9626 - val_loss: 1.2244 - val_acc: 0.9207
Epoch 4/35
 - 1s - loss: 0.6285 - acc: 0.9723 - val_loss: 0.7783 - val_acc: 0.9185
Epoch 5/35
 - 1s - loss: 0.3676 - acc: 0.9896 - val_loss: 0.6331 - val_acc: 0.9236
Epoch 6/35
 - 1s - loss: 0.2947 - acc: 0.9881 - val_loss: 0.5416 - val_acc: 0.9575
Epoch 7/35
 - 1s - loss: 0.2464 - acc: 0.9930 - val_loss: 0.5001 - val_acc: 0.9495
Epoch 8/35
 - 1s - loss: 0.2303 - acc: 0.9878 - val_loss: 0.5032 - val_acc: 0.9106
Epoch 9/35
 - 1s - loss: 0.2022 - acc: 0.9936 - val_loss: 0.4197 - val_acc: 0.9668
Epoch 10/35
 - 1s - loss: 0.1990 - acc: 0.9912 - val_loss: 0.4492 - val_acc: 0.9200
Epoch 11/35
 - 1s - loss: 0.1755 - acc: 0.9948 - val_loss: 0.4377 - val_acc: 0.9279
Epoch 12/35
 - 1s - loss: 0.1734 - acc: 0.9909 - val_loss: 0.3932 - val_acc: 0.9459
Epoch 13/35
 - 1s - loss: 0.1498 - acc: 0.9970 - val_loss: 0.3791 - val_acc: 0.9611
Epoch 14/35
 - 1s - loss: 0.1438 - acc: 0.9933 - val_loss: 0.3844 - val_acc: 0.9452
Epoch 15/35
 - 1s - loss: 0.1476 - acc: 0.9918 - val_loss: 0.3349 - val_acc: 0.9676
Epoch 16/35
 - 1s - loss: 0.1451 - acc: 0.9915 - val_loss: 0.3554 - val_acc: 0.9380
Epoch 17/35
 - 1s - loss: 0.1603 - acc: 0.9866 - val_loss: 0.3298 - val_acc: 0.9416
Epoch 18/35
 - 1s - loss: 0.1258 - acc: 0.9951 - val_loss: 0.3292 - val_acc: 0.9625
Epoch 19/35
 - 1s - loss: 0.1225 - acc: 0.9939 - val_loss: 0.3167 - val_acc: 0.9517
```

```
Epoch 20/35
 - 1s - loss: 0.1264 - acc: 0.9930 - val_loss: 0.3727 - val_acc: 0.9034
Epoch 21/35
 - 1s - loss: 0.1147 - acc: 0.9960 - val_loss: 0.3233 - val_acc: 0.9445
Epoch 22/35
 - 1s - loss: 0.1209 - acc: 0.9927 - val_loss: 0.3088 - val_acc: 0.9488
Epoch 23/35
 - 1s - loss: 0.1178 - acc: 0.9921 - val_loss: 0.2854 - val_acc: 0.9668
Epoch 24/35
 - 1s - loss: 0.1256 - acc: 0.9909 - val_loss: 0.2761 - val_acc: 0.9654
Epoch 25/35
 - 1s - loss: 0.1054 - acc: 0.9970 - val_loss: 0.2772 - val_acc: 0.9712
Epoch 26/35
 - 1s - loss: 0.0956 - acc: 0.9970 - val_loss: 0.2667 - val_acc: 0.9697
Epoch 27/35
 - 1s - loss: 0.1257 - acc: 0.9854 - val_loss: 0.4082 - val_acc: 0.9070
Epoch 28/35
 - 1s - loss: 0.1490 - acc: 0.9866 - val_loss: 0.2711 - val_acc: 0.9618
Epoch 29/35
 - 1s - loss: 0.0913 - acc: 0.9991 - val_loss: 0.2754 - val_acc: 0.9618
Epoch 30/35
 - 1s - loss: 0.1116 - acc: 0.9906 - val_loss: 0.2690 - val_acc: 0.9589
Epoch 31/35
 - 1s - loss: 0.0934 - acc: 0.9982 - val_loss: 0.2659 - val_acc: 0.9625
Epoch 32/35
 - 1s - loss: 0.1062 - acc: 0.9893 - val_loss: 0.2955 - val_acc: 0.9481
Epoch 33/35
 - 1s - loss: 0.0911 - acc: 0.9979 - val_loss: 0.2514 - val_acc: 0.9740
Epoch 34/35
 - 1s - loss: 0.0888 - acc: 0.9960 - val_loss: 0.2506 - val_acc: 0.9618
Epoch 35/35
 - 1s - loss: 0.0985 - acc: 0.9930 - val_loss: 0.2561 - val_acc: 0.9596
Train accuracy 1.0 Test accuracy: 0.9596250901225667
------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0

```
max_pooling1d_1 (MaxPooling1 (None, 38, 32)              0
_____
flatten_1 (Flatten)          (None, 1216)                0
_____
dense_1 (Dense)              (None, 32)                  38944
_____
dense_2 (Dense)              (None, 3)                   99
=================================================================
Total params: 48,291
Trainable params: 48,291
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 38.8960 - acc: 0.5991 - val_loss: 17.2090 - val_acc: 0.8306
Epoch 2/35
 - 2s - loss: 9.3178 - acc: 0.9400 - val_loss: 4.7509 - val_acc: 0.9077
Epoch 3/35
 - 2s - loss: 2.6779 - acc: 0.9744 - val_loss: 1.7228 - val_acc: 0.8673
Epoch 4/35
 - 2s - loss: 0.9279 - acc: 0.9851 - val_loss: 0.7867 - val_acc: 0.9322
Epoch 5/35
 - 2s - loss: 0.4150 - acc: 0.9878 - val_loss: 0.5300 - val_acc: 0.9373
Epoch 6/35
 - 2s - loss: 0.2724 - acc: 0.9863 - val_loss: 0.4391 - val_acc: 0.9459
Epoch 7/35
 - 2s - loss: 0.2132 - acc: 0.9915 - val_loss: 0.4348 - val_acc: 0.9178
Epoch 8/35
 - 2s - loss: 0.1972 - acc: 0.9918 - val_loss: 0.4086 - val_acc: 0.9120
Epoch 9/35
 - 2s - loss: 0.1768 - acc: 0.9942 - val_loss: 0.3255 - val_acc: 0.9510
Epoch 10/35
 - 2s - loss: 0.1657 - acc: 0.9924 - val_loss: 0.4025 - val_acc: 0.8818
Epoch 11/35
 - 2s - loss: 0.1538 - acc: 0.9936 - val_loss: 0.3004 - val_acc: 0.9712
Epoch 12/35
 - 2s - loss: 0.1721 - acc: 0.9863 - val_loss: 0.3200 - val_acc: 0.9546
Epoch 13/35
 - 2s - loss: 0.1362 - acc: 0.9957 - val_loss: 0.2827 - val_acc: 0.9697
Epoch 14/35
 - 2s - loss: 0.1218 - acc: 0.9973 - val_loss: 0.2673 - val_acc: 0.9683
Epoch 15/35
```

```
        - 2s - loss: 0.1493 - acc: 0.9890 - val_loss: 0.2758 - val_acc: 0.9524
       Epoch 16/35
        - 2s - loss: 0.1271 - acc: 0.9945 - val_loss: 0.2426 - val_acc: 0.9776
       Epoch 17/35
        - 2s - loss: 0.1332 - acc: 0.9900 - val_loss: 0.2268 - val_acc: 0.9748
       Epoch 18/35
        - 2s - loss: 0.1162 - acc: 0.9973 - val_loss: 0.2560 - val_acc: 0.9546
       Epoch 19/35
        - 2s - loss: 0.1540 - acc: 0.9814 - val_loss: 0.3681 - val_acc: 0.9149
       Epoch 20/35
        - 2s - loss: 0.1355 - acc: 0.9936 - val_loss: 0.2216 - val_acc: 0.9733
       Epoch 21/35
        - 2s - loss: 0.0951 - acc: 0.9994 - val_loss: 0.2297 - val_acc: 0.9784
       Epoch 22/35
        - 2s - loss: 0.0933 - acc: 0.9991 - val_loss: 0.2213 - val_acc: 0.9690
       Epoch 23/35
        - 2s - loss: 0.0994 - acc: 0.9960 - val_loss: 0.2224 - val_acc: 0.9697
       Epoch 24/35
        - 2s - loss: 0.1085 - acc: 0.9921 - val_loss: 0.2476 - val_acc: 0.9553
       Epoch 25/35
        - 2s - loss: 0.1797 - acc: 0.9790 - val_loss: 0.1993 - val_acc: 0.9755
       Epoch 26/35
        - 2s - loss: 0.0888 - acc: 0.9994 - val_loss: 0.2148 - val_acc: 0.9676
       Epoch 27/35
        - 2s - loss: 0.0839 - acc: 0.9991 - val_loss: 0.2077 - val_acc: 0.9769
       Epoch 28/35
        - 2s - loss: 0.0841 - acc: 0.9982 - val_loss: 0.1877 - val_acc: 0.9798
       Epoch 29/35
        - 2s - loss: 0.0824 - acc: 0.9979 - val_loss: 0.2056 - val_acc: 0.9596
       Epoch 30/35
        - 2s - loss: 0.0924 - acc: 0.9942 - val_loss: 0.1870 - val_acc: 0.9762
       Epoch 31/35
        - 2s - loss: 0.0831 - acc: 0.9988 - val_loss: 0.1728 - val_acc: 0.9769
       Epoch 32/35
        - 2s - loss: 0.1719 - acc: 0.9756 - val_loss: 0.4165 - val_acc: 0.9077
       Epoch 33/35
        - 2s - loss: 0.1427 - acc: 0.9951 - val_loss: 0.1929 - val_acc: 0.9661
       Epoch 34/35
        - 2s - loss: 0.0834 - acc: 0.9985 - val_loss: 0.1873 - val_acc: 0.9755
       Epoch 35/35
        - 2s - loss: 0.0715 - acc: 0.9991 - val_loss: 0.1718 - val_acc: 0.9798
       Train accuracy 1.0 Test accuracy: 0.9798125450612833
       -------------------------------------------------------------------------------
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 126, 32)           896

conv1d_2 (Conv1D)            (None, 120, 16)           3600

dropout_1 (Dropout)          (None, 120, 16)           0

max_pooling1d_1 (MaxPooling1 (None, 40, 16)            0

flatten_1 (Flatten)          (None, 640)               0

dense_1 (Dense)              (None, 64)                41024

dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 45,715
Trainable params: 45,715
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 8.5415 - acc: 0.7026 - val_loss: 3.7678 - val_acc: 0.9048
Epoch 2/55
 - 2s - loss: 2.1438 - acc: 0.9686 - val_loss: 1.4563 - val_acc: 0.9481
Epoch 3/55
 - 2s - loss: 0.8488 - acc: 0.9903 - val_loss: 0.7582 - val_acc: 0.9488
Epoch 4/55
 - 2s - loss: 0.4135 - acc: 0.9936 - val_loss: 0.5107 - val_acc: 0.9416
Epoch 5/55
 - 2s - loss: 0.2588 - acc: 0.9933 - val_loss: 0.4065 - val_acc: 0.9560
Epoch 6/55
 - 2s - loss: 0.1839 - acc: 0.9945 - val_loss: 0.3803 - val_acc: 0.9394
Epoch 7/55
 - 2s - loss: 0.1729 - acc: 0.9903 - val_loss: 0.3097 - val_acc: 0.9575
Epoch 8/55
 - 2s - loss: 0.1354 - acc: 0.9948 - val_loss: 0.3041 - val_acc: 0.9517
Epoch 9/55
 - 2s - loss: 0.1309 - acc: 0.9933 - val_loss: 0.2780 - val_acc: 0.9553
Epoch 10/55
 - 2s - loss: 0.1137 - acc: 0.9960 - val_loss: 0.2717 - val_acc: 0.9531
```

```
Epoch 11/55
 - 2s - loss: 0.2032 - acc: 0.9689 - val_loss: 0.3156 - val_acc: 0.9539
Epoch 12/55
 - 2s - loss: 0.1186 - acc: 0.9988 - val_loss: 0.2367 - val_acc: 0.9690
Epoch 13/55
 - 2s - loss: 0.0932 - acc: 0.9982 - val_loss: 0.2351 - val_acc: 0.9603
Epoch 14/55
 - 2s - loss: 0.0853 - acc: 0.9988 - val_loss: 0.2343 - val_acc: 0.9546
Epoch 15/55
 - 2s - loss: 0.0766 - acc: 0.9973 - val_loss: 0.2361 - val_acc: 0.9517
Epoch 16/55
 - 2s - loss: 0.0746 - acc: 0.9970 - val_loss: 0.2236 - val_acc: 0.9495
Epoch 17/55
 - 2s - loss: 0.0789 - acc: 0.9960 - val_loss: 0.2052 - val_acc: 0.9553
Epoch 18/55
 - 2s - loss: 0.0846 - acc: 0.9939 - val_loss: 0.2233 - val_acc: 0.9560
Epoch 19/55
 - 2s - loss: 0.1006 - acc: 0.9909 - val_loss: 0.1907 - val_acc: 0.9611
Epoch 20/55
 - 2s - loss: 0.0767 - acc: 0.9970 - val_loss: 0.1916 - val_acc: 0.9596
Epoch 21/55
 - 2s - loss: 0.0639 - acc: 0.9979 - val_loss: 0.2473 - val_acc: 0.9517
Epoch 22/55
 - 2s - loss: 0.0751 - acc: 0.9963 - val_loss: 0.1730 - val_acc: 0.9603
Epoch 23/55
 - 2s - loss: 0.0627 - acc: 0.9957 - val_loss: 0.2897 - val_acc: 0.9193
Epoch 24/55
 - 2s - loss: 0.0923 - acc: 0.9887 - val_loss: 0.2140 - val_acc: 0.9517
Epoch 25/55
 - 2s - loss: 0.0689 - acc: 0.9979 - val_loss: 0.2103 - val_acc: 0.9524
Epoch 26/55
 - 2s - loss: 0.0686 - acc: 0.9954 - val_loss: 0.2041 - val_acc: 0.9416
Epoch 27/55
 - 2s - loss: 0.0525 - acc: 0.9991 - val_loss: 0.2342 - val_acc: 0.9387
Epoch 28/55
 - 2s - loss: 0.0553 - acc: 0.9973 - val_loss: 0.1673 - val_acc: 0.9690
Epoch 29/55
 - 2s - loss: 0.0531 - acc: 0.9970 - val_loss: 0.2297 - val_acc: 0.9459
Epoch 30/55
 - 2s - loss: 0.0817 - acc: 0.9936 - val_loss: 0.2390 - val_acc: 0.9430
Epoch 31/55
 - 2s - loss: 0.0697 - acc: 0.9960 - val_loss: 0.1766 - val_acc: 0.9582
Epoch 32/55
```

```
      - 2s - loss: 0.0562 - acc: 0.9985 - val_loss: 0.2653 - val_acc: 0.9236
Epoch 33/55
      - 2s - loss: 0.0868 - acc: 0.9893 - val_loss: 0.1994 - val_acc: 0.9495
Epoch 34/55
      - 2s - loss: 0.0522 - acc: 0.9997 - val_loss: 0.1956 - val_acc: 0.9510
Epoch 35/55
      - 2s - loss: 0.0536 - acc: 0.9967 - val_loss: 0.2557 - val_acc: 0.9366
Epoch 36/55
      - 2s - loss: 0.0599 - acc: 0.9960 - val_loss: 0.1863 - val_acc: 0.9474
Epoch 37/55
      - 2s - loss: 0.0549 - acc: 0.9973 - val_loss: 0.2054 - val_acc: 0.9503
Epoch 38/55
      - 2s - loss: 0.0460 - acc: 0.9988 - val_loss: 0.2229 - val_acc: 0.9344
Epoch 39/55
      - 2s - loss: 0.0622 - acc: 0.9942 - val_loss: 0.1865 - val_acc: 0.9582
Epoch 40/55
      - 2s - loss: 0.0568 - acc: 0.9963 - val_loss: 0.2667 - val_acc: 0.9149
Epoch 41/55
      - 2s - loss: 0.0555 - acc: 0.9960 - val_loss: 0.1694 - val_acc: 0.9539
Epoch 42/55
      - 2s - loss: 0.0521 - acc: 0.9976 - val_loss: 0.2094 - val_acc: 0.9329
Epoch 43/55
      - 2s - loss: 0.0512 - acc: 0.9973 - val_loss: 0.1839 - val_acc: 0.9553
Epoch 44/55
      - 2s - loss: 0.0434 - acc: 0.9982 - val_loss: 0.1852 - val_acc: 0.9567
Epoch 45/55
      - 2s - loss: 0.0572 - acc: 0.9936 - val_loss: 0.1867 - val_acc: 0.9459
Epoch 46/55
      - 2s - loss: 0.0621 - acc: 0.9957 - val_loss: 0.2916 - val_acc: 0.9250
Epoch 47/55
      - 2s - loss: 0.0579 - acc: 0.9963 - val_loss: 0.2497 - val_acc: 0.9430
Epoch 48/55
      - 2s - loss: 0.0458 - acc: 0.9985 - val_loss: 0.2003 - val_acc: 0.9531
Epoch 49/55
      - 2s - loss: 0.0764 - acc: 0.9896 - val_loss: 0.2287 - val_acc: 0.9416
Epoch 50/55
      - 2s - loss: 0.0585 - acc: 0.9970 - val_loss: 0.2139 - val_acc: 0.9459
Epoch 51/55
      - 2s - loss: 0.0539 - acc: 0.9945 - val_loss: 0.2087 - val_acc: 0.9474
Epoch 52/55
      - 2s - loss: 0.0612 - acc: 0.9951 - val_loss: 0.1458 - val_acc: 0.9589
Epoch 53/55
      - 2s - loss: 0.0562 - acc: 0.9957 - val_loss: 0.1913 - val_acc: 0.9560
```

```
Epoch 54/55
 - 2s - loss: 0.0538 - acc: 0.9954 - val_loss: 0.2297 - val_acc: 0.9510
Epoch 55/55
 - 2s - loss: 0.0566 - acc: 0.9957 - val_loss: 0.2106 - val_acc: 0.9517
Train accuracy 1.0 Test accuracy: 0.9516943042537851
---------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 42)           2688
_____
conv1d_2 (Conv1D)            (None, 116, 32)           9440
_____
dropout_1 (Dropout)          (None, 116, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 38, 32)            0
_____
flatten_1 (Flatten)          (None, 1216)              0
_____
dense_1 (Dense)              (None, 32)                38944
_____
dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 51,171
Trainable params: 51,171
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 2.6849 - acc: 0.8825 - val_loss: 0.5958 - val_acc: 0.9135
Epoch 2/35
 - 2s - loss: 0.3426 - acc: 0.9720 - val_loss: 0.3723 - val_acc: 0.9402
Epoch 3/35
 - 2s - loss: 0.1920 - acc: 0.9872 - val_loss: 0.3124 - val_acc: 0.9358
Epoch 4/35
 - 2s - loss: 0.1805 - acc: 0.9857 - val_loss: 0.2593 - val_acc: 0.9481
Epoch 5/35
 - 2s - loss: 0.2038 - acc: 0.9775 - val_loss: 0.3168 - val_acc: 0.9409
Epoch 6/35
 - 2s - loss: 0.1140 - acc: 0.9927 - val_loss: 0.2110 - val_acc: 0.9575
Epoch 7/35
 - 2s - loss: 0.1318 - acc: 0.9866 - val_loss: 0.2483 - val_acc: 0.9553
```

```
Epoch 8/35
 - 2s - loss: 0.1803 - acc: 0.9763 - val_loss: 0.2362 - val_acc: 0.9531
Epoch 9/35
 - 2s - loss: 0.0754 - acc: 0.9970 - val_loss: 0.2049 - val_acc: 0.9445
Epoch 10/35
 - 2s - loss: 0.0754 - acc: 0.9957 - val_loss: 0.4773 - val_acc: 0.8443
Epoch 11/35
 - 2s - loss: 0.1252 - acc: 0.9854 - val_loss: 0.2614 - val_acc: 0.9344
Epoch 12/35
 - 2s - loss: 0.0592 - acc: 0.9976 - val_loss: 0.2241 - val_acc: 0.9351
Epoch 13/35
 - 2s - loss: 0.1024 - acc: 0.9909 - val_loss: 0.2325 - val_acc: 0.9481
Epoch 14/35
 - 2s - loss: 0.1021 - acc: 0.9881 - val_loss: 0.2856 - val_acc: 0.9524
Epoch 15/35
 - 2s - loss: 0.1042 - acc: 0.9896 - val_loss: 0.2529 - val_acc: 0.9409
Epoch 16/35
 - 2s - loss: 0.0689 - acc: 0.9951 - val_loss: 0.3579 - val_acc: 0.8601
Epoch 17/35
 - 2s - loss: 0.0782 - acc: 0.9939 - val_loss: 0.2222 - val_acc: 0.9380
Epoch 18/35
 - 2s - loss: 0.1001 - acc: 0.9903 - val_loss: 0.3661 - val_acc: 0.9185
Epoch 19/35
 - 2s - loss: 0.0716 - acc: 0.9936 - val_loss: 0.2637 - val_acc: 0.9214
Epoch 20/35
 - 2s - loss: 0.0892 - acc: 0.9924 - val_loss: 0.3396 - val_acc: 0.9301
Epoch 21/35
 - 2s - loss: 0.0477 - acc: 0.9988 - val_loss: 0.2275 - val_acc: 0.9524
Epoch 22/35
 - 2s - loss: 0.0609 - acc: 0.9942 - val_loss: 0.4125 - val_acc: 0.9308
Epoch 23/35
 - 2s - loss: 0.0627 - acc: 0.9957 - val_loss: 0.1783 - val_acc: 0.9531
Epoch 24/35
 - 2s - loss: 0.1416 - acc: 0.9836 - val_loss: 0.3482 - val_acc: 0.9322
Epoch 25/35
 - 2s - loss: 0.0783 - acc: 0.9957 - val_loss: 0.2636 - val_acc: 0.9423
Epoch 26/35
 - 2s - loss: 0.0415 - acc: 0.9985 - val_loss: 0.3182 - val_acc: 0.9171
Epoch 27/35
 - 2s - loss: 0.0499 - acc: 0.9970 - val_loss: 0.2968 - val_acc: 0.9265
Epoch 28/35
 - 2s - loss: 0.0754 - acc: 0.9909 - val_loss: 0.2699 - val_acc: 0.9409
Epoch 29/35
```

```
 - 2s - loss: 0.0986 - acc: 0.9878 - val_loss: 0.2593 - val_acc: 0.9351
Epoch 30/35
 - 2s - loss: 0.0677 - acc: 0.9963 - val_loss: 0.1945 - val_acc: 0.9402
Epoch 31/35
 - 2s - loss: 0.0370 - acc: 0.9997 - val_loss: 0.1990 - val_acc: 0.9560
Epoch 32/35
 - 2s - loss: 0.0352 - acc: 0.9994 - val_loss: 0.2087 - val_acc: 0.9553
Epoch 33/35
 - 2s - loss: 0.1549 - acc: 0.9857 - val_loss: 0.2147 - val_acc: 0.9416
Epoch 34/35
 - 2s - loss: 0.0503 - acc: 0.9979 - val_loss: 0.1681 - val_acc: 0.9589
Epoch 35/35
 - 2s - loss: 0.0411 - acc: 0.9967 - val_loss: 0.2415 - val_acc: 0.9668
Train accuracy 0.9984779299847792 Test accuracy: 0.9668348954578226
------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 38, 32)	0
flatten_1 (Flatten)	(None, 1216)	0
dense_1 (Dense)	(None, 16)	19472
dense_2 (Dense)	(None, 3)	51

```
Total params: 28,771
Trainable params: 28,771
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 39.1465 - acc: 0.4654 - val_loss: 18.0663 - val_acc: 0.5321
Epoch 2/35
 - 2s - loss: 10.1946 - acc: 0.6874 - val_loss: 5.3358 - val_acc: 0.7152
Epoch 3/35
```

```
                - 2s - loss: 3.1728 - acc: 0.8928 - val_loss: 2.0494 - val_acc: 0.8724
        Epoch 4/35
                - 2s - loss: 1.1925 - acc: 0.9671 - val_loss: 1.0105 - val_acc: 0.9214
        Epoch 5/35
                - 2s - loss: 0.5451 - acc: 0.9833 - val_loss: 0.6764 - val_acc: 0.9120
        Epoch 6/35
                - 2s - loss: 0.3432 - acc: 0.9851 - val_loss: 0.5294 - val_acc: 0.9322
        Epoch 7/35
                - 2s - loss: 0.2585 - acc: 0.9933 - val_loss: 0.4750 - val_acc: 0.9106
        Epoch 8/35
                - 2s - loss: 0.2275 - acc: 0.9906 - val_loss: 0.4393 - val_acc: 0.9193
        Epoch 9/35
                - 2s - loss: 0.2021 - acc: 0.9945 - val_loss: 0.3771 - val_acc: 0.9553
        Epoch 10/35
                - 2s - loss: 0.1991 - acc: 0.9924 - val_loss: 0.4823 - val_acc: 0.8565
        Epoch 11/35
                - 2s - loss: 0.1850 - acc: 0.9918 - val_loss: 0.3742 - val_acc: 0.9366
        Epoch 12/35
                - 2s - loss: 0.1797 - acc: 0.9903 - val_loss: 0.3341 - val_acc: 0.9560
        Epoch 13/35
                - 2s - loss: 0.1547 - acc: 0.9963 - val_loss: 0.3230 - val_acc: 0.9625
        Epoch 14/35
                - 2s - loss: 0.1397 - acc: 0.9982 - val_loss: 0.3145 - val_acc: 0.9553
        Epoch 15/35
                - 2s - loss: 0.1747 - acc: 0.9845 - val_loss: 0.2921 - val_acc: 0.9661
        Epoch 16/35
                - 2s - loss: 0.1467 - acc: 0.9933 - val_loss: 0.3013 - val_acc: 0.9459
        Epoch 17/35
                - 2s - loss: 0.1374 - acc: 0.9936 - val_loss: 0.2976 - val_acc: 0.9524
        Epoch 18/35
                - 2s - loss: 0.1393 - acc: 0.9930 - val_loss: 0.2777 - val_acc: 0.9632
        Epoch 19/35
                - 2s - loss: 0.1716 - acc: 0.9808 - val_loss: 0.3505 - val_acc: 0.9250
        Epoch 20/35
                - 2s - loss: 0.1450 - acc: 0.9939 - val_loss: 0.2802 - val_acc: 0.9596
        Epoch 21/35
                - 2s - loss: 0.1189 - acc: 0.9967 - val_loss: 0.2596 - val_acc: 0.9647
        Epoch 22/35
                - 2s - loss: 0.1119 - acc: 0.9970 - val_loss: 0.2791 - val_acc: 0.9445
        Epoch 23/35
                - 2s - loss: 0.1196 - acc: 0.9939 - val_loss: 0.2498 - val_acc: 0.9640
        Epoch 24/35
                - 2s - loss: 0.1233 - acc: 0.9918 - val_loss: 0.2644 - val_acc: 0.9488
```

```
Epoch 25/35
 - 2s - loss: 0.1292 - acc: 0.9909 - val_loss: 0.2577 - val_acc: 0.9510
Epoch 26/35
 - 2s - loss: 0.1017 - acc: 0.9982 - val_loss: 0.2476 - val_acc: 0.9575
Epoch 27/35
 - 2s - loss: 0.1208 - acc: 0.9906 - val_loss: 0.1996 - val_acc: 0.9827
Epoch 28/35
 - 2s - loss: 0.1460 - acc: 0.9854 - val_loss: 0.2308 - val_acc: 0.9697
Epoch 29/35
 - 2s - loss: 0.1022 - acc: 0.9960 - val_loss: 0.2645 - val_acc: 0.9301
Epoch 30/35
 - 2s - loss: 0.1039 - acc: 0.9945 - val_loss: 0.2193 - val_acc: 0.9683
Epoch 31/35
 - 2s - loss: 0.0949 - acc: 0.9967 - val_loss: 0.2054 - val_acc: 0.9776
Epoch 32/35
 - 2s - loss: 0.1408 - acc: 0.9811 - val_loss: 0.2089 - val_acc: 0.9769
Epoch 33/35
 - 2s - loss: 0.0986 - acc: 0.9967 - val_loss: 0.2177 - val_acc: 0.9733
Epoch 34/35
 - 2s - loss: 0.1107 - acc: 0.9936 - val_loss: 0.2339 - val_acc: 0.9539
Epoch 35/35
 - 2s - loss: 0.0974 - acc: 0.9967 - val_loss: 0.1974 - val_acc: 0.9726
Train accuracy 1.0 Test accuracy: 0.9726027397260274
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 118, 32)	5152
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 32)	0
flatten_1 (Flatten)	(None, 1248)	0
dense_1 (Dense)	(None, 32)	39968
dense_2 (Dense)	(None, 3)	99

```
Total params: 47,267
Trainable params: 47,267
```

```
        Non-trainable params: 0

        _____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 22.1495 - acc: 0.5577 - val_loss: 2.1420 - val_acc: 0.6943
Epoch 2/55
 - 2s - loss: 0.8020 - acc: 0.9102 - val_loss: 0.6961 - val_acc: 0.8688
Epoch 3/55
 - 2s - loss: 0.3743 - acc: 0.9559 - val_loss: 0.5399 - val_acc: 0.9315
Epoch 4/55
 - 2s - loss: 0.3439 - acc: 0.9589 - val_loss: 0.4918 - val_acc: 0.9315
Epoch 5/55
 - 2s - loss: 0.2748 - acc: 0.9735 - val_loss: 0.4317 - val_acc: 0.9560
Epoch 6/55
 - 2s - loss: 0.2586 - acc: 0.9723 - val_loss: 0.4849 - val_acc: 0.8846
Epoch 7/55
 - 2s - loss: 0.2445 - acc: 0.9760 - val_loss: 0.4234 - val_acc: 0.9452
Epoch 8/55
 - 2s - loss: 0.2442 - acc: 0.9708 - val_loss: 0.5394 - val_acc: 0.9027
Epoch 9/55
 - 2s - loss: 0.2842 - acc: 0.9638 - val_loss: 0.3635 - val_acc: 0.9625
Epoch 10/55
 - 2s - loss: 0.2495 - acc: 0.9726 - val_loss: 0.3865 - val_acc: 0.9539
Epoch 11/55
 - 2s - loss: 0.1852 - acc: 0.9881 - val_loss: 0.3612 - val_acc: 0.9366
Epoch 12/55
 - 2s - loss: 0.2320 - acc: 0.9689 - val_loss: 0.3922 - val_acc: 0.9387
Epoch 13/55
 - 2s - loss: 0.1959 - acc: 0.9839 - val_loss: 0.3711 - val_acc: 0.9474
Epoch 14/55
 - 2s - loss: 0.1694 - acc: 0.9875 - val_loss: 0.3649 - val_acc: 0.9416
Epoch 15/55
 - 2s - loss: 0.1704 - acc: 0.9839 - val_loss: 0.3498 - val_acc: 0.9344
Epoch 16/55
 - 2s - loss: 0.2056 - acc: 0.9769 - val_loss: 0.5219 - val_acc: 0.8529
Epoch 17/55
 - 2s - loss: 0.1812 - acc: 0.9839 - val_loss: 0.3210 - val_acc: 0.9430
Epoch 18/55
 - 2s - loss: 0.1727 - acc: 0.9814 - val_loss: 0.3783 - val_acc: 0.9056
Epoch 19/55
 - 2s - loss: 0.1764 - acc: 0.9766 - val_loss: 0.4081 - val_acc: 0.9113
Epoch 20/55
```

```
              - 2s - loss: 0.1787 - acc: 0.9836 - val_loss: 0.3292 - val_acc: 0.9351
Epoch 21/55
              - 2s - loss: 0.1888 - acc: 0.9766 - val_loss: 0.3683 - val_acc: 0.9380
Epoch 22/55
              - 2s - loss: 0.1543 - acc: 0.9857 - val_loss: 0.3306 - val_acc: 0.9430
Epoch 23/55
              - 2s - loss: 0.1845 - acc: 0.9747 - val_loss: 0.3594 - val_acc: 0.9387
Epoch 24/55
              - 2s - loss: 0.1829 - acc: 0.9811 - val_loss: 0.3234 - val_acc: 0.9358
Epoch 25/55
              - 2s - loss: 0.1491 - acc: 0.9872 - val_loss: 0.2876 - val_acc: 0.9430
Epoch 26/55
              - 2s - loss: 0.1616 - acc: 0.9802 - val_loss: 0.3114 - val_acc: 0.9337
Epoch 27/55
              - 2s - loss: 0.1488 - acc: 0.9863 - val_loss: 0.3248 - val_acc: 0.9503
Epoch 28/55
              - 2s - loss: 0.1865 - acc: 0.9760 - val_loss: 0.4330 - val_acc: 0.9005
Epoch 29/55
              - 2s - loss: 0.1404 - acc: 0.9909 - val_loss: 0.3247 - val_acc: 0.9351
Epoch 30/55
              - 2s - loss: 0.1619 - acc: 0.9802 - val_loss: 0.3820 - val_acc: 0.9308
Epoch 31/55
              - 2s - loss: 0.1287 - acc: 0.9893 - val_loss: 0.2627 - val_acc: 0.9567
Epoch 32/55
              - 2s - loss: 0.2424 - acc: 0.9650 - val_loss: 0.3321 - val_acc: 0.9416
Epoch 33/55
              - 2s - loss: 0.1536 - acc: 0.9884 - val_loss: 0.3908 - val_acc: 0.9200
Epoch 34/55
              - 2s - loss: 0.1511 - acc: 0.9842 - val_loss: 0.4770 - val_acc: 0.8234
Epoch 35/55
              - 2s - loss: 0.2029 - acc: 0.9717 - val_loss: 0.3288 - val_acc: 0.9438
Epoch 36/55
              - 2s - loss: 0.1294 - acc: 0.9906 - val_loss: 0.2352 - val_acc: 0.9632
Epoch 37/55
              - 2s - loss: 0.1608 - acc: 0.9823 - val_loss: 0.3602 - val_acc: 0.9337
Epoch 38/55
              - 2s - loss: 0.1375 - acc: 0.9863 - val_loss: 0.4090 - val_acc: 0.8745
Epoch 39/55
              - 2s - loss: 0.1911 - acc: 0.9799 - val_loss: 0.3231 - val_acc: 0.9265
Epoch 40/55
              - 2s - loss: 0.1633 - acc: 0.9793 - val_loss: 0.3094 - val_acc: 0.9618
Epoch 41/55
              - 2s - loss: 0.2160 - acc: 0.9705 - val_loss: 0.3574 - val_acc: 0.9351
```

```
Epoch 42/55
 - 2s - loss: 0.1516 - acc: 0.9854 - val_loss: 0.3479 - val_acc: 0.9048
Epoch 43/55
 - 2s - loss: 0.2132 - acc: 0.9729 - val_loss: 0.2979 - val_acc: 0.9423
Epoch 44/55
 - 2s - loss: 0.1272 - acc: 0.9924 - val_loss: 0.3241 - val_acc: 0.9193
Epoch 45/55
 - 2s - loss: 0.1190 - acc: 0.9884 - val_loss: 0.2679 - val_acc: 0.9452
Epoch 46/55
 - 2s - loss: 0.1570 - acc: 0.9778 - val_loss: 0.5182 - val_acc: 0.8810
Epoch 47/55
 - 2s - loss: 0.2014 - acc: 0.9772 - val_loss: 0.4916 - val_acc: 0.9106
Epoch 48/55
 - 2s - loss: 0.1585 - acc: 0.9860 - val_loss: 0.3940 - val_acc: 0.8911
Epoch 49/55
 - 2s - loss: 0.1401 - acc: 0.9875 - val_loss: 0.3846 - val_acc: 0.9135
Epoch 50/55
 - 2s - loss: 0.1212 - acc: 0.9896 - val_loss: 0.4093 - val_acc: 0.8846
Epoch 51/55
 - 2s - loss: 0.2201 - acc: 0.9705 - val_loss: 0.4886 - val_acc: 0.8976
Epoch 52/55
 - 2s - loss: 0.1375 - acc: 0.9900 - val_loss: 0.4245 - val_acc: 0.8911
Epoch 53/55
 - 2s - loss: 0.1229 - acc: 0.9878 - val_loss: 0.5579 - val_acc: 0.8378
Epoch 54/55
 - 2s - loss: 0.1506 - acc: 0.9814 - val_loss: 0.3228 - val_acc: 0.9322
Epoch 55/55
 - 2s - loss: 0.1859 - acc: 0.9763 - val_loss: 0.6605 - val_acc: 0.7830
Train accuracy 0.8700152207001522 Test accuracy: 0.7829848594087959
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 116, 32)	6304
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 38, 32)	0
flatten_1 (Flatten)	(None, 1216)	0

```
dense_1 (Dense)                  (None, 32)                   38944
_____
dense_2 (Dense)                  (None, 3)                    99
===============================================================
Total params: 47,139
Trainable params: 47,139
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 19.1088 - acc: 0.7172 - val_loss: 8.3971 - val_acc: 0.9207
Epoch 2/35
 - 1s - loss: 4.4090 - acc: 0.9732 - val_loss: 2.2830 - val_acc: 0.9402
Epoch 3/35
 - 1s - loss: 1.2143 - acc: 0.9896 - val_loss: 0.8836 - val_acc: 0.9416
Epoch 4/35
 - 1s - loss: 0.4594 - acc: 0.9896 - val_loss: 0.5111 - val_acc: 0.9481
Epoch 5/35
 - 1s - loss: 0.2520 - acc: 0.9900 - val_loss: 0.4331 - val_acc: 0.9156
Epoch 6/35
 - 1s - loss: 0.1796 - acc: 0.9936 - val_loss: 0.3207 - val_acc: 0.9697
Epoch 7/35
 - 1s - loss: 0.1579 - acc: 0.9927 - val_loss: 0.3465 - val_acc: 0.9286
Epoch 8/35
 - 1s - loss: 0.1467 - acc: 0.9933 - val_loss: 0.3164 - val_acc: 0.9373
Epoch 9/35
 - 1s - loss: 0.1261 - acc: 0.9963 - val_loss: 0.2580 - val_acc: 0.9553
Epoch 10/35
 - 1s - loss: 0.1089 - acc: 0.9979 - val_loss: 0.2981 - val_acc: 0.9402
Epoch 11/35
 - 1s - loss: 0.1109 - acc: 0.9948 - val_loss: 0.2506 - val_acc: 0.9503
Epoch 12/35
 - 1s - loss: 0.1256 - acc: 0.9915 - val_loss: 0.2510 - val_acc: 0.9589
Epoch 13/35
 - 1s - loss: 0.0899 - acc: 0.9988 - val_loss: 0.2430 - val_acc: 0.9697
Epoch 14/35
 - 1s - loss: 0.0839 - acc: 0.9991 - val_loss: 0.2567 - val_acc: 0.9402
Epoch 15/35
 - 1s - loss: 0.1086 - acc: 0.9903 - val_loss: 0.2098 - val_acc: 0.9632
Epoch 16/35
 - 1s - loss: 0.0884 - acc: 0.9963 - val_loss: 0.2337 - val_acc: 0.9430
Epoch 17/35
```

```
 - 1s - loss: 0.1030 - acc: 0.9909 - val_loss: 0.2032 - val_acc: 0.9611
Epoch 18/35
 - 1s - loss: 0.0779 - acc: 0.9979 - val_loss: 0.2353 - val_acc: 0.9488
Epoch 19/35
 - 1s - loss: 0.0848 - acc: 0.9936 - val_loss: 0.2139 - val_acc: 0.9524
Epoch 20/35
 - 1s - loss: 0.1165 - acc: 0.9884 - val_loss: 0.2074 - val_acc: 0.9690
Epoch 21/35
 - 1s - loss: 0.0665 - acc: 1.0000 - val_loss: 0.2353 - val_acc: 0.9661
Epoch 22/35
 - 1s - loss: 0.0648 - acc: 0.9985 - val_loss: 0.2149 - val_acc: 0.9589
Epoch 23/35
 - 1s - loss: 0.0655 - acc: 0.9988 - val_loss: 0.1877 - val_acc: 0.9748
Epoch 24/35
 - 1s - loss: 0.1080 - acc: 0.9851 - val_loss: 0.3830 - val_acc: 0.9092
Epoch 25/35
 - 1s - loss: 0.1191 - acc: 0.9936 - val_loss: 0.2155 - val_acc: 0.9625
Epoch 26/35
 - 1s - loss: 0.0653 - acc: 0.9991 - val_loss: 0.2264 - val_acc: 0.9647
Epoch 27/35
 - 1s - loss: 0.0615 - acc: 0.9988 - val_loss: 0.1887 - val_acc: 0.9740
Epoch 28/35
 - 1s - loss: 0.0571 - acc: 0.9997 - val_loss: 0.1979 - val_acc: 0.9704
Epoch 29/35
 - 1s - loss: 0.0751 - acc: 0.9936 - val_loss: 0.2034 - val_acc: 0.9704
Epoch 30/35
 - 1s - loss: 0.1445 - acc: 0.9781 - val_loss: 0.2378 - val_acc: 0.9430
Epoch 31/35
 - 1s - loss: 0.0728 - acc: 0.9988 - val_loss: 0.1998 - val_acc: 0.9618
Epoch 32/35
 - 1s - loss: 0.0563 - acc: 0.9994 - val_loss: 0.1761 - val_acc: 0.9661
Epoch 33/35
 - 1s - loss: 0.0506 - acc: 0.9994 - val_loss: 0.1966 - val_acc: 0.9697
Epoch 34/35
 - 1s - loss: 0.0573 - acc: 0.9982 - val_loss: 0.2645 - val_acc: 0.9582
Epoch 35/35
 - 1s - loss: 0.1006 - acc: 0.9848 - val_loss: 0.2936 - val_acc: 0.9394
Train accuracy 0.9500761035189055 Test accuracy: 0.9394376353987189
--------------------------------------------------------------------------------

_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 126, 32)           896
```

```
conv1d_2 (Conv1D)            (None, 120, 16)            3600
_____
dropout_1 (Dropout)          (None, 120, 16)            0
_____
max_pooling1d_1 (MaxPooling1 (None, 40, 16)             0
_____
flatten_1 (Flatten)          (None, 640)                0
_____
dense_1 (Dense)              (None, 64)                 41024
_____
dense_2 (Dense)              (None, 3)                  195
=================================================================
Total params: 45,715
Trainable params: 45,715
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 24.8907 - acc: 0.7166 - val_loss: 7.7521 - val_acc: 0.7700
Epoch 2/35
 - 2s - loss: 3.4306 - acc: 0.9583 - val_loss: 1.4761 - val_acc: 0.8709
Epoch 3/35
 - 2s - loss: 0.7040 - acc: 0.9653 - val_loss: 0.5831 - val_acc: 0.9524
Epoch 4/35
 - 2s - loss: 0.3330 - acc: 0.9766 - val_loss: 0.4911 - val_acc: 0.9279
Epoch 5/35
 - 2s - loss: 0.3146 - acc: 0.9665 - val_loss: 0.4411 - val_acc: 0.9380
Epoch 6/35
 - 2s - loss: 0.2373 - acc: 0.9863 - val_loss: 0.3714 - val_acc: 0.9503
Epoch 7/35
 - 2s - loss: 0.2384 - acc: 0.9781 - val_loss: 0.3979 - val_acc: 0.9286
Epoch 8/35
 - 2s - loss: 0.2134 - acc: 0.9808 - val_loss: 0.3545 - val_acc: 0.9539
Epoch 9/35
 - 2s - loss: 0.2168 - acc: 0.9860 - val_loss: 0.3197 - val_acc: 0.9503
Epoch 10/35
 - 2s - loss: 0.1984 - acc: 0.9848 - val_loss: 0.3826 - val_acc: 0.9193
Epoch 11/35
 - 2s - loss: 0.2633 - acc: 0.9641 - val_loss: 0.4197 - val_acc: 0.9135
Epoch 12/35
 - 2s - loss: 0.1867 - acc: 0.9896 - val_loss: 0.3654 - val_acc: 0.9178
```

```
Epoch 13/35
 - 2s - loss: 0.1626 - acc: 0.9878 - val_loss: 0.3004 - val_acc: 0.9582
Epoch 14/35
 - 2s - loss: 0.1822 - acc: 0.9790 - val_loss: 0.3893 - val_acc: 0.9329
Epoch 15/35
 - 2s - loss: 0.1494 - acc: 0.9957 - val_loss: 0.2848 - val_acc: 0.9394
Epoch 16/35
 - 2s - loss: 0.1384 - acc: 0.9900 - val_loss: 0.2924 - val_acc: 0.9243
Epoch 17/35
 - 2s - loss: 0.1683 - acc: 0.9833 - val_loss: 0.2854 - val_acc: 0.9351
Epoch 18/35
 - 2s - loss: 0.1176 - acc: 0.9945 - val_loss: 0.2596 - val_acc: 0.9474
Epoch 19/35
 - 2s - loss: 0.1460 - acc: 0.9875 - val_loss: 0.2867 - val_acc: 0.9394
Epoch 20/35
 - 2s - loss: 0.1363 - acc: 0.9890 - val_loss: 0.4354 - val_acc: 0.8472
Epoch 21/35
 - 2s - loss: 0.1215 - acc: 0.9951 - val_loss: 0.2927 - val_acc: 0.9452
Epoch 22/35
 - 2s - loss: 0.1046 - acc: 0.9954 - val_loss: 0.2569 - val_acc: 0.9293
Epoch 23/35
 - 2s - loss: 0.1071 - acc: 0.9942 - val_loss: 0.2517 - val_acc: 0.9416
Epoch 24/35
 - 2s - loss: 0.1317 - acc: 0.9866 - val_loss: 0.3348 - val_acc: 0.9019
Epoch 25/35
 - 2s - loss: 0.1526 - acc: 0.9848 - val_loss: 0.2568 - val_acc: 0.9560
Epoch 26/35
 - 2s - loss: 0.1257 - acc: 0.9881 - val_loss: 0.2863 - val_acc: 0.9236
Epoch 27/35
 - 2s - loss: 0.1237 - acc: 0.9896 - val_loss: 0.2806 - val_acc: 0.9322
Epoch 28/35
 - 2s - loss: 0.1429 - acc: 0.9851 - val_loss: 0.2710 - val_acc: 0.9337
Epoch 29/35
 - 2s - loss: 0.1240 - acc: 0.9890 - val_loss: 0.3995 - val_acc: 0.9171
Epoch 30/35
 - 2s - loss: 0.1126 - acc: 0.9930 - val_loss: 0.2584 - val_acc: 0.9380
Epoch 31/35
 - 2s - loss: 0.1573 - acc: 0.9796 - val_loss: 0.3229 - val_acc: 0.9286
Epoch 32/35
 - 2s - loss: 0.1144 - acc: 0.9909 - val_loss: 0.3109 - val_acc: 0.9120
Epoch 33/35
 - 2s - loss: 0.1456 - acc: 0.9830 - val_loss: 0.2734 - val_acc: 0.9293
Epoch 34/35
```

```
  - 2s - loss: 0.1376 - acc: 0.9848 - val_loss: 0.3992 - val_acc: 0.9048
Epoch 35/35
  - 2s - loss: 0.1219 - acc: 0.9893 - val_loss: 0.2666 - val_acc: 0.9358
Train accuracy 0.9993911719939117 Test accuracy: 0.935832732516222
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 116, 32)	9440
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 38, 32)	0
flatten_1 (Flatten)	(None, 1216)	0
dense_1 (Dense)	(None, 32)	38944
dense_2 (Dense)	(None, 3)	99

```
Total params: 51,171
Trainable params: 51,171
Non-trainable params: 0


None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
  - 3s - loss: 42.0609 - acc: 0.7394 - val_loss: 1.2721 - val_acc: 0.7549
Epoch 2/55
  - 2s - loss: 0.5984 - acc: 0.9059 - val_loss: 0.7206 - val_acc: 0.8176
Epoch 3/55
  - 2s - loss: 0.4322 - acc: 0.9263 - val_loss: 0.7502 - val_acc: 0.8161
Epoch 4/55
  - 2s - loss: 0.4315 - acc: 0.9196 - val_loss: 0.5608 - val_acc: 0.8962
Epoch 5/55
  - 2s - loss: 0.3550 - acc: 0.9409 - val_loss: 0.4886 - val_acc: 0.9214
Epoch 6/55
  - 2s - loss: 0.3515 - acc: 0.9397 - val_loss: 0.6397 - val_acc: 0.8125
Epoch 7/55
  - 2s - loss: 0.3621 - acc: 0.9397 - val_loss: 0.5487 - val_acc: 0.8594
Epoch 8/55
```

```
           - 2s - loss: 0.3102 - acc: 0.9467 - val_loss: 0.5749 - val_acc: 0.8897
Epoch 9/55
           - 2s - loss: 0.3106 - acc: 0.9476 - val_loss: 0.4982 - val_acc: 0.8947
Epoch 10/55
           - 2s - loss: 0.2942 - acc: 0.9513 - val_loss: 0.4938 - val_acc: 0.8983
Epoch 11/55
           - 2s - loss: 0.2920 - acc: 0.9553 - val_loss: 0.4148 - val_acc: 0.9120
Epoch 12/55
           - 2s - loss: 0.3007 - acc: 0.9498 - val_loss: 0.5185 - val_acc: 0.9156
Epoch 13/55
           - 2s - loss: 0.2865 - acc: 0.9562 - val_loss: 0.4809 - val_acc: 0.9041
Epoch 14/55
           - 2s - loss: 0.2779 - acc: 0.9549 - val_loss: 0.5107 - val_acc: 0.8940
Epoch 15/55
           - 2s - loss: 0.3022 - acc: 0.9507 - val_loss: 0.5769 - val_acc: 0.8529
Epoch 16/55
           - 2s - loss: 0.2847 - acc: 0.9525 - val_loss: 0.4970 - val_acc: 0.8544
Epoch 17/55
           - 2s - loss: 0.2568 - acc: 0.9616 - val_loss: 0.4449 - val_acc: 0.8911
Epoch 18/55
           - 2s - loss: 0.2743 - acc: 0.9549 - val_loss: 0.4363 - val_acc: 0.9092
Epoch 19/55
           - 2s - loss: 0.2567 - acc: 0.9565 - val_loss: 0.5197 - val_acc: 0.9019
Epoch 20/55
           - 2s - loss: 0.2920 - acc: 0.9504 - val_loss: 0.4682 - val_acc: 0.8825
Epoch 21/55
           - 2s - loss: 0.2651 - acc: 0.9501 - val_loss: 0.4713 - val_acc: 0.8882
Epoch 22/55
           - 2s - loss: 0.2711 - acc: 0.9589 - val_loss: 0.4870 - val_acc: 0.8789
Epoch 23/55
           - 2s - loss: 0.2519 - acc: 0.9595 - val_loss: 0.4988 - val_acc: 0.8327
Epoch 24/55
           - 2s - loss: 0.2461 - acc: 0.9604 - val_loss: 0.4447 - val_acc: 0.8875
Epoch 25/55
           - 2s - loss: 0.2879 - acc: 0.9513 - val_loss: 0.5453 - val_acc: 0.8594
Epoch 26/55
           - 2s - loss: 0.2900 - acc: 0.9419 - val_loss: 0.5774 - val_acc: 0.8356
Epoch 27/55
           - 2s - loss: 0.2631 - acc: 0.9510 - val_loss: 0.5451 - val_acc: 0.8558
Epoch 28/55
           - 2s - loss: 0.2833 - acc: 0.9510 - val_loss: 0.5554 - val_acc: 0.8147
Epoch 29/55
           - 2s - loss: 0.2579 - acc: 0.9592 - val_loss: 0.4405 - val_acc: 0.8882
```

```
Epoch 30/55
 - 2s - loss: 0.2638 - acc: 0.9549 - val_loss: 0.5211 - val_acc: 0.8464
Epoch 31/55
 - 2s - loss: 0.2626 - acc: 0.9574 - val_loss: 0.5684 - val_acc: 0.8349
Epoch 32/55
 - 2s - loss: 0.2541 - acc: 0.9559 - val_loss: 0.4862 - val_acc: 0.8609
Epoch 33/55
 - 2s - loss: 0.2841 - acc: 0.9519 - val_loss: 0.5745 - val_acc: 0.8565
Epoch 34/55
 - 2s - loss: 0.2451 - acc: 0.9571 - val_loss: 0.4676 - val_acc: 0.8818
Epoch 35/55
 - 2s - loss: 0.2505 - acc: 0.9592 - val_loss: 0.5952 - val_acc: 0.8529
Epoch 36/55
 - 2s - loss: 0.2515 - acc: 0.9568 - val_loss: 0.7347 - val_acc: 0.7714
Epoch 37/55
 - 2s - loss: 0.2508 - acc: 0.9553 - val_loss: 0.6065 - val_acc: 0.7931
Epoch 38/55
 - 2s - loss: 0.2689 - acc: 0.9577 - val_loss: 0.4935 - val_acc: 0.8544
Epoch 39/55
 - 2s - loss: 0.2797 - acc: 0.9513 - val_loss: 0.5644 - val_acc: 0.8695
Epoch 40/55
 - 2s - loss: 0.2590 - acc: 0.9568 - val_loss: 0.5554 - val_acc: 0.8630
Epoch 41/55
 - 2s - loss: 0.2479 - acc: 0.9589 - val_loss: 0.5949 - val_acc: 0.8205
Epoch 42/55
 - 2s - loss: 0.2791 - acc: 0.9507 - val_loss: 0.5851 - val_acc: 0.8508
Epoch 43/55
 - 2s - loss: 0.2221 - acc: 0.9683 - val_loss: 0.5097 - val_acc: 0.8551
Epoch 44/55
 - 2s - loss: 0.2587 - acc: 0.9556 - val_loss: 0.5335 - val_acc: 0.8097
Epoch 45/55
 - 2s - loss: 0.2631 - acc: 0.9501 - val_loss: 0.4630 - val_acc: 0.9012
Epoch 46/55
 - 2s - loss: 0.2632 - acc: 0.9546 - val_loss: 1.1790 - val_acc: 0.6013
Epoch 47/55
 - 2s - loss: 0.2602 - acc: 0.9574 - val_loss: 0.8425 - val_acc: 0.7678
Epoch 48/55
 - 2s - loss: 0.2681 - acc: 0.9543 - val_loss: 0.5152 - val_acc: 0.8681
Epoch 49/55
 - 2s - loss: 0.2396 - acc: 0.9647 - val_loss: 0.5595 - val_acc: 0.8435
Epoch 50/55
 - 2s - loss: 0.3118 - acc: 0.9431 - val_loss: 0.5410 - val_acc: 0.8472
Epoch 51/55
```

```
  - 2s - loss: 0.2242 - acc: 0.9662 - val_loss: 0.3938 - val_acc: 0.9099
Epoch 52/55
  - 2s - loss: 0.2492 - acc: 0.9586 - val_loss: 0.4097 - val_acc: 0.8976
Epoch 53/55
  - 2s - loss: 0.2464 - acc: 0.9586 - val_loss: 0.3959 - val_acc: 0.8983
Epoch 54/55
  - 2s - loss: 0.2529 - acc: 0.9580 - val_loss: 0.6173 - val_acc: 0.8861
Epoch 55/55
  - 2s - loss: 0.2475 - acc: 0.9577 - val_loss: 0.6052 - val_acc: 0.8565
Train accuracy 0.95220700152207 Test accuracy: 0.8565248737854328
-----------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 118, 32)	5152
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 32)	0
flatten_1 (Flatten)	(None, 1248)	0
dense_1 (Dense)	(None, 16)	19984
dense_2 (Dense)	(None, 3)	51

```
Total params: 27,235
Trainable params: 27,235
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
  - 3s - loss: 44.5745 - acc: 0.4469 - val_loss: 5.9368 - val_acc: 0.4859
Epoch 2/35
  - 2s - loss: 2.3378 - acc: 0.6180 - val_loss: 1.1436 - val_acc: 0.6460
Epoch 3/35
  - 2s - loss: 0.8321 - acc: 0.7495 - val_loss: 0.8675 - val_acc: 0.7693
Epoch 4/35
  - 2s - loss: 0.6828 - acc: 0.8222 - val_loss: 0.8743 - val_acc: 0.6965
Epoch 5/35
```

```
       - 2s - loss: 0.6380 - acc: 0.8417 - val_loss: 0.7682 - val_acc: 0.7837
Epoch 6/35
       - 2s - loss: 0.5675 - acc: 0.8855 - val_loss: 0.7538 - val_acc: 0.8161
Epoch 7/35
       - 2s - loss: 0.5242 - acc: 0.9081 - val_loss: 0.6852 - val_acc: 0.8313
Epoch 8/35
       - 2s - loss: 0.4746 - acc: 0.9269 - val_loss: 0.6533 - val_acc: 0.8572
Epoch 9/35
       - 2s - loss: 0.4276 - acc: 0.9458 - val_loss: 0.6063 - val_acc: 0.8926
Epoch 10/35
       - 2s - loss: 0.3752 - acc: 0.9653 - val_loss: 0.5708 - val_acc: 0.9056
Epoch 11/35
       - 2s - loss: 0.3278 - acc: 0.9793 - val_loss: 0.5030 - val_acc: 0.9474
Epoch 12/35
       - 2s - loss: 0.3440 - acc: 0.9635 - val_loss: 0.4776 - val_acc: 0.9366
Epoch 13/35
       - 2s - loss: 0.2837 - acc: 0.9833 - val_loss: 0.5417 - val_acc: 0.8955
Epoch 14/35
       - 2s - loss: 0.2337 - acc: 0.9945 - val_loss: 0.4183 - val_acc: 0.9445
Epoch 15/35
       - 2s - loss: 0.2400 - acc: 0.9823 - val_loss: 0.4288 - val_acc: 0.9229
Epoch 16/35
       - 2s - loss: 0.2319 - acc: 0.9845 - val_loss: 0.4064 - val_acc: 0.9474
Epoch 17/35
       - 2s - loss: 0.2153 - acc: 0.9872 - val_loss: 0.3881 - val_acc: 0.9337
Epoch 18/35
       - 2s - loss: 0.2175 - acc: 0.9845 - val_loss: 0.3497 - val_acc: 0.9488
Epoch 19/35
       - 2s - loss: 0.2311 - acc: 0.9793 - val_loss: 0.5765 - val_acc: 0.8731
Epoch 20/35
       - 2s - loss: 0.2205 - acc: 0.9845 - val_loss: 0.3430 - val_acc: 0.9358
Epoch 21/35
       - 2s - loss: 0.1913 - acc: 0.9860 - val_loss: 0.3446 - val_acc: 0.9445
Epoch 22/35
       - 2s - loss: 0.1711 - acc: 0.9918 - val_loss: 0.4034 - val_acc: 0.9077
Epoch 23/35
       - 2s - loss: 0.1662 - acc: 0.9915 - val_loss: 0.3260 - val_acc: 0.9495
Epoch 24/35
       - 2s - loss: 0.1540 - acc: 0.9927 - val_loss: 0.2976 - val_acc: 0.9546
Epoch 25/35
       - 2s - loss: 0.1529 - acc: 0.9918 - val_loss: 0.3278 - val_acc: 0.9466
Epoch 26/35
       - 2s - loss: 0.1861 - acc: 0.9836 - val_loss: 0.4289 - val_acc: 0.8529
```

```
Epoch 27/35
 - 2s - loss: 0.1603 - acc: 0.9906 - val_loss: 0.2515 - val_acc: 0.9776
Epoch 28/35
 - 2s - loss: 0.1641 - acc: 0.9893 - val_loss: 0.3070 - val_acc: 0.9272
Epoch 29/35
 - 2s - loss: 0.1283 - acc: 0.9970 - val_loss: 0.2490 - val_acc: 0.9654
Epoch 30/35
 - 2s - loss: 0.1317 - acc: 0.9936 - val_loss: 0.2474 - val_acc: 0.9611
Epoch 31/35
 - 2s - loss: 0.2225 - acc: 0.9744 - val_loss: 0.3883 - val_acc: 0.9387
Epoch 32/35
 - 2s - loss: 0.2265 - acc: 0.9726 - val_loss: 0.3649 - val_acc: 0.9120
Epoch 33/35
 - 2s - loss: 0.1340 - acc: 0.9948 - val_loss: 0.2802 - val_acc: 0.9366
Epoch 34/35
 - 2s - loss: 0.1258 - acc: 0.9954 - val_loss: 0.2930 - val_acc: 0.9243
Epoch 35/35
 - 2s - loss: 0.1464 - acc: 0.9854 - val_loss: 0.4581 - val_acc: 0.8825
Train accuracy 0.9780821917808219 Test accuracy: 0.882480173035328
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 38, 32)	0
flatten_1 (Flatten)	(None, 1216)	0
dense_1 (Dense)	(None, 32)	38944
dense_2 (Dense)	(None, 3)	99

```
Total params: 48,291
Trainable params: 48,291
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
```

```
Epoch 1/55
 - 3s - loss: 22.2866 - acc: 0.6737 - val_loss: 2.5636 - val_acc: 0.8111
Epoch 2/55
 - 2s - loss: 1.0101 - acc: 0.9677 - val_loss: 0.6582 - val_acc: 0.9661
Epoch 3/55
 - 2s - loss: 0.3418 - acc: 0.9890 - val_loss: 0.4287 - val_acc: 0.9495
Epoch 4/55
 - 2s - loss: 0.2181 - acc: 0.9918 - val_loss: 0.3490 - val_acc: 0.9560
Epoch 5/55
 - 2s - loss: 0.2198 - acc: 0.9802 - val_loss: 0.3152 - val_acc: 0.9539
Epoch 6/55
 - 2s - loss: 0.1422 - acc: 0.9976 - val_loss: 0.2934 - val_acc: 0.9625
Epoch 7/55
 - 2s - loss: 0.1405 - acc: 0.9924 - val_loss: 0.3245 - val_acc: 0.9128
Epoch 8/55
 - 2s - loss: 0.2099 - acc: 0.9720 - val_loss: 0.5047 - val_acc: 0.8601
Epoch 9/55
 - 2s - loss: 0.1453 - acc: 0.9909 - val_loss: 0.2559 - val_acc: 0.9510
Epoch 10/55
 - 2s - loss: 0.1049 - acc: 0.9982 - val_loss: 0.2597 - val_acc: 0.9474
Epoch 11/55
 - 2s - loss: 0.3044 - acc: 0.9601 - val_loss: 0.4004 - val_acc: 0.9452
Epoch 12/55
 - 2s - loss: 0.1589 - acc: 0.9936 - val_loss: 0.2284 - val_acc: 0.9647
Epoch 13/55
 - 2s - loss: 0.0974 - acc: 0.9985 - val_loss: 0.2157 - val_acc: 0.9704
Epoch 14/55
 - 2s - loss: 0.0853 - acc: 0.9994 - val_loss: 0.2105 - val_acc: 0.9625
Epoch 15/55
 - 2s - loss: 0.0912 - acc: 0.9957 - val_loss: 0.1911 - val_acc: 0.9784
Epoch 16/55
 - 2s - loss: 0.0897 - acc: 0.9957 - val_loss: 0.1854 - val_acc: 0.9748
Epoch 17/55
 - 2s - loss: 0.1282 - acc: 0.9866 - val_loss: 0.1954 - val_acc: 0.9582
Epoch 18/55
 - 2s - loss: 0.0845 - acc: 0.9957 - val_loss: 0.2238 - val_acc: 0.9488
Epoch 19/55
 - 2s - loss: 0.0842 - acc: 0.9954 - val_loss: 0.2174 - val_acc: 0.9495
Epoch 20/55
 - 2s - loss: 0.0802 - acc: 0.9970 - val_loss: 0.1724 - val_acc: 0.9755
Epoch 21/55
 - 2s - loss: 0.0785 - acc: 0.9951 - val_loss: 0.3165 - val_acc: 0.9337
Epoch 22/55
```

```
    - 2s - loss: 0.1093 - acc: 0.9906 - val_loss: 0.3111 - val_acc: 0.8991
Epoch 23/55
    - 2s - loss: 0.0845 - acc: 0.9954 - val_loss: 0.1653 - val_acc: 0.9748
Epoch 24/55
    - 2s - loss: 0.1352 - acc: 0.9814 - val_loss: 0.2242 - val_acc: 0.9603
Epoch 25/55
    - 2s - loss: 0.1011 - acc: 0.9912 - val_loss: 0.1757 - val_acc: 0.9726
Epoch 26/55
    - 2s - loss: 0.0672 - acc: 0.9973 - val_loss: 0.2114 - val_acc: 0.9589
Epoch 27/55
    - 2s - loss: 0.0607 - acc: 0.9997 - val_loss: 0.2289 - val_acc: 0.9546
Epoch 28/55
    - 2s - loss: 0.0676 - acc: 0.9973 - val_loss: 0.1734 - val_acc: 0.9704
Epoch 29/55
    - 2s - loss: 0.0655 - acc: 0.9976 - val_loss: 0.2064 - val_acc: 0.9567
Epoch 30/55
    - 2s - loss: 0.0619 - acc: 0.9973 - val_loss: 0.1880 - val_acc: 0.9560
Epoch 31/55
    - 2s - loss: 0.0618 - acc: 0.9967 - val_loss: 0.1844 - val_acc: 0.9582
Epoch 32/55
    - 2s - loss: 0.1743 - acc: 0.9714 - val_loss: 0.2179 - val_acc: 0.9704
Epoch 33/55
    - 2s - loss: 0.1020 - acc: 0.9936 - val_loss: 0.1873 - val_acc: 0.9704
Epoch 34/55
    - 2s - loss: 0.0618 - acc: 0.9985 - val_loss: 0.1676 - val_acc: 0.9726
Epoch 35/55
    - 2s - loss: 0.0602 - acc: 0.9979 - val_loss: 0.1672 - val_acc: 0.9690
Epoch 36/55
    - 2s - loss: 0.0519 - acc: 0.9991 - val_loss: 0.1864 - val_acc: 0.9704
Epoch 37/55
    - 2s - loss: 0.0735 - acc: 0.9933 - val_loss: 0.2079 - val_acc: 0.9459
Epoch 38/55
    - 2s - loss: 0.1666 - acc: 0.9790 - val_loss: 0.2110 - val_acc: 0.9632
Epoch 39/55
    - 2s - loss: 0.0647 - acc: 0.9973 - val_loss: 0.1628 - val_acc: 0.9726
Epoch 40/55
    - 2s - loss: 0.0517 - acc: 0.9997 - val_loss: 0.1671 - val_acc: 0.9733
Epoch 41/55
    - 2s - loss: 0.0476 - acc: 1.0000 - val_loss: 0.1654 - val_acc: 0.9740
Epoch 42/55
    - 2s - loss: 0.0653 - acc: 0.9963 - val_loss: 0.1780 - val_acc: 0.9603
Epoch 43/55
    - 2s - loss: 0.0574 - acc: 0.9991 - val_loss: 0.1573 - val_acc: 0.9755
```

```
Epoch 44/55
 - 2s - loss: 0.0475 - acc: 0.9991 - val_loss: 0.2206 - val_acc: 0.9495
Epoch 45/55
 - 2s - loss: 0.0499 - acc: 0.9979 - val_loss: 0.1880 - val_acc: 0.9719
Epoch 46/55
 - 2s - loss: 0.0889 - acc: 0.9884 - val_loss: 0.4190 - val_acc: 0.8738
Epoch 47/55
 - 2s - loss: 0.0738 - acc: 0.9939 - val_loss: 0.3316 - val_acc: 0.9546
Epoch 48/55
 - 2s - loss: 0.0768 - acc: 0.9939 - val_loss: 0.1829 - val_acc: 0.9546
Epoch 49/55
 - 2s - loss: 0.0905 - acc: 0.9906 - val_loss: 0.3455 - val_acc: 0.9452
Epoch 50/55
 - 2s - loss: 0.0835 - acc: 0.9939 - val_loss: 0.1262 - val_acc: 0.9827
Epoch 51/55
 - 2s - loss: 0.0749 - acc: 0.9945 - val_loss: 0.2146 - val_acc: 0.9640
Epoch 52/55
 - 2s - loss: 0.0577 - acc: 0.9973 - val_loss: 0.1836 - val_acc: 0.9733
Epoch 53/55
 - 2s - loss: 0.0520 - acc: 0.9973 - val_loss: 0.1966 - val_acc: 0.9776
Epoch 54/55
 - 2s - loss: 0.0459 - acc: 0.9994 - val_loss: 0.1592 - val_acc: 0.9805
Epoch 55/55
 - 2s - loss: 0.0413 - acc: 0.9994 - val_loss: 0.1589 - val_acc: 0.9776
Train accuracy 1.0 Test accuracy: 0.9776496034607065
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 116, 32)	6304
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 38, 32)	0
flatten_1 (Flatten)	(None, 1216)	0
dense_1 (Dense)	(None, 32)	38944
dense_2 (Dense)	(None, 3)	99

```
           Total params: 47,139
           Trainable params: 47,139
           Non-trainable params: 0

           _____

           None
           Train on 3285 samples, validate on 1387 samples
           Epoch 1/35
            - 2s - loss: 34.2356 - acc: 0.6600 - val_loss: 6.4293 - val_acc: 0.8933
           Epoch 2/35
            - 1s - loss: 2.4324 - acc: 0.9638 - val_loss: 1.0693 - val_acc: 0.9120
           Epoch 3/35
            - 1s - loss: 0.5105 - acc: 0.9787 - val_loss: 0.5480 - val_acc: 0.9503
           Epoch 4/35
            - 1s - loss: 0.3032 - acc: 0.9817 - val_loss: 0.4452 - val_acc: 0.9488
           Epoch 5/35
            - 1s - loss: 0.2639 - acc: 0.9787 - val_loss: 0.4190 - val_acc: 0.9430
           Epoch 6/35
            - 1s - loss: 0.2202 - acc: 0.9860 - val_loss: 0.4531 - val_acc: 0.9056
           Epoch 7/35
            - 1s - loss: 0.1943 - acc: 0.9900 - val_loss: 0.3805 - val_acc: 0.9193
           Epoch 8/35
            - 1s - loss: 0.1957 - acc: 0.9851 - val_loss: 0.3856 - val_acc: 0.9322
           Epoch 9/35
            - 1s - loss: 0.1780 - acc: 0.9863 - val_loss: 0.4134 - val_acc: 0.9005
           Epoch 10/35
            - 1s - loss: 0.1874 - acc: 0.9814 - val_loss: 0.5280 - val_acc: 0.8846
           Epoch 11/35
            - 1s - loss: 0.1818 - acc: 0.9854 - val_loss: 0.3168 - val_acc: 0.9366
           Epoch 12/35
            - 1s - loss: 0.1818 - acc: 0.9848 - val_loss: 0.3568 - val_acc: 0.9445
           Epoch 13/35
            - 1s - loss: 0.1485 - acc: 0.9924 - val_loss: 0.3397 - val_acc: 0.9438
           Epoch 14/35
            - 1s - loss: 0.1303 - acc: 0.9939 - val_loss: 0.3326 - val_acc: 0.9315
           Epoch 15/35
            - 1s - loss: 0.1747 - acc: 0.9833 - val_loss: 0.3255 - val_acc: 0.9293
           Epoch 16/35
            - 1s - loss: 0.1310 - acc: 0.9945 - val_loss: 0.3146 - val_acc: 0.9200
           Epoch 17/35
            - 1s - loss: 0.1429 - acc: 0.9872 - val_loss: 0.2779 - val_acc: 0.9503
           Epoch 18/35
            - 1s - loss: 0.1056 - acc: 0.9985 - val_loss: 0.3453 - val_acc: 0.9019
           Epoch 19/35
```

```
 - 1s - loss: 0.1366 - acc: 0.9875 - val_loss: 0.4263 - val_acc: 0.9056
Epoch 20/35
 - 1s - loss: 0.2136 - acc: 0.9705 - val_loss: 0.2914 - val_acc: 0.9553
Epoch 21/35
 - 1s - loss: 0.1126 - acc: 0.9945 - val_loss: 0.2975 - val_acc: 0.9430
Epoch 22/35
 - 1s - loss: 0.1088 - acc: 0.9960 - val_loss: 0.2981 - val_acc: 0.9373
Epoch 23/35
 - 1s - loss: 0.1180 - acc: 0.9890 - val_loss: 0.3526 - val_acc: 0.9027
Epoch 24/35
 - 1s - loss: 0.1664 - acc: 0.9799 - val_loss: 0.2930 - val_acc: 0.9402
Epoch 25/35
 - 1s - loss: 0.0999 - acc: 0.9960 - val_loss: 0.3478 - val_acc: 0.9149
Epoch 26/35
 - 1s - loss: 0.1048 - acc: 0.9930 - val_loss: 0.2964 - val_acc: 0.9481
Epoch 27/35
 - 1s - loss: 0.1070 - acc: 0.9921 - val_loss: 0.5227 - val_acc: 0.8991
Epoch 28/35
 - 1s - loss: 0.1140 - acc: 0.9924 - val_loss: 0.3315 - val_acc: 0.9185
Epoch 29/35
 - 1s - loss: 0.1167 - acc: 0.9884 - val_loss: 0.3498 - val_acc: 0.9056
Epoch 30/35
 - 1s - loss: 0.1742 - acc: 0.9808 - val_loss: 0.3266 - val_acc: 0.9164
Epoch 31/35
 - 1s - loss: 0.0914 - acc: 0.9973 - val_loss: 0.2560 - val_acc: 0.9640
Epoch 32/35
 - 1s - loss: 0.0896 - acc: 0.9954 - val_loss: 0.2281 - val_acc: 0.9560
Epoch 33/35
 - 1s - loss: 0.0855 - acc: 0.9963 - val_loss: 0.3827 - val_acc: 0.8947
Epoch 34/35
 - 1s - loss: 0.0960 - acc: 0.9921 - val_loss: 0.2713 - val_acc: 0.9423
Epoch 35/35
 - 1s - loss: 0.1830 - acc: 0.9702 - val_loss: 0.7350 - val_acc: 0.8580
Train accuracy 0.8885844749947117 Test accuracy: 0.8579668348954578
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 120, 16)	3600
dropout_1 (Dropout)	(None, 120, 16)	0

```
_____

max_pooling1d_1 (MaxPooling1 (None, 40, 16)              0
_____

flatten_1 (Flatten)          (None, 640)                 0
_____

dense_1 (Dense)              (None, 64)                  41024
_____

dense_2 (Dense)              (None, 3)                   195
===============================================================
Total params: 45,715
Trainable params: 45,715
Non-trainable params: 0

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None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 131.3500 - acc: 0.6137 - val_loss: 77.0016 - val_acc: 0.8385
Epoch 2/35
 - 2s - loss: 50.0564 - acc: 0.9123 - val_loss: 30.1199 - val_acc: 0.8688
Epoch 3/35
 - 2s - loss: 19.1553 - acc: 0.9416 - val_loss: 11.2891 - val_acc: 0.9265
Epoch 4/35
 - 2s - loss: 6.9244 - acc: 0.9571 - val_loss: 4.1284 - val_acc: 0.9229
Epoch 5/35
 - 2s - loss: 2.4509 - acc: 0.9650 - val_loss: 1.6827 - val_acc: 0.8897
Epoch 6/35
 - 2s - loss: 0.9956 - acc: 0.9626 - val_loss: 0.9481 - val_acc: 0.8681
Epoch 7/35
 - 2s - loss: 0.5852 - acc: 0.9607 - val_loss: 0.6829 - val_acc: 0.9257
Epoch 8/35
 - 2s - loss: 0.4323 - acc: 0.9677 - val_loss: 0.6058 - val_acc: 0.9221
Epoch 9/35
 - 2s - loss: 0.3907 - acc: 0.9641 - val_loss: 0.5755 - val_acc: 0.9156
Epoch 10/35
 - 2s - loss: 0.3385 - acc: 0.9778 - val_loss: 0.5836 - val_acc: 0.8882
Epoch 11/35
 - 2s - loss: 0.3359 - acc: 0.9650 - val_loss: 0.4965 - val_acc: 0.9293
Epoch 12/35
 - 2s - loss: 0.3401 - acc: 0.9659 - val_loss: 0.4919 - val_acc: 0.9250
Epoch 13/35
 - 2s - loss: 0.2967 - acc: 0.9720 - val_loss: 0.4843 - val_acc: 0.9236
Epoch 14/35
 - 2s - loss: 0.2690 - acc: 0.9808 - val_loss: 0.4428 - val_acc: 0.9466
```

```
Epoch 15/35
 - 2s - loss: 0.2658 - acc: 0.9805 - val_loss: 0.4239 - val_acc: 0.9524
Epoch 16/35
 - 2s - loss: 0.2444 - acc: 0.9863 - val_loss: 0.4731 - val_acc: 0.8983
Epoch 17/35
 - 2s - loss: 0.2522 - acc: 0.9760 - val_loss: 0.4055 - val_acc: 0.9524
Epoch 18/35
 - 2s - loss: 0.2354 - acc: 0.9836 - val_loss: 0.3891 - val_acc: 0.9546
Epoch 19/35
 - 2s - loss: 0.2301 - acc: 0.9839 - val_loss: 0.4395 - val_acc: 0.9019
Epoch 20/35
 - 2s - loss: 0.2443 - acc: 0.9760 - val_loss: 0.5381 - val_acc: 0.8529
Epoch 21/35
 - 2s - loss: 0.2094 - acc: 0.9884 - val_loss: 0.4257 - val_acc: 0.9229
Epoch 22/35
 - 2s - loss: 0.2163 - acc: 0.9833 - val_loss: 0.5198 - val_acc: 0.8479
Epoch 23/35
 - 2s - loss: 0.2125 - acc: 0.9839 - val_loss: 0.3358 - val_acc: 0.9575
Epoch 24/35
 - 2s - loss: 0.2109 - acc: 0.9808 - val_loss: 0.3335 - val_acc: 0.9510
Epoch 25/35
 - 2s - loss: 0.1907 - acc: 0.9863 - val_loss: 0.4009 - val_acc: 0.9113
Epoch 26/35
 - 2s - loss: 0.2200 - acc: 0.9802 - val_loss: 0.3496 - val_acc: 0.9286
Epoch 27/35
 - 2s - loss: 0.1880 - acc: 0.9860 - val_loss: 0.3364 - val_acc: 0.9445
Epoch 28/35
 - 2s - loss: 0.1910 - acc: 0.9811 - val_loss: 0.3602 - val_acc: 0.9366
Epoch 29/35
 - 2s - loss: 0.1828 - acc: 0.9884 - val_loss: 0.3715 - val_acc: 0.9301
Epoch 30/35
 - 2s - loss: 0.1743 - acc: 0.9884 - val_loss: 0.3609 - val_acc: 0.9322
Epoch 31/35
 - 2s - loss: 0.2023 - acc: 0.9817 - val_loss: 0.2870 - val_acc: 0.9560
Epoch 32/35
 - 2s - loss: 0.2051 - acc: 0.9817 - val_loss: 0.3014 - val_acc: 0.9481
Epoch 33/35
 - 2s - loss: 0.1590 - acc: 0.9903 - val_loss: 0.3336 - val_acc: 0.9387
Epoch 34/35
 - 2s - loss: 0.1515 - acc: 0.9921 - val_loss: 0.2981 - val_acc: 0.9373
Epoch 35/35
 - 2s - loss: 0.1675 - acc: 0.9857 - val_loss: 0.2966 - val_acc: 0.9495
Train accuracy 0.9969558599695586 Test accuracy: 0.9495313626532084
```

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_____
Layer (type)                 Output Shape              Param #
================================================================
conv1d_1 (Conv1D)            (None, 122, 42)           2688
_____
conv1d_2 (Conv1D)            (None, 116, 32)           9440
_____
dropout_1 (Dropout)          (None, 116, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 38, 32)            0
_____
flatten_1 (Flatten)          (None, 1216)              0
_____
dense_1 (Dense)              (None, 32)                38944
_____
dense_2 (Dense)              (None, 3)                 99
================================================================
Total params: 51,171
Trainable params: 51,171
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 12.7213 - acc: 0.8040 - val_loss: 0.7684 - val_acc: 0.7851
Epoch 2/55
 - 2s - loss: 0.4069 - acc: 0.9422 - val_loss: 0.5022 - val_acc: 0.9171
Epoch 3/55
 - 2s - loss: 0.3085 - acc: 0.9635 - val_loss: 0.5673 - val_acc: 0.8623
Epoch 4/55
 - 2s - loss: 0.2896 - acc: 0.9641 - val_loss: 0.4374 - val_acc: 0.9178
Epoch 5/55
 - 2s - loss: 0.3032 - acc: 0.9607 - val_loss: 0.5231 - val_acc: 0.8904
Epoch 6/55
 - 2s - loss: 0.2469 - acc: 0.9677 - val_loss: 0.3854 - val_acc: 0.9380
Epoch 7/55
 - 2s - loss: 0.2470 - acc: 0.9708 - val_loss: 0.4439 - val_acc: 0.8919
Epoch 8/55
 - 2s - loss: 0.2073 - acc: 0.9769 - val_loss: 0.4602 - val_acc: 0.9156
Epoch 9/55
 - 2s - loss: 0.1978 - acc: 0.9772 - val_loss: 0.4686 - val_acc: 0.8969
Epoch 10/55
```

```
            - 2s - loss: 0.2349 - acc: 0.9714 - val_loss: 0.3687 - val_acc: 0.9193
       Epoch 11/55
            - 2s - loss: 0.2504 - acc: 0.9635 - val_loss: 0.5966 - val_acc: 0.8767
       Epoch 12/55
            - 2s - loss: 0.1918 - acc: 0.9842 - val_loss: 0.4016 - val_acc: 0.9265
       Epoch 13/55
            - 2s - loss: 0.1966 - acc: 0.9766 - val_loss: 0.4027 - val_acc: 0.9092
       Epoch 14/55
            - 2s - loss: 0.2365 - acc: 0.9665 - val_loss: 0.6304 - val_acc: 0.8536
       Epoch 15/55
            - 2s - loss: 0.1963 - acc: 0.9823 - val_loss: 0.3002 - val_acc: 0.9301
       Epoch 16/55
            - 2s - loss: 0.1773 - acc: 0.9802 - val_loss: 0.3484 - val_acc: 0.9279
       Epoch 17/55
            - 2s - loss: 0.2345 - acc: 0.9686 - val_loss: 0.3616 - val_acc: 0.9402
       Epoch 18/55
            - 2s - loss: 0.1525 - acc: 0.9884 - val_loss: 0.3164 - val_acc: 0.9366
       Epoch 19/55
            - 2s - loss: 0.1681 - acc: 0.9817 - val_loss: 0.5513 - val_acc: 0.8472
       Epoch 20/55
            - 2s - loss: 0.2300 - acc: 0.9686 - val_loss: 0.3968 - val_acc: 0.9135
       Epoch 21/55
            - 2s - loss: 0.1709 - acc: 0.9793 - val_loss: 0.4950 - val_acc: 0.8810
       Epoch 22/55
            - 2s - loss: 0.1684 - acc: 0.9808 - val_loss: 0.4034 - val_acc: 0.8875
       Epoch 23/55
            - 2s - loss: 0.2030 - acc: 0.9723 - val_loss: 0.3229 - val_acc: 0.9366
       Epoch 24/55
            - 2s - loss: 0.1829 - acc: 0.9796 - val_loss: 0.4640 - val_acc: 0.9041
       Epoch 25/55
            - 2s - loss: 0.2014 - acc: 0.9738 - val_loss: 0.5489 - val_acc: 0.8767
       Epoch 26/55
            - 2s - loss: 0.1547 - acc: 0.9878 - val_loss: 0.3786 - val_acc: 0.9092
       Epoch 27/55
            - 2s - loss: 0.1998 - acc: 0.9708 - val_loss: 0.4362 - val_acc: 0.8947
       Epoch 28/55
            - 2s - loss: 0.2237 - acc: 0.9686 - val_loss: 0.6271 - val_acc: 0.8378
       Epoch 29/55
            - 2s - loss: 0.1547 - acc: 0.9881 - val_loss: 0.3367 - val_acc: 0.9185
       Epoch 30/55
            - 2s - loss: 0.1792 - acc: 0.9753 - val_loss: 0.4615 - val_acc: 0.9113
       Epoch 31/55
            - 2s - loss: 0.1787 - acc: 0.9796 - val_loss: 0.4040 - val_acc: 0.8940
```

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Epoch 32/55
 - 2s - loss: 0.1875 - acc: 0.9775 - val_loss: 0.4023 - val_acc: 0.9019
Epoch 33/55
 - 2s - loss: 0.1777 - acc: 0.9802 - val_loss: 0.3382 - val_acc: 0.9257
Epoch 34/55
 - 2s - loss: 0.1976 - acc: 0.9708 - val_loss: 0.4286 - val_acc: 0.8962
Epoch 35/55
 - 2s - loss: 0.1677 - acc: 0.9802 - val_loss: 0.6987 - val_acc: 0.8212
Epoch 36/55
 - 2s - loss: 0.2142 - acc: 0.9747 - val_loss: 0.4448 - val_acc: 0.9019
Epoch 37/55
 - 2s - loss: 0.1861 - acc: 0.9790 - val_loss: 0.3354 - val_acc: 0.9308
Epoch 38/55
 - 2s - loss: 0.1600 - acc: 0.9836 - val_loss: 0.3623 - val_acc: 0.9048
Epoch 39/55
 - 2s - loss: 0.1405 - acc: 0.9836 - val_loss: 0.3163 - val_acc: 0.9214
Epoch 40/55
 - 2s - loss: 0.1764 - acc: 0.9805 - val_loss: 0.3097 - val_acc: 0.9142
Epoch 41/55
 - 2s - loss: 0.1963 - acc: 0.9689 - val_loss: 0.4408 - val_acc: 0.9149
Epoch 42/55
 - 2s - loss: 0.1643 - acc: 0.9836 - val_loss: 0.4159 - val_acc: 0.8897
Epoch 43/55
 - 2s - loss: 0.1840 - acc: 0.9756 - val_loss: 0.2473 - val_acc: 0.9567
Epoch 44/55
 - 2s - loss: 0.2243 - acc: 0.9686 - val_loss: 0.3618 - val_acc: 0.9293
Epoch 45/55
 - 2s - loss: 0.1461 - acc: 0.9830 - val_loss: 0.3451 - val_acc: 0.9366
Epoch 46/55
 - 2s - loss: 0.1809 - acc: 0.9763 - val_loss: 0.3364 - val_acc: 0.9200
Epoch 47/55
 - 2s - loss: 0.1531 - acc: 0.9793 - val_loss: 0.6266 - val_acc: 0.8371
Epoch 48/55
 - 2s - loss: 0.1827 - acc: 0.9750 - val_loss: 0.7392 - val_acc: 0.8140
Epoch 49/55
 - 2s - loss: 0.2107 - acc: 0.9723 - val_loss: 0.4020 - val_acc: 0.9019
Epoch 50/55
 - 2s - loss: 0.1278 - acc: 0.9903 - val_loss: 0.2453 - val_acc: 0.9495
Epoch 51/55
 - 2s - loss: 0.1341 - acc: 0.9826 - val_loss: 0.2853 - val_acc: 0.9380
Epoch 52/55
 - 2s - loss: 0.1868 - acc: 0.9744 - val_loss: 0.6705 - val_acc: 0.8270
Epoch 53/55
```

```
 - 2s - loss: 0.1649 - acc: 0.9811 - val_loss: 0.3825 - val_acc: 0.9106
Epoch 54/55
 - 2s - loss: 0.2339 - acc: 0.9619 - val_loss: 0.4136 - val_acc: 0.9243
Epoch 55/55
 - 2s - loss: 0.1484 - acc: 0.9860 - val_loss: 0.5168 - val_acc: 0.8782
Train accuracy 0.978386605783866 Test accuracy: 0.8781542898341744
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 120, 32)	5152
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 32)	0
flatten_1 (Flatten)	(None, 1280)	0
dense_1 (Dense)	(None, 32)	40992
dense_2 (Dense)	(None, 3)	99

```
Total params: 47,715
Trainable params: 47,715
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 29.8451 - acc: 0.5160 - val_loss: 2.5604 - val_acc: 0.5400
Epoch 2/55
 - 2s - loss: 1.1999 - acc: 0.8033 - val_loss: 0.8535 - val_acc: 0.7729
Epoch 3/55
 - 2s - loss: 0.5354 - acc: 0.9041 - val_loss: 0.7134 - val_acc: 0.7758
Epoch 4/55
 - 2s - loss: 0.4273 - acc: 0.9239 - val_loss: 0.6622 - val_acc: 0.8140
Epoch 5/55
 - 2s - loss: 0.4018 - acc: 0.9181 - val_loss: 0.6994 - val_acc: 0.7823
Epoch 6/55
 - 2s - loss: 0.3862 - acc: 0.9269 - val_loss: 0.5448 - val_acc: 0.8919
Epoch 7/55
```

```
         - 2s - loss: 0.3534 - acc: 0.9358 - val_loss: 0.5720 - val_acc: 0.8421
Epoch 8/55
         - 2s - loss: 0.3191 - acc: 0.9458 - val_loss: 0.6439 - val_acc: 0.7924
Epoch 9/55
         - 2s - loss: 0.3211 - acc: 0.9358 - val_loss: 0.5222 - val_acc: 0.8868
Epoch 10/55
         - 2s - loss: 0.3035 - acc: 0.9495 - val_loss: 0.6848 - val_acc: 0.7967
Epoch 11/55
         - 2s - loss: 0.3166 - acc: 0.9394 - val_loss: 0.5226 - val_acc: 0.8738
Epoch 12/55
         - 2s - loss: 0.2606 - acc: 0.9623 - val_loss: 0.5105 - val_acc: 0.8709
Epoch 13/55
         - 2s - loss: 0.2746 - acc: 0.9537 - val_loss: 0.6600 - val_acc: 0.7952
Epoch 14/55
         - 2s - loss: 0.2801 - acc: 0.9504 - val_loss: 0.5695 - val_acc: 0.8529
Epoch 15/55
         - 2s - loss: 0.2260 - acc: 0.9732 - val_loss: 0.5540 - val_acc: 0.8623
Epoch 16/55
         - 2s - loss: 0.2329 - acc: 0.9699 - val_loss: 0.5734 - val_acc: 0.8414
Epoch 17/55
         - 2s - loss: 0.2624 - acc: 0.9556 - val_loss: 0.5536 - val_acc: 0.8717
Epoch 18/55
         - 2s - loss: 0.2363 - acc: 0.9638 - val_loss: 0.5665 - val_acc: 0.8623
Epoch 19/55
         - 2s - loss: 0.2062 - acc: 0.9744 - val_loss: 0.5498 - val_acc: 0.8637
Epoch 20/55
         - 2s - loss: 0.2226 - acc: 0.9696 - val_loss: 0.4968 - val_acc: 0.9142
Epoch 21/55
         - 2s - loss: 0.2033 - acc: 0.9750 - val_loss: 0.5875 - val_acc: 0.8760
Epoch 22/55
         - 2s - loss: 0.2378 - acc: 0.9604 - val_loss: 0.6212 - val_acc: 0.8717
Epoch 23/55
         - 2s - loss: 0.1882 - acc: 0.9823 - val_loss: 0.4958 - val_acc: 0.8947
Epoch 24/55
         - 2s - loss: 0.2186 - acc: 0.9674 - val_loss: 0.5509 - val_acc: 0.8515
Epoch 25/55
         - 2s - loss: 0.2579 - acc: 0.9516 - val_loss: 0.5386 - val_acc: 0.8738
Epoch 26/55
         - 2s - loss: 0.1881 - acc: 0.9769 - val_loss: 0.4782 - val_acc: 0.8940
Epoch 27/55
         - 2s - loss: 0.1740 - acc: 0.9802 - val_loss: 0.4922 - val_acc: 0.8998
Epoch 28/55
         - 2s - loss: 0.1727 - acc: 0.9805 - val_loss: 0.6470 - val_acc: 0.8125
```

```
Epoch 29/55
 - 2s - loss: 0.1776 - acc: 0.9784 - val_loss: 0.5964 - val_acc: 0.8637
Epoch 30/55
 - 2s - loss: 0.1833 - acc: 0.9753 - val_loss: 0.6061 - val_acc: 0.8198
Epoch 31/55
 - 2s - loss: 0.1833 - acc: 0.9763 - val_loss: 0.5341 - val_acc: 0.8969
Epoch 32/55
 - 2s - loss: 0.2125 - acc: 0.9671 - val_loss: 0.5104 - val_acc: 0.8854
Epoch 33/55
 - 2s - loss: 0.1875 - acc: 0.9699 - val_loss: 0.7438 - val_acc: 0.8414
Epoch 34/55
 - 2s - loss: 0.1796 - acc: 0.9775 - val_loss: 0.5685 - val_acc: 0.8587
Epoch 35/55
 - 2s - loss: 0.1752 - acc: 0.9756 - val_loss: 0.5923 - val_acc: 0.8738
Epoch 36/55
 - 2s - loss: 0.1613 - acc: 0.9833 - val_loss: 0.7117 - val_acc: 0.8147
Epoch 37/55
 - 2s - loss: 0.1621 - acc: 0.9808 - val_loss: 0.4736 - val_acc: 0.8897
Epoch 38/55
 - 2s - loss: 0.1401 - acc: 0.9866 - val_loss: 0.6608 - val_acc: 0.8385
Epoch 39/55
 - 2s - loss: 0.1532 - acc: 0.9784 - val_loss: 0.5569 - val_acc: 0.8753
Epoch 40/55
 - 2s - loss: 0.1834 - acc: 0.9741 - val_loss: 0.7243 - val_acc: 0.8587
Epoch 41/55
 - 2s - loss: 0.2598 - acc: 0.9507 - val_loss: 0.8677 - val_acc: 0.7686
Epoch 42/55
 - 2s - loss: 0.1991 - acc: 0.9714 - val_loss: 0.5431 - val_acc: 0.8839
Epoch 43/55
 - 2s - loss: 0.1388 - acc: 0.9896 - val_loss: 0.5139 - val_acc: 0.8832
Epoch 44/55
 - 2s - loss: 0.1464 - acc: 0.9833 - val_loss: 0.5411 - val_acc: 0.8940
Epoch 45/55
 - 2s - loss: 0.1899 - acc: 0.9677 - val_loss: 0.6997 - val_acc: 0.8472
Epoch 46/55
 - 2s - loss: 0.1626 - acc: 0.9805 - val_loss: 0.5224 - val_acc: 0.8947
Epoch 47/55
 - 2s - loss: 0.1395 - acc: 0.9863 - val_loss: 0.4547 - val_acc: 0.8882
Epoch 48/55
 - 2s - loss: 0.1592 - acc: 0.9808 - val_loss: 0.7803 - val_acc: 0.8025
Epoch 49/55
 - 2s - loss: 0.1648 - acc: 0.9799 - val_loss: 0.4998 - val_acc: 0.8911
Epoch 50/55
```

```
 - 2s - loss: 0.1715 - acc: 0.9766 - val_loss: 0.5779 - val_acc: 0.8630
Epoch 51/55
 - 2s - loss: 0.1714 - acc: 0.9726 - val_loss: 0.5017 - val_acc: 0.8976
Epoch 52/55
 - 2s - loss: 0.1859 - acc: 0.9702 - val_loss: 0.7117 - val_acc: 0.8536
Epoch 53/55
 - 2s - loss: 0.1537 - acc: 0.9817 - val_loss: 0.7039 - val_acc: 0.8385
Epoch 54/55
 - 2s - loss: 0.1972 - acc: 0.9647 - val_loss: 0.6440 - val_acc: 0.8544
Epoch 55/55
 - 2s - loss: 0.1436 - acc: 0.9878 - val_loss: 0.5237 - val_acc: 0.8976
Train accuracy 0.997869101978691 Test accuracy: 0.8976207642393655
--------------------------------------------------------------------------------
```

```
_____
Layer (type)                    Output Shape              Param #
================================================================
conv1d_1 (Conv1D)               (None, 122, 32)           2048

conv1d_2 (Conv1D)               (None, 116, 32)           7200

dropout_1 (Dropout)             (None, 116, 32)           0

max_pooling1d_1 (MaxPooling1    (None, 38, 32)            0

flatten_1 (Flatten)             (None, 1216)              0

dense_1 (Dense)                 (None, 16)                19472

dense_2 (Dense)                 (None, 3)                 51
================================================================
Total params: 28,771
Trainable params: 28,771
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 3s - loss: 26.0287 - acc: 0.5729 - val_loss: 2.8879 - val_acc: 0.6763
Epoch 2/55
 - 2s - loss: 1.2910 - acc: 0.8405 - val_loss: 0.9808 - val_acc: 0.8039
Epoch 3/55
 - 2s - loss: 0.5843 - acc: 0.9245 - val_loss: 0.6569 - val_acc: 0.9034
Epoch 4/55
```

```
          - 2s - loss: 0.3963 - acc: 0.9671 - val_loss: 0.6266 - val_acc: 0.8861
       Epoch 5/55
          - 2s - loss: 0.2859 - acc: 0.9836 - val_loss: 0.4709 - val_acc: 0.9149
       Epoch 6/55
          - 2s - loss: 0.2090 - acc: 0.9878 - val_loss: 0.3683 - val_acc: 0.9452
       Epoch 7/55
          - 2s - loss: 0.1635 - acc: 0.9960 - val_loss: 0.4013 - val_acc: 0.8782
       Epoch 8/55
          - 2s - loss: 0.1502 - acc: 0.9930 - val_loss: 0.3197 - val_acc: 0.9524
       Epoch 9/55
          - 2s - loss: 0.1427 - acc: 0.9921 - val_loss: 0.3031 - val_acc: 0.9416
       Epoch 10/55
          - 2s - loss: 0.1392 - acc: 0.9896 - val_loss: 0.3528 - val_acc: 0.9185
       Epoch 11/55
          - 2s - loss: 0.1409 - acc: 0.9890 - val_loss: 0.2892 - val_acc: 0.9438
       Epoch 12/55
          - 2s - loss: 0.1093 - acc: 0.9957 - val_loss: 0.3237 - val_acc: 0.9394
       Epoch 13/55
          - 2s - loss: 0.1084 - acc: 0.9960 - val_loss: 0.2874 - val_acc: 0.9488
       Epoch 14/55
          - 2s - loss: 0.0947 - acc: 0.9982 - val_loss: 0.2563 - val_acc: 0.9632
       Epoch 15/55
          - 2s - loss: 0.1263 - acc: 0.9903 - val_loss: 0.2952 - val_acc: 0.9380
       Epoch 16/55
          - 2s - loss: 0.1182 - acc: 0.9915 - val_loss: 0.4621 - val_acc: 0.8601
       Epoch 17/55
          - 2s - loss: 0.1732 - acc: 0.9790 - val_loss: 0.2939 - val_acc: 0.9272
       Epoch 18/55
          - 2s - loss: 0.0906 - acc: 0.9976 - val_loss: 0.2920 - val_acc: 0.9229
       Epoch 19/55
          - 2s - loss: 0.1220 - acc: 0.9878 - val_loss: 0.4338 - val_acc: 0.8890
       Epoch 20/55
          - 2s - loss: 0.0996 - acc: 0.9951 - val_loss: 0.2291 - val_acc: 0.9560
       Epoch 21/55
          - 2s - loss: 0.0763 - acc: 0.9979 - val_loss: 0.2328 - val_acc: 0.9611
       Epoch 22/55
          - 2s - loss: 0.0872 - acc: 0.9960 - val_loss: 0.2489 - val_acc: 0.9387
       Epoch 23/55
          - 2s - loss: 0.0919 - acc: 0.9933 - val_loss: 0.2750 - val_acc: 0.9423
       Epoch 24/55
          - 2s - loss: 0.1185 - acc: 0.9860 - val_loss: 0.5264 - val_acc: 0.8782
       Epoch 25/55
          - 2s - loss: 0.1141 - acc: 0.9893 - val_loss: 0.2701 - val_acc: 0.9322
```

```
Epoch 26/55
 - 2s - loss: 0.0769 - acc: 0.9970 - val_loss: 0.3014 - val_acc: 0.9315
Epoch 27/55
 - 2s - loss: 0.0844 - acc: 0.9948 - val_loss: 0.2384 - val_acc: 0.9582
Epoch 28/55
 - 2s - loss: 0.0849 - acc: 0.9942 - val_loss: 0.2194 - val_acc: 0.9647
Epoch 29/55
 - 2s - loss: 0.0629 - acc: 0.9994 - val_loss: 0.2603 - val_acc: 0.9438
Epoch 30/55
 - 2s - loss: 0.0958 - acc: 0.9918 - val_loss: 0.2702 - val_acc: 0.9315
Epoch 31/55
 - 2s - loss: 0.0624 - acc: 0.9991 - val_loss: 0.2287 - val_acc: 0.9553
Epoch 32/55
 - 2s - loss: 0.1048 - acc: 0.9860 - val_loss: 0.3792 - val_acc: 0.8933
Epoch 33/55
 - 2s - loss: 0.0806 - acc: 0.9963 - val_loss: 0.2347 - val_acc: 0.9488
Epoch 34/55
 - 2s - loss: 0.0996 - acc: 0.9887 - val_loss: 0.3910 - val_acc: 0.9423
Epoch 35/55
 - 2s - loss: 0.1470 - acc: 0.9826 - val_loss: 0.3058 - val_acc: 0.9128
Epoch 36/55
 - 2s - loss: 0.0799 - acc: 0.9960 - val_loss: 0.3268 - val_acc: 0.9178
Epoch 37/55
 - 2s - loss: 0.0734 - acc: 0.9954 - val_loss: 0.2603 - val_acc: 0.9279
Epoch 38/55
 - 2s - loss: 0.1653 - acc: 0.9802 - val_loss: 0.2464 - val_acc: 0.9625
Epoch 39/55
 - 2s - loss: 0.0691 - acc: 0.9985 - val_loss: 0.2237 - val_acc: 0.9575
Epoch 40/55
 - 2s - loss: 0.0608 - acc: 0.9979 - val_loss: 0.2234 - val_acc: 0.9589
Epoch 41/55
 - 2s - loss: 0.0567 - acc: 0.9988 - val_loss: 0.2230 - val_acc: 0.9611
Epoch 42/55
 - 2s - loss: 0.0592 - acc: 0.9973 - val_loss: 0.2423 - val_acc: 0.9394
Epoch 43/55
 - 2s - loss: 0.0670 - acc: 0.9967 - val_loss: 0.2273 - val_acc: 0.9560
Epoch 44/55
 - 2s - loss: 0.0611 - acc: 0.9985 - val_loss: 0.2818 - val_acc: 0.9315
Epoch 45/55
 - 2s - loss: 0.0780 - acc: 0.9933 - val_loss: 0.2420 - val_acc: 0.9438
Epoch 46/55
 - 2s - loss: 0.0785 - acc: 0.9930 - val_loss: 0.2782 - val_acc: 0.9337
Epoch 47/55
```

```
 - 2s - loss: 0.0756 - acc: 0.9945 - val_loss: 0.3651 - val_acc: 0.9286
Epoch 48/55
 - 2s - loss: 0.0856 - acc: 0.9912 - val_loss: 0.2382 - val_acc: 0.9661
Epoch 49/55
 - 2s - loss: 0.0508 - acc: 0.9997 - val_loss: 0.2021 - val_acc: 0.9654
Epoch 50/55
 - 2s - loss: 0.0949 - acc: 0.9900 - val_loss: 0.3832 - val_acc: 0.9315
Epoch 51/55
 - 2s - loss: 0.0784 - acc: 0.9948 - val_loss: 0.2721 - val_acc: 0.9402
Epoch 52/55
 - 2s - loss: 0.0616 - acc: 0.9973 - val_loss: 0.2278 - val_acc: 0.9329
Epoch 53/55
 - 2s - loss: 0.0512 - acc: 0.9988 - val_loss: 0.1992 - val_acc: 0.9503
Epoch 54/55
 - 2s - loss: 0.0454 - acc: 0.9997 - val_loss: 0.1998 - val_acc: 0.9632
Epoch 55/55
 - 2s - loss: 0.0651 - acc: 0.9948 - val_loss: 0.2485 - val_acc: 0.9445
Train accuracy 0.9917808219178083 Test accuracy: 0.9444844989185291
--------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

_____
conv1d_2 (Conv1D)            (None, 116, 32)           7200

_____
dropout_1 (Dropout)          (None, 116, 32)           0

_____
max_pooling1d_1 (MaxPooling1 (None, 58, 32)            0

_____
flatten_1 (Flatten)          (None, 1856)              0

_____
dense_1 (Dense)              (None, 32)                59424

_____
dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 68,771
Trainable params: 68,771
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
```

```
            - 3s - loss: 42.5671 - acc: 0.4627 - val_loss: 20.3896 - val_acc: 0.6712
        Epoch 2/35
         - 2s - loss: 11.5550 - acc: 0.8460 - val_loss: 6.0887 - val_acc: 0.8486
        Epoch 3/35
         - 2s - loss: 3.5088 - acc: 0.9577 - val_loss: 2.1941 - val_acc: 0.8637
        Epoch 4/35
         - 2s - loss: 1.2233 - acc: 0.9784 - val_loss: 0.9422 - val_acc: 0.9445
        Epoch 5/35
         - 2s - loss: 0.5161 - acc: 0.9833 - val_loss: 0.6032 - val_acc: 0.9250
        Epoch 6/35
         - 2s - loss: 0.3141 - acc: 0.9820 - val_loss: 0.4764 - val_acc: 0.9373
        Epoch 7/35
         - 2s - loss: 0.2332 - acc: 0.9887 - val_loss: 0.4282 - val_acc: 0.9272
        Epoch 8/35
         - 2s - loss: 0.2176 - acc: 0.9872 - val_loss: 0.3987 - val_acc: 0.9394
        Epoch 9/35
         - 2s - loss: 0.1961 - acc: 0.9906 - val_loss: 0.3700 - val_acc: 0.9329
        Epoch 10/35
         - 2s - loss: 0.1919 - acc: 0.9869 - val_loss: 0.3875 - val_acc: 0.9135
        Epoch 11/35
         - 2s - loss: 0.1762 - acc: 0.9887 - val_loss: 0.3160 - val_acc: 0.9697
        Epoch 12/35
         - 2s - loss: 0.2040 - acc: 0.9796 - val_loss: 0.2751 - val_acc: 0.9776
        Epoch 13/35
         - 2s - loss: 0.1442 - acc: 0.9957 - val_loss: 0.3157 - val_acc: 0.9625
        Epoch 14/35
         - 2s - loss: 0.1337 - acc: 0.9970 - val_loss: 0.2847 - val_acc: 0.9661
        Epoch 15/35
         - 2s - loss: 0.1429 - acc: 0.9912 - val_loss: 0.2955 - val_acc: 0.9423
        Epoch 16/35
         - 2s - loss: 0.1392 - acc: 0.9933 - val_loss: 0.2877 - val_acc: 0.9618
        Epoch 17/35
         - 2s - loss: 0.1392 - acc: 0.9909 - val_loss: 0.2632 - val_acc: 0.9712
        Epoch 18/35
         - 2s - loss: 0.1298 - acc: 0.9942 - val_loss: 0.2696 - val_acc: 0.9567
        Epoch 19/35
         - 2s - loss: 0.1852 - acc: 0.9760 - val_loss: 0.4149 - val_acc: 0.9171
        Epoch 20/35
         - 2s - loss: 0.1584 - acc: 0.9933 - val_loss: 0.2368 - val_acc: 0.9798
        Epoch 21/35
         - 2s - loss: 0.1065 - acc: 0.9982 - val_loss: 0.2628 - val_acc: 0.9618
        Epoch 22/35
         - 2s - loss: 0.1096 - acc: 0.9970 - val_loss: 0.2490 - val_acc: 0.9618
```

```
Epoch 23/35
 - 2s - loss: 0.1101 - acc: 0.9945 - val_loss: 0.2930 - val_acc: 0.9250
Epoch 24/35
 - 2s - loss: 0.1183 - acc: 0.9918 - val_loss: 0.2872 - val_acc: 0.9373
Epoch 25/35
 - 2s - loss: 0.1085 - acc: 0.9945 - val_loss: 0.2491 - val_acc: 0.9510
Epoch 26/35
 - 2s - loss: 0.1003 - acc: 0.9970 - val_loss: 0.2179 - val_acc: 0.9719
Epoch 27/35
 - 2s - loss: 0.1461 - acc: 0.9802 - val_loss: 0.2088 - val_acc: 0.9942
Epoch 28/35
 - 2s - loss: 0.1290 - acc: 0.9951 - val_loss: 0.2194 - val_acc: 0.9683
Epoch 29/35
 - 2s - loss: 0.0907 - acc: 0.9976 - val_loss: 0.2533 - val_acc: 0.9402
Epoch 30/35
 - 2s - loss: 0.0956 - acc: 0.9945 - val_loss: 0.1947 - val_acc: 0.9740
Epoch 31/35
 - 2s - loss: 0.0823 - acc: 0.9976 - val_loss: 0.2414 - val_acc: 0.9301
Epoch 32/35
 - 2s - loss: 0.2003 - acc: 0.9702 - val_loss: 0.2938 - val_acc: 0.9495
Epoch 33/35
 - 2s - loss: 0.1090 - acc: 0.9985 - val_loss: 0.2039 - val_acc: 0.9668
Epoch 34/35
 - 2s - loss: 0.0833 - acc: 0.9979 - val_loss: 0.2130 - val_acc: 0.9575
Epoch 35/35
 - 2s - loss: 0.0815 - acc: 0.9973 - val_loss: 0.1946 - val_acc: 0.9697
Train accuracy 0.9987823439878234 Test accuracy: 0.969718817591925
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 116, 16)	4720
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 38, 16)	0
flatten_1 (Flatten)	(None, 608)	0
dense_1 (Dense)	(None, 32)	19488

```
dense_2 (Dense)                  (None, 3)                      99
=================================================================
Total params: 26,995
Trainable params: 26,995
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 36.5622 - acc: 0.6938 - val_loss: 7.7461 - val_acc: 0.7967
Epoch 2/55
 - 1s - loss: 2.9025 - acc: 0.9440 - val_loss: 1.0764 - val_acc: 0.8861
Epoch 3/55
 - 1s - loss: 0.5003 - acc: 0.9662 - val_loss: 0.5874 - val_acc: 0.9034
Epoch 4/55
 - 1s - loss: 0.3471 - acc: 0.9662 - val_loss: 0.5310 - val_acc: 0.9034
Epoch 5/55
 - 1s - loss: 0.3203 - acc: 0.9653 - val_loss: 0.4633 - val_acc: 0.9459
Epoch 6/55
 - 1s - loss: 0.2631 - acc: 0.9793 - val_loss: 0.4904 - val_acc: 0.8933
Epoch 7/55
 - 1s - loss: 0.2218 - acc: 0.9851 - val_loss: 0.5110 - val_acc: 0.8529
Epoch 8/55
 - 1s - loss: 0.2658 - acc: 0.9702 - val_loss: 0.4132 - val_acc: 0.9193
Epoch 9/55
 - 1s - loss: 0.1952 - acc: 0.9860 - val_loss: 0.3650 - val_acc: 0.9250
Epoch 10/55
 - 1s - loss: 0.2785 - acc: 0.9595 - val_loss: 0.6396 - val_acc: 0.8335
Epoch 11/55
 - 1s - loss: 0.2343 - acc: 0.9826 - val_loss: 0.3875 - val_acc: 0.9286
Epoch 12/55
 - 1s - loss: 0.2005 - acc: 0.9796 - val_loss: 0.4104 - val_acc: 0.8998
Epoch 13/55
 - 1s - loss: 0.2343 - acc: 0.9769 - val_loss: 0.3774 - val_acc: 0.9402
Epoch 14/55
 - 1s - loss: 0.1574 - acc: 0.9930 - val_loss: 0.3637 - val_acc: 0.9409
Epoch 15/55
 - 1s - loss: 0.1882 - acc: 0.9814 - val_loss: 0.3666 - val_acc: 0.9373
Epoch 16/55
 - 1s - loss: 0.1462 - acc: 0.9936 - val_loss: 0.2949 - val_acc: 0.9546
Epoch 17/55
 - 1s - loss: 0.1471 - acc: 0.9900 - val_loss: 0.2940 - val_acc: 0.9488
Epoch 18/55
```

```
                - 1s - loss: 0.1432 - acc: 0.9900 - val_loss: 0.3324 - val_acc: 0.9301
        Epoch 19/55
                - 1s - loss: 0.1544 - acc: 0.9875 - val_loss: 0.4027 - val_acc: 0.8991
        Epoch 20/55
                - 1s - loss: 0.1973 - acc: 0.9781 - val_loss: 0.3840 - val_acc: 0.9416
        Epoch 21/55
                - 1s - loss: 0.1657 - acc: 0.9860 - val_loss: 0.3232 - val_acc: 0.9387
        Epoch 22/55
                - 1s - loss: 0.1359 - acc: 0.9893 - val_loss: 0.3344 - val_acc: 0.9337
        Epoch 23/55
                - 1s - loss: 0.1395 - acc: 0.9875 - val_loss: 0.2956 - val_acc: 0.9351
        Epoch 24/55
                - 1s - loss: 0.2107 - acc: 0.9756 - val_loss: 0.3586 - val_acc: 0.9373
        Epoch 25/55
                - 1s - loss: 0.1414 - acc: 0.9896 - val_loss: 0.3294 - val_acc: 0.9200
        Epoch 26/55
                - 1s - loss: 0.1360 - acc: 0.9884 - val_loss: 0.3196 - val_acc: 0.9387
        Epoch 27/55
                - 1s - loss: 0.1224 - acc: 0.9912 - val_loss: 0.3720 - val_acc: 0.9099
        Epoch 28/55
                - 1s - loss: 0.2700 - acc: 0.9619 - val_loss: 0.4394 - val_acc: 0.9416
        Epoch 29/55
                - 1s - loss: 0.1461 - acc: 0.9936 - val_loss: 0.3698 - val_acc: 0.8947
        Epoch 30/55
                - 1s - loss: 0.1671 - acc: 0.9808 - val_loss: 0.3418 - val_acc: 0.9344
        Epoch 31/55
                - 1s - loss: 0.1190 - acc: 0.9927 - val_loss: 0.3360 - val_acc: 0.9149
        Epoch 32/55
                - 1s - loss: 0.1180 - acc: 0.9921 - val_loss: 0.2923 - val_acc: 0.9524
        Epoch 33/55
                - 1s - loss: 0.1234 - acc: 0.9881 - val_loss: 0.4145 - val_acc: 0.8637
        Epoch 34/55
                - 1s - loss: 0.3605 - acc: 0.9501 - val_loss: 0.3857 - val_acc: 0.9171
        Epoch 35/55
                - 1s - loss: 0.1410 - acc: 0.9915 - val_loss: 0.3261 - val_acc: 0.9286
        Epoch 36/55
                - 1s - loss: 0.1351 - acc: 0.9881 - val_loss: 0.3244 - val_acc: 0.9193
        Epoch 37/55
                - 1s - loss: 0.1414 - acc: 0.9845 - val_loss: 0.3245 - val_acc: 0.9193
        Epoch 38/55
                - 1s - loss: 0.1310 - acc: 0.9860 - val_loss: 0.6909 - val_acc: 0.8046
        Epoch 39/55
                - 1s - loss: 0.2657 - acc: 0.9650 - val_loss: 0.3848 - val_acc: 0.9200
```

```
Epoch 40/55
 - 1s - loss: 0.1528 - acc: 0.9900 - val_loss: 0.4364 - val_acc: 0.8738
Epoch 41/55
 - 1s - loss: 0.1447 - acc: 0.9823 - val_loss: 0.5141 - val_acc: 0.8904
Epoch 42/55
 - 1s - loss: 0.1434 - acc: 0.9884 - val_loss: 0.3351 - val_acc: 0.9149
Epoch 43/55
 - 1s - loss: 0.1574 - acc: 0.9836 - val_loss: 0.3167 - val_acc: 0.9394
Epoch 44/55
 - 1s - loss: 0.1316 - acc: 0.9890 - val_loss: 0.3009 - val_acc: 0.9503
Epoch 45/55
 - 1s - loss: 0.0941 - acc: 0.9970 - val_loss: 0.3375 - val_acc: 0.9041
Epoch 46/55
 - 1s - loss: 0.1452 - acc: 0.9826 - val_loss: 0.2971 - val_acc: 0.9214
Epoch 47/55
 - 1s - loss: 0.2152 - acc: 0.9705 - val_loss: 0.4550 - val_acc: 0.9272
Epoch 48/55
 - 1s - loss: 0.1151 - acc: 0.9954 - val_loss: 0.2880 - val_acc: 0.9560
Epoch 49/55
 - 1s - loss: 0.0971 - acc: 0.9939 - val_loss: 0.3479 - val_acc: 0.9351
Epoch 50/55
 - 1s - loss: 0.1586 - acc: 0.9766 - val_loss: 0.6053 - val_acc: 0.8702
Epoch 51/55
 - 1s - loss: 0.1552 - acc: 0.9857 - val_loss: 0.2823 - val_acc: 0.9286
Epoch 52/55
 - 1s - loss: 0.1031 - acc: 0.9967 - val_loss: 0.3154 - val_acc: 0.9193
Epoch 53/55
 - 1s - loss: 0.1433 - acc: 0.9839 - val_loss: 0.3174 - val_acc: 0.9171
Epoch 54/55
 - 1s - loss: 0.0995 - acc: 0.9918 - val_loss: 0.2748 - val_acc: 0.9416
Epoch 55/55
 - 1s - loss: 0.0952 - acc: 0.9939 - val_loss: 0.2731 - val_acc: 0.9272
Train accuracy 0.9914764079147641 Test accuracy: 0.9271809661139149
-----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 28)	1288
conv1d_2 (Conv1D)	(None, 118, 32)	6304
dropout_1 (Dropout)	(None, 118, 32)	0

```
max_pooling1d_1 (MaxPooling1 (None, 23, 32)                0
_____
flatten_1 (Flatten)          (None, 736)                   0
_____
dense_1 (Dense)              (None, 64)                    47168
_____
dense_2 (Dense)              (None, 3)                     195
================================================================
Total params: 54,955
Trainable params: 54,955
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 34.2710 - acc: 0.7489 - val_loss: 17.4761 - val_acc: 0.9063
Epoch 2/35
 - 2s - loss: 9.7622 - acc: 0.9665 - val_loss: 4.9856 - val_acc: 0.9452
Epoch 3/35
 - 2s - loss: 2.6903 - acc: 0.9881 - val_loss: 1.6250 - val_acc: 0.9387
Epoch 4/35
 - 2s - loss: 0.8841 - acc: 0.9896 - val_loss: 0.8212 - val_acc: 0.9272
Epoch 5/35
 - 2s - loss: 0.4265 - acc: 0.9900 - val_loss: 0.5368 - val_acc: 0.9567
Epoch 6/35
 - 2s - loss: 0.2736 - acc: 0.9933 - val_loss: 0.4210 - val_acc: 0.9567
Epoch 7/35
 - 2s - loss: 0.2167 - acc: 0.9866 - val_loss: 0.4253 - val_acc: 0.9070
Epoch 8/35
 - 2s - loss: 0.1782 - acc: 0.9912 - val_loss: 0.3590 - val_acc: 0.9459
Epoch 9/35
 - 2s - loss: 0.1408 - acc: 0.9951 - val_loss: 0.3169 - val_acc: 0.9589
Epoch 10/35
 - 2s - loss: 0.1216 - acc: 0.9963 - val_loss: 0.2940 - val_acc: 0.9539
Epoch 11/35
 - 2s - loss: 0.1541 - acc: 0.9893 - val_loss: 0.3461 - val_acc: 0.9200
Epoch 12/35
 - 2s - loss: 0.1249 - acc: 0.9918 - val_loss: 0.3291 - val_acc: 0.9402
Epoch 13/35
 - 2s - loss: 0.1108 - acc: 0.9951 - val_loss: 0.3326 - val_acc: 0.9329
Epoch 14/35
 - 2s - loss: 0.1291 - acc: 0.9887 - val_loss: 0.3556 - val_acc: 0.9322
Epoch 15/35
```

```
          - 2s - loss: 0.0974 - acc: 0.9979 - val_loss: 0.2681 - val_acc: 0.9524
        Epoch 16/35
          - 2s - loss: 0.0898 - acc: 0.9963 - val_loss: 0.2585 - val_acc: 0.9445
        Epoch 17/35
          - 2s - loss: 0.1332 - acc: 0.9866 - val_loss: 0.2370 - val_acc: 0.9654
        Epoch 18/35
          - 2s - loss: 0.0820 - acc: 0.9979 - val_loss: 0.2884 - val_acc: 0.9409
        Epoch 19/35
          - 2s - loss: 0.0842 - acc: 0.9951 - val_loss: 0.2578 - val_acc: 0.9466
        Epoch 20/35
          - 2s - loss: 0.0814 - acc: 0.9960 - val_loss: 0.2345 - val_acc: 0.9539
        Epoch 21/35
          - 2s - loss: 0.0778 - acc: 0.9954 - val_loss: 0.2683 - val_acc: 0.9510
        Epoch 22/35
          - 2s - loss: 0.0785 - acc: 0.9954 - val_loss: 0.4639 - val_acc: 0.8414
        Epoch 23/35
          - 2s - loss: 0.0842 - acc: 0.9951 - val_loss: 0.3294 - val_acc: 0.9301
        Epoch 24/35
          - 2s - loss: 0.0704 - acc: 0.9963 - val_loss: 0.2395 - val_acc: 0.9481
        Epoch 25/35
          - 2s - loss: 0.0719 - acc: 0.9970 - val_loss: 0.2429 - val_acc: 0.9402
        Epoch 26/35
          - 2s - loss: 0.0533 - acc: 0.9994 - val_loss: 0.2240 - val_acc: 0.9459
        Epoch 27/35
          - 2s - loss: 0.0715 - acc: 0.9948 - val_loss: 0.2221 - val_acc: 0.9553
        Epoch 28/35
          - 2s - loss: 0.0859 - acc: 0.9906 - val_loss: 0.2194 - val_acc: 0.9632
        Epoch 29/35
          - 2s - loss: 0.0688 - acc: 0.9967 - val_loss: 0.2364 - val_acc: 0.9553
        Epoch 30/35
          - 2s - loss: 0.0510 - acc: 0.9997 - val_loss: 0.1989 - val_acc: 0.9632
        Epoch 31/35
          - 2s - loss: 0.0845 - acc: 0.9924 - val_loss: 0.1831 - val_acc: 0.9632
        Epoch 32/35
          - 2s - loss: 0.0461 - acc: 1.0000 - val_loss: 0.1651 - val_acc: 0.9690
        Epoch 33/35
          - 2s - loss: 0.0555 - acc: 0.9957 - val_loss: 0.4642 - val_acc: 0.8544
        Epoch 34/35
          - 2s - loss: 0.1397 - acc: 0.9860 - val_loss: 0.2102 - val_acc: 0.9575
        Epoch 35/35
          - 2s - loss: 0.0553 - acc: 0.9994 - val_loss: 0.2101 - val_acc: 0.9387
        Train accuracy 0.9975646879756469 Test accuracy: 0.9387166546503244
        ------------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)            (None, 126, 32)           896
_____
conv1d_2 (Conv1D)            (None, 122, 32)           5152
_____
dropout_1 (Dropout)          (None, 122, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 24, 32)            0
_____
flatten_1 (Flatten)          (None, 768)               0
_____
dense_1 (Dense)              (None, 32)                24608
_____
dense_2 (Dense)              (None, 3)                 99
===============================================================
Total params: 30,755
Trainable params: 30,755
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 40.6311 - acc: 0.6289 - val_loss: 22.0869 - val_acc: 0.7332
Epoch 2/35
 - 2s - loss: 13.7671 - acc: 0.9035 - val_loss: 8.4053 - val_acc: 0.8846
Epoch 3/35
 - 2s - loss: 5.3421 - acc: 0.9461 - val_loss: 3.6136 - val_acc: 0.7938
Epoch 4/35
 - 2s - loss: 2.2098 - acc: 0.9574 - val_loss: 1.6966 - val_acc: 0.8673
Epoch 5/35
 - 2s - loss: 0.9858 - acc: 0.9717 - val_loss: 0.9733 - val_acc: 0.9156
Epoch 6/35
 - 2s - loss: 0.5453 - acc: 0.9753 - val_loss: 0.6953 - val_acc: 0.9358
Epoch 7/35
 - 2s - loss: 0.3898 - acc: 0.9778 - val_loss: 0.5939 - val_acc: 0.9315
Epoch 8/35
 - 2s - loss: 0.3317 - acc: 0.9756 - val_loss: 0.6359 - val_acc: 0.8111
Epoch 9/35
 - 2s - loss: 0.3135 - acc: 0.9756 - val_loss: 0.5357 - val_acc: 0.9056
Epoch 10/35
 - 2s - loss: 0.2581 - acc: 0.9893 - val_loss: 0.5165 - val_acc: 0.8947
```

```
Epoch 11/35
 - 2s - loss: 0.2400 - acc: 0.9896 - val_loss: 0.5078 - val_acc: 0.8854
Epoch 12/35
 - 2s - loss: 0.2305 - acc: 0.9878 - val_loss: 0.4715 - val_acc: 0.9077
Epoch 13/35
 - 2s - loss: 0.2251 - acc: 0.9845 - val_loss: 0.4466 - val_acc: 0.9113
Epoch 14/35
 - 2s - loss: 0.2025 - acc: 0.9887 - val_loss: 0.4269 - val_acc: 0.9416
Epoch 15/35
 - 2s - loss: 0.1950 - acc: 0.9906 - val_loss: 0.3938 - val_acc: 0.9387
Epoch 16/35
 - 2s - loss: 0.1863 - acc: 0.9890 - val_loss: 0.5061 - val_acc: 0.8277
Epoch 17/35
 - 2s - loss: 0.2084 - acc: 0.9820 - val_loss: 0.3632 - val_acc: 0.9539
Epoch 18/35
 - 2s - loss: 0.1716 - acc: 0.9912 - val_loss: 0.3482 - val_acc: 0.9575
Epoch 19/35
 - 2s - loss: 0.2015 - acc: 0.9784 - val_loss: 0.4376 - val_acc: 0.9012
Epoch 20/35
 - 2s - loss: 0.1661 - acc: 0.9948 - val_loss: 0.3387 - val_acc: 0.9517
Epoch 21/35
 - 2s - loss: 0.1505 - acc: 0.9924 - val_loss: 0.3897 - val_acc: 0.9193
Epoch 22/35
 - 2s - loss: 0.1680 - acc: 0.9836 - val_loss: 0.3684 - val_acc: 0.9344
Epoch 23/35
 - 2s - loss: 0.1565 - acc: 0.9945 - val_loss: 0.3828 - val_acc: 0.9120
Epoch 24/35
 - 2s - loss: 0.1609 - acc: 0.9893 - val_loss: 0.3260 - val_acc: 0.9387
Epoch 25/35
 - 2s - loss: 0.1503 - acc: 0.9912 - val_loss: 0.3136 - val_acc: 0.9495
Epoch 26/35
 - 2s - loss: 0.1470 - acc: 0.9921 - val_loss: 0.3199 - val_acc: 0.9445
Epoch 27/35
 - 2s - loss: 0.1300 - acc: 0.9939 - val_loss: 0.3144 - val_acc: 0.9517
Epoch 28/35
 - 2s - loss: 0.1318 - acc: 0.9939 - val_loss: 0.2866 - val_acc: 0.9603
Epoch 29/35
 - 2s - loss: 0.1350 - acc: 0.9893 - val_loss: 0.3323 - val_acc: 0.9358
Epoch 30/35
 - 2s - loss: 0.1309 - acc: 0.9924 - val_loss: 0.3132 - val_acc: 0.9430
Epoch 31/35
 - 2s - loss: 0.1193 - acc: 0.9924 - val_loss: 0.2819 - val_acc: 0.9524
Epoch 32/35
```

```
 - 2s - loss: 0.1417 - acc: 0.9881 - val_loss: 0.3448 - val_acc: 0.9221
Epoch 33/35
 - 2s - loss: 0.1413 - acc: 0.9912 - val_loss: 0.2934 - val_acc: 0.9510
Epoch 34/35
 - 2s - loss: 0.1125 - acc: 0.9954 - val_loss: 0.3602 - val_acc: 0.9214
Epoch 35/35
 - 2s - loss: 0.1117 - acc: 0.9924 - val_loss: 0.3756 - val_acc: 0.8983
Train accuracy 0.9656012176560121 Test accuracy: 0.8983417447728911
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 58, 32)	0
flatten_1 (Flatten)	(None, 1856)	0
dense_1 (Dense)	(None, 32)	59424
dense_2 (Dense)	(None, 3)	99

```
Total params: 68,771
Trainable params: 68,771
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 3s - loss: 68.4506 - acc: 0.4788 - val_loss: 13.4246 - val_acc: 0.4744
Epoch 2/40
 - 2s - loss: 4.6661 - acc: 0.7887 - val_loss: 1.2823 - val_acc: 0.7924
Epoch 3/40
 - 2s - loss: 0.6683 - acc: 0.8971 - val_loss: 0.6814 - val_acc: 0.8882
Epoch 4/40
 - 2s - loss: 0.4641 - acc: 0.9272 - val_loss: 0.6150 - val_acc: 0.8854
Epoch 5/40
 - 2s - loss: 0.3940 - acc: 0.9495 - val_loss: 0.5454 - val_acc: 0.9128
Epoch 6/40
```

```
          - 2s - loss: 0.3439 - acc: 0.9595 - val_loss: 0.5015 - val_acc: 0.9200
Epoch 7/40
          - 2s - loss: 0.3095 - acc: 0.9656 - val_loss: 0.6085 - val_acc: 0.8363
Epoch 8/40
          - 2s - loss: 0.3100 - acc: 0.9647 - val_loss: 0.4668 - val_acc: 0.9474
Epoch 9/40
          - 2s - loss: 0.3880 - acc: 0.9492 - val_loss: 0.4723 - val_acc: 0.9164
Epoch 10/40
          - 2s - loss: 0.2655 - acc: 0.9760 - val_loss: 0.4773 - val_acc: 0.9120
Epoch 11/40
          - 2s - loss: 0.2754 - acc: 0.9723 - val_loss: 0.4182 - val_acc: 0.9293
Epoch 12/40
          - 2s - loss: 0.3107 - acc: 0.9568 - val_loss: 0.4218 - val_acc: 0.9510
Epoch 13/40
          - 2s - loss: 0.2616 - acc: 0.9753 - val_loss: 0.4383 - val_acc: 0.9308
Epoch 14/40
          - 2s - loss: 0.2149 - acc: 0.9802 - val_loss: 0.4033 - val_acc: 0.9084
Epoch 15/40
          - 2s - loss: 0.2333 - acc: 0.9705 - val_loss: 0.3532 - val_acc: 0.9402
Epoch 16/40
          - 2s - loss: 0.2157 - acc: 0.9787 - val_loss: 0.3658 - val_acc: 0.9337
Epoch 17/40
          - 2s - loss: 0.2133 - acc: 0.9784 - val_loss: 0.3835 - val_acc: 0.9459
Epoch 18/40
          - 2s - loss: 0.2042 - acc: 0.9823 - val_loss: 0.3791 - val_acc: 0.9229
Epoch 19/40
          - 2s - loss: 0.2755 - acc: 0.9623 - val_loss: 0.6711 - val_acc: 0.8277
Epoch 20/40
          - 2s - loss: 0.2916 - acc: 0.9656 - val_loss: 0.3567 - val_acc: 0.9539
Epoch 21/40
          - 2s - loss: 0.2319 - acc: 0.9735 - val_loss: 0.5258 - val_acc: 0.9106
Epoch 22/40
          - 2s - loss: 0.1993 - acc: 0.9799 - val_loss: 0.4885 - val_acc: 0.8825
Epoch 23/40
          - 2s - loss: 0.2041 - acc: 0.9741 - val_loss: 0.3549 - val_acc: 0.9373
Epoch 24/40
          - 2s - loss: 0.2362 - acc: 0.9680 - val_loss: 0.4294 - val_acc: 0.9048
Epoch 25/40
          - 2s - loss: 0.1877 - acc: 0.9836 - val_loss: 0.3676 - val_acc: 0.9156
Epoch 26/40
          - 2s - loss: 0.2316 - acc: 0.9720 - val_loss: 0.4527 - val_acc: 0.8616
Epoch 27/40
          - 2s - loss: 0.2256 - acc: 0.9693 - val_loss: 0.4042 - val_acc: 0.9301
```

```
Epoch 28/40
 - 2s - loss: 0.1946 - acc: 0.9805 - val_loss: 0.6861 - val_acc: 0.7765
Epoch 29/40
 - 2s - loss: 0.2048 - acc: 0.9766 - val_loss: 0.3131 - val_acc: 0.9366
Epoch 30/40
 - 2s - loss: 0.1652 - acc: 0.9839 - val_loss: 0.3526 - val_acc: 0.9272
Epoch 31/40
 - 2s - loss: 0.2895 - acc: 0.9589 - val_loss: 0.3582 - val_acc: 0.9221
Epoch 32/40
 - 2s - loss: 0.2608 - acc: 0.9635 - val_loss: 0.3533 - val_acc: 0.9503
Epoch 33/40
 - 2s - loss: 0.1756 - acc: 0.9854 - val_loss: 0.5115 - val_acc: 0.8760
Epoch 34/40
 - 2s - loss: 0.2333 - acc: 0.9686 - val_loss: 0.5419 - val_acc: 0.8421
Epoch 35/40
 - 2s - loss: 0.2173 - acc: 0.9689 - val_loss: 0.5006 - val_acc: 0.8991
Epoch 36/40
 - 2s - loss: 0.2132 - acc: 0.9787 - val_loss: 0.4357 - val_acc: 0.8969
Epoch 37/40
 - 2s - loss: 0.1865 - acc: 0.9805 - val_loss: 0.3590 - val_acc: 0.9200
Epoch 38/40
 - 2s - loss: 0.1907 - acc: 0.9769 - val_loss: 0.3284 - val_acc: 0.9229
Epoch 39/40
 - 2s - loss: 0.1879 - acc: 0.9784 - val_loss: 0.3877 - val_acc: 0.8955
Epoch 40/40
 - 2s - loss: 0.1803 - acc: 0.9793 - val_loss: 0.4176 - val_acc: 0.8976
Train accuracy 0.980517503805175 Test accuracy: 0.8976207642393655
---------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 16)	11792

```
dense_2 (Dense)                  (None, 3)                    51
=================================================================
Total params: 21,091
Trainable params: 21,091
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 23.0997 - acc: 0.4919 - val_loss: 12.9703 - val_acc: 0.5725
Epoch 2/35
 - 2s - loss: 7.9639 - acc: 0.8033 - val_loss: 4.7915 - val_acc: 0.8349
Epoch 3/35
 - 2s - loss: 2.8474 - acc: 0.9632 - val_loss: 2.0515 - val_acc: 0.8435
Epoch 4/35
 - 2s - loss: 1.1397 - acc: 0.9784 - val_loss: 1.0259 - val_acc: 0.9366
Epoch 5/35
 - 2s - loss: 0.5190 - acc: 0.9942 - val_loss: 0.6745 - val_acc: 0.9459
Epoch 6/35
 - 2s - loss: 0.3058 - acc: 0.9921 - val_loss: 0.5255 - val_acc: 0.9546
Epoch 7/35
 - 2s - loss: 0.2250 - acc: 0.9924 - val_loss: 0.4733 - val_acc: 0.9329
Epoch 8/35
 - 2s - loss: 0.1909 - acc: 0.9948 - val_loss: 0.4741 - val_acc: 0.9041
Epoch 9/35
 - 2s - loss: 0.1681 - acc: 0.9960 - val_loss: 0.3995 - val_acc: 0.9445
Epoch 10/35
 - 2s - loss: 0.1491 - acc: 0.9982 - val_loss: 0.4452 - val_acc: 0.8919
Epoch 11/35
 - 2s - loss: 0.1349 - acc: 0.9976 - val_loss: 0.3635 - val_acc: 0.9589
Epoch 12/35
 - 2s - loss: 0.1366 - acc: 0.9948 - val_loss: 0.3224 - val_acc: 0.9784
Epoch 13/35
 - 2s - loss: 0.1188 - acc: 0.9979 - val_loss: 0.3289 - val_acc: 0.9661
Epoch 14/35
 - 2s - loss: 0.1085 - acc: 0.9997 - val_loss: 0.3135 - val_acc: 0.9769
Epoch 15/35
 - 2s - loss: 0.1079 - acc: 0.9979 - val_loss: 0.3330 - val_acc: 0.9481
Epoch 16/35
 - 2s - loss: 0.1068 - acc: 0.9963 - val_loss: 0.2971 - val_acc: 0.9740
Epoch 17/35
 - 2s - loss: 0.1225 - acc: 0.9912 - val_loss: 0.3029 - val_acc: 0.9575
Epoch 18/35
```

```
 - 2s - loss: 0.0914 - acc: 0.9994 - val_loss: 0.2811 - val_acc: 0.9712
Epoch 19/35
 - 2s - loss: 0.1554 - acc: 0.9778 - val_loss: 0.2811 - val_acc: 0.9661
Epoch 20/35
 - 2s - loss: 0.1114 - acc: 0.9979 - val_loss: 0.2667 - val_acc: 0.9704
Epoch 21/35
 - 2s - loss: 0.0839 - acc: 0.9991 - val_loss: 0.2769 - val_acc: 0.9625
Epoch 22/35
 - 2s - loss: 0.0800 - acc: 0.9994 - val_loss: 0.2766 - val_acc: 0.9575
Epoch 23/35
 - 2s - loss: 0.0834 - acc: 0.9973 - val_loss: 0.2577 - val_acc: 0.9654
Epoch 24/35
 - 2s - loss: 0.0848 - acc: 0.9970 - val_loss: 0.2520 - val_acc: 0.9813
Epoch 25/35
 - 2s - loss: 0.0743 - acc: 0.9994 - val_loss: 0.2484 - val_acc: 0.9726
Epoch 26/35
 - 2s - loss: 0.0737 - acc: 0.9991 - val_loss: 0.2656 - val_acc: 0.9510
Epoch 27/35
 - 2s - loss: 0.0892 - acc: 0.9939 - val_loss: 0.2361 - val_acc: 0.9690
Epoch 28/35
 - 2s - loss: 0.0712 - acc: 0.9991 - val_loss: 0.2424 - val_acc: 0.9712
Epoch 29/35
 - 2s - loss: 0.0961 - acc: 0.9906 - val_loss: 0.1938 - val_acc: 0.9813
Epoch 30/35
 - 2s - loss: 0.0691 - acc: 1.0000 - val_loss: 0.2356 - val_acc: 0.9668
Epoch 31/35
 - 2s - loss: 0.0632 - acc: 0.9991 - val_loss: 0.2272 - val_acc: 0.9798
Epoch 32/35
 - 2s - loss: 0.0779 - acc: 0.9912 - val_loss: 0.2241 - val_acc: 0.9625
Epoch 33/35
 - 2s - loss: 0.1114 - acc: 0.9903 - val_loss: 0.2077 - val_acc: 0.9661
Epoch 34/35
 - 2s - loss: 0.0643 - acc: 0.9994 - val_loss: 0.2208 - val_acc: 0.9690
Epoch 35/35
 - 2s - loss: 0.0580 - acc: 0.9997 - val_loss: 0.2195 - val_acc: 0.9784
Train accuracy 1.0 Test accuracy: 0.9783705839942322
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 24)	5400

```
_____
dropout_1 (Dropout)          (None, 116, 24)            0
_____
max_pooling1d_1 (MaxPooling1 (None, 23, 24)             0
_____
flatten_1 (Flatten)          (None, 552)                0
_____
dense_1 (Dense)              (None, 16)                 8848
_____
dense_2 (Dense)              (None, 3)                  51
===========================================================
Total params: 16,347
Trainable params: 16,347
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 104.8181 - acc: 0.5075 - val_loss: 60.5449 - val_acc: 0.5580
Epoch 2/35
 - 1s - loss: 38.1838 - acc: 0.6463 - val_loss: 21.9688 - val_acc: 0.5797
Epoch 3/35
 - 1s - loss: 13.6180 - acc: 0.8408 - val_loss: 7.9362 - val_acc: 0.7859
Epoch 4/35
 - 1s - loss: 4.7102 - acc: 0.9245 - val_loss: 2.9717 - val_acc: 0.8702
Epoch 5/35
 - 1s - loss: 1.7033 - acc: 0.9452 - val_loss: 1.3923 - val_acc: 0.9084
Epoch 6/35
 - 1s - loss: 0.7662 - acc: 0.9619 - val_loss: 0.9169 - val_acc: 0.9250
Epoch 7/35
 - 1s - loss: 0.4747 - acc: 0.9756 - val_loss: 0.7678 - val_acc: 0.9178
Epoch 8/35
 - 1s - loss: 0.3902 - acc: 0.9738 - val_loss: 0.7131 - val_acc: 0.8861
Epoch 9/35
 - 1s - loss: 0.3416 - acc: 0.9833 - val_loss: 0.6343 - val_acc: 0.9582
Epoch 10/35
 - 1s - loss: 0.3352 - acc: 0.9735 - val_loss: 0.6599 - val_acc: 0.8955
Epoch 11/35
 - 1s - loss: 0.2980 - acc: 0.9826 - val_loss: 0.5956 - val_acc: 0.9495
Epoch 12/35
 - 1s - loss: 0.2856 - acc: 0.9814 - val_loss: 0.5751 - val_acc: 0.9452
Epoch 13/35
 - 1s - loss: 0.2601 - acc: 0.9890 - val_loss: 0.5868 - val_acc: 0.9322
```

```
Epoch 14/35
 - 1s - loss: 0.2442 - acc: 0.9896 - val_loss: 0.5542 - val_acc: 0.9495
Epoch 15/35
 - 1s - loss: 0.2540 - acc: 0.9839 - val_loss: 0.5381 - val_acc: 0.9207
Epoch 16/35
 - 1s - loss: 0.2331 - acc: 0.9881 - val_loss: 0.4996 - val_acc: 0.9704
Epoch 17/35
 - 1s - loss: 0.2401 - acc: 0.9814 - val_loss: 0.4772 - val_acc: 0.9690
Epoch 18/35
 - 1s - loss: 0.2084 - acc: 0.9909 - val_loss: 0.4981 - val_acc: 0.9329
Epoch 19/35
 - 1s - loss: 0.2211 - acc: 0.9814 - val_loss: 0.4761 - val_acc: 0.9553
Epoch 20/35
 - 1s - loss: 0.2198 - acc: 0.9805 - val_loss: 0.5105 - val_acc: 0.9019
Epoch 21/35
 - 1s - loss: 0.2164 - acc: 0.9863 - val_loss: 0.4493 - val_acc: 0.9603
Epoch 22/35
 - 1s - loss: 0.1912 - acc: 0.9878 - val_loss: 0.4812 - val_acc: 0.9503
Epoch 23/35
 - 1s - loss: 0.1864 - acc: 0.9878 - val_loss: 0.4365 - val_acc: 0.9654
Epoch 24/35
 - 1s - loss: 0.2026 - acc: 0.9830 - val_loss: 0.4079 - val_acc: 0.9690
Epoch 25/35
 - 1s - loss: 0.1782 - acc: 0.9884 - val_loss: 0.4029 - val_acc: 0.9546
Epoch 26/35
 - 1s - loss: 0.1865 - acc: 0.9820 - val_loss: 0.4020 - val_acc: 0.9733
Epoch 27/35
 - 1s - loss: 0.1843 - acc: 0.9830 - val_loss: 0.4260 - val_acc: 0.9430
Epoch 28/35
 - 1s - loss: 0.1824 - acc: 0.9884 - val_loss: 0.4218 - val_acc: 0.9531
Epoch 29/35
 - 1s - loss: 0.1659 - acc: 0.9896 - val_loss: 0.4117 - val_acc: 0.9430
Epoch 30/35
 - 1s - loss: 0.1610 - acc: 0.9906 - val_loss: 0.3714 - val_acc: 0.9740
Epoch 31/35
 - 1s - loss: 0.1459 - acc: 0.9945 - val_loss: 0.3801 - val_acc: 0.9589
Epoch 32/35
 - 1s - loss: 0.1745 - acc: 0.9833 - val_loss: 0.3788 - val_acc: 0.9603
Epoch 33/35
 - 1s - loss: 0.1523 - acc: 0.9903 - val_loss: 0.3852 - val_acc: 0.9539
Epoch 34/35
 - 1s - loss: 0.1462 - acc: 0.9915 - val_loss: 0.3626 - val_acc: 0.9539
Epoch 35/35
```

```
   - 1s - loss: 0.1388 - acc: 0.9948 - val_loss: 0.3725 - val_acc: 0.9589
Train accuracy 0.9963470319634703 Test accuracy: 0.958904109589041
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 42)	1932
conv1d_2 (Conv1D)	(None, 118, 32)	9440
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 32)	0
flatten_1 (Flatten)	(None, 1248)	0
dense_1 (Dense)	(None, 16)	19984
dense_2 (Dense)	(None, 3)	51

```
Total params: 31,407
Trainable params: 31,407
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 29.1221 - acc: 0.4618 - val_loss: 19.5991 - val_acc: 0.5934
Epoch 2/40
 - 1s - loss: 14.2418 - acc: 0.7677 - val_loss: 10.2271 - val_acc: 0.8190
Epoch 3/40
 - 1s - loss: 7.6386 - acc: 0.9035 - val_loss: 5.8862 - val_acc: 0.8724
Epoch 4/40
 - 1s - loss: 4.3480 - acc: 0.9616 - val_loss: 3.5301 - val_acc: 0.9286
Epoch 5/40
 - 1s - loss: 2.5365 - acc: 0.9784 - val_loss: 2.2112 - val_acc: 0.9084
Epoch 6/40
 - 1s - loss: 1.5134 - acc: 0.9820 - val_loss: 1.4243 - val_acc: 0.9445
Epoch 7/40
 - 1s - loss: 0.9189 - acc: 0.9875 - val_loss: 0.9804 - val_acc: 0.9553
Epoch 8/40
 - 1s - loss: 0.5833 - acc: 0.9924 - val_loss: 0.7425 - val_acc: 0.9539
Epoch 9/40
```

```
           - 1s - loss: 0.4200 - acc: 0.9839 - val_loss: 0.6252 - val_acc: 0.9366
Epoch 10/40
           - 1s - loss: 0.3159 - acc: 0.9903 - val_loss: 0.5192 - val_acc: 0.9603
Epoch 11/40
           - 1s - loss: 0.2496 - acc: 0.9945 - val_loss: 0.4941 - val_acc: 0.9387
Epoch 12/40
           - 1s - loss: 0.2148 - acc: 0.9936 - val_loss: 0.4322 - val_acc: 0.9647
Epoch 13/40
           - 1s - loss: 0.1983 - acc: 0.9912 - val_loss: 0.4186 - val_acc: 0.9524
Epoch 14/40
           - 1s - loss: 0.1892 - acc: 0.9896 - val_loss: 0.4008 - val_acc: 0.9380
Epoch 15/40
           - 1s - loss: 0.1714 - acc: 0.9942 - val_loss: 0.3835 - val_acc: 0.9488
Epoch 16/40
           - 1s - loss: 0.1507 - acc: 0.9982 - val_loss: 0.3626 - val_acc: 0.9553
Epoch 17/40
           - 1s - loss: 0.1545 - acc: 0.9930 - val_loss: 0.3534 - val_acc: 0.9553
Epoch 18/40
           - 1s - loss: 0.1433 - acc: 0.9957 - val_loss: 0.3508 - val_acc: 0.9560
Epoch 19/40
           - 1s - loss: 0.1315 - acc: 0.9976 - val_loss: 0.3222 - val_acc: 0.9618
Epoch 20/40
           - 1s - loss: 0.1260 - acc: 0.9976 - val_loss: 0.3344 - val_acc: 0.9546
Epoch 21/40
           - 1s - loss: 0.1376 - acc: 0.9921 - val_loss: 0.3354 - val_acc: 0.9531
Epoch 22/40
           - 1s - loss: 0.1267 - acc: 0.9951 - val_loss: 0.3111 - val_acc: 0.9625
Epoch 23/40
           - 1s - loss: 0.1246 - acc: 0.9951 - val_loss: 0.3039 - val_acc: 0.9596
Epoch 24/40
           - 1s - loss: 0.1277 - acc: 0.9927 - val_loss: 0.3375 - val_acc: 0.9243
Epoch 25/40
           - 1s - loss: 0.1344 - acc: 0.9927 - val_loss: 0.2861 - val_acc: 0.9704
Epoch 26/40
           - 1s - loss: 0.1115 - acc: 0.9976 - val_loss: 0.2918 - val_acc: 0.9625
Epoch 27/40
           - 1s - loss: 0.1025 - acc: 0.9985 - val_loss: 0.2790 - val_acc: 0.9676
Epoch 28/40
           - 1s - loss: 0.0999 - acc: 0.9991 - val_loss: 0.2858 - val_acc: 0.9683
Epoch 29/40
           - 1s - loss: 0.1320 - acc: 0.9860 - val_loss: 0.2688 - val_acc: 0.9567
Epoch 30/40
           - 1s - loss: 0.1075 - acc: 0.9960 - val_loss: 0.2536 - val_acc: 0.9704
```

```
Epoch 31/40
 - 1s - loss: 0.0993 - acc: 0.9979 - val_loss: 0.2493 - val_acc: 0.9719
Epoch 32/40
 - 1s - loss: 0.1262 - acc: 0.9854 - val_loss: 0.3293 - val_acc: 0.9207
Epoch 33/40
 - 1s - loss: 0.1178 - acc: 0.9936 - val_loss: 0.2989 - val_acc: 0.9387
Epoch 34/40
 - 1s - loss: 0.1031 - acc: 0.9957 - val_loss: 0.2575 - val_acc: 0.9668
Epoch 35/40
 - 1s - loss: 0.0889 - acc: 0.9976 - val_loss: 0.2480 - val_acc: 0.9676
Epoch 36/40
 - 1s - loss: 0.0866 - acc: 0.9997 - val_loss: 0.2586 - val_acc: 0.9603
Epoch 37/40
 - 1s - loss: 0.0977 - acc: 0.9942 - val_loss: 0.2555 - val_acc: 0.9625
Epoch 38/40
 - 1s - loss: 0.0868 - acc: 0.9994 - val_loss: 0.2341 - val_acc: 0.9719
Epoch 39/40
 - 1s - loss: 0.0825 - acc: 0.9994 - val_loss: 0.2262 - val_acc: 0.9733
Epoch 40/40
 - 1s - loss: 0.0812 - acc: 0.9982 - val_loss: 0.2445 - val_acc: 0.9603
Train accuracy 0.9990867579908675 Test accuracy: 0.9603460706560922
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 16)	3600
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 16)	0
flatten_1 (Flatten)	(None, 368)	0
dense_1 (Dense)	(None, 16)	5904
dense_2 (Dense)	(None, 3)	51

```
Total params: 11,603
Trainable params: 11,603
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 49.9272 - acc: 0.4094 - val_loss: 20.7428 - val_acc: 0.5386
Epoch 2/35
 - 1s - loss: 10.1104 - acc: 0.7598 - val_loss: 3.9770 - val_acc: 0.8832
Epoch 3/35
 - 1s - loss: 1.7959 - acc: 0.9556 - val_loss: 1.0558 - val_acc: 0.9142
Epoch 4/35
 - 1s - loss: 0.5014 - acc: 0.9732 - val_loss: 0.6415 - val_acc: 0.9236
Epoch 5/35
 - 1s - loss: 0.2948 - acc: 0.9854 - val_loss: 0.5471 - val_acc: 0.9423
Epoch 6/35
 - 1s - loss: 0.2485 - acc: 0.9851 - val_loss: 0.5157 - val_acc: 0.9452
Epoch 7/35
 - 1s - loss: 0.2257 - acc: 0.9857 - val_loss: 0.5077 - val_acc: 0.9077
Epoch 8/35
 - 1s - loss: 0.2126 - acc: 0.9823 - val_loss: 0.4304 - val_acc: 0.9603
Epoch 9/35
 - 1s - loss: 0.1860 - acc: 0.9887 - val_loss: 0.4385 - val_acc: 0.9257
Epoch 10/35
 - 1s - loss: 0.2331 - acc: 0.9760 - val_loss: 0.4543 - val_acc: 0.9164
Epoch 11/35
 - 1s - loss: 0.1769 - acc: 0.9887 - val_loss: 0.4008 - val_acc: 0.9481
Epoch 12/35
 - 1s - loss: 0.1929 - acc: 0.9820 - val_loss: 0.3687 - val_acc: 0.9524
Epoch 13/35
 - 1s - loss: 0.1643 - acc: 0.9875 - val_loss: 0.3865 - val_acc: 0.9423
Epoch 14/35
 - 1s - loss: 0.1385 - acc: 0.9942 - val_loss: 0.3583 - val_acc: 0.9481
Epoch 15/35
 - 1s - loss: 0.1447 - acc: 0.9912 - val_loss: 0.3463 - val_acc: 0.9611
Epoch 16/35
 - 1s - loss: 0.1692 - acc: 0.9836 - val_loss: 0.3394 - val_acc: 0.9647
Epoch 17/35
 - 1s - loss: 0.1712 - acc: 0.9845 - val_loss: 0.3449 - val_acc: 0.9596
Epoch 18/35
 - 1s - loss: 0.1509 - acc: 0.9890 - val_loss: 0.3523 - val_acc: 0.9553
Epoch 19/35
 - 1s - loss: 0.1440 - acc: 0.9881 - val_loss: 0.2919 - val_acc: 0.9877
Epoch 20/35
 - 1s - loss: 0.1186 - acc: 0.9963 - val_loss: 0.3095 - val_acc: 0.9575
Epoch 21/35
```

```
        - 1s - loss: 0.1555 - acc: 0.9848 - val_loss: 0.3323 - val_acc: 0.9567
Epoch 22/35
        - 1s - loss: 0.1087 - acc: 0.9970 - val_loss: 0.3030 - val_acc: 0.9719
Epoch 23/35
        - 1s - loss: 0.1475 - acc: 0.9860 - val_loss: 0.3152 - val_acc: 0.9531
Epoch 24/35
        - 1s - loss: 0.1861 - acc: 0.9790 - val_loss: 0.3033 - val_acc: 0.9582
Epoch 25/35
        - 1s - loss: 0.1333 - acc: 0.9851 - val_loss: 0.3348 - val_acc: 0.9495
Epoch 26/35
        - 1s - loss: 0.1736 - acc: 0.9826 - val_loss: 0.3213 - val_acc: 0.9567
Epoch 27/35
        - 1s - loss: 0.1051 - acc: 0.9945 - val_loss: 0.2816 - val_acc: 0.9784
Epoch 28/35
        - 1s - loss: 0.1037 - acc: 0.9957 - val_loss: 0.3041 - val_acc: 0.9445
Epoch 29/35
        - 1s - loss: 0.1147 - acc: 0.9918 - val_loss: 0.2707 - val_acc: 0.9733
Epoch 30/35
        - 1s - loss: 0.1197 - acc: 0.9915 - val_loss: 0.2486 - val_acc: 0.9726
Epoch 31/35
        - 1s - loss: 0.0895 - acc: 0.9970 - val_loss: 0.2463 - val_acc: 0.9776
Epoch 32/35
        - 1s - loss: 0.1253 - acc: 0.9863 - val_loss: 0.2742 - val_acc: 0.9517
Epoch 33/35
        - 1s - loss: 0.1093 - acc: 0.9918 - val_loss: 0.3344 - val_acc: 0.9387
Epoch 34/35
        - 1s - loss: 0.2112 - acc: 0.9766 - val_loss: 0.2539 - val_acc: 0.9704
Epoch 35/35
        - 1s - loss: 0.1013 - acc: 0.9960 - val_loss: 0.2499 - val_acc: 0.9762
Train accuracy 0.9990867579908675 Test accuracy: 0.9762076423936553
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 118, 32)	4512
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 59, 32)	0
flatten_1 (Flatten)	(None, 1888)	0

```
_____
dense_1 (Dense)                  (None, 16)                    30224
_____
dense_2 (Dense)                  (None, 3)                      51
================================================================
Total params: 36,579
Trainable params: 36,579
Non-trainable params: 0

_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 19.5358 - acc: 0.3799 - val_loss: 1.8626 - val_acc: 0.4629
Epoch 2/55
 - 2s - loss: 1.0296 - acc: 0.6170 - val_loss: 0.7845 - val_acc: 0.8147
Epoch 3/55
 - 2s - loss: 0.5333 - acc: 0.8895 - val_loss: 0.9670 - val_acc: 0.6864
Epoch 4/55
 - 2s - loss: 0.4538 - acc: 0.9199 - val_loss: 0.5835 - val_acc: 0.8486
Epoch 5/55
 - 2s - loss: 0.4003 - acc: 0.9336 - val_loss: 0.6024 - val_acc: 0.8673
Epoch 6/55
 - 2s - loss: 0.3606 - acc: 0.9473 - val_loss: 0.5956 - val_acc: 0.8688
Epoch 7/55
 - 2s - loss: 0.3238 - acc: 0.9595 - val_loss: 0.5001 - val_acc: 0.8616
Epoch 8/55
 - 2s - loss: 0.3353 - acc: 0.9440 - val_loss: 0.5423 - val_acc: 0.8911
Epoch 9/55
 - 2s - loss: 0.2950 - acc: 0.9619 - val_loss: 0.5656 - val_acc: 0.8558
Epoch 10/55
 - 2s - loss: 0.3091 - acc: 0.9571 - val_loss: 0.4094 - val_acc: 0.9041
Epoch 11/55
 - 2s - loss: 0.2954 - acc: 0.9595 - val_loss: 0.4167 - val_acc: 0.9005
Epoch 12/55
 - 2s - loss: 0.2550 - acc: 0.9686 - val_loss: 0.8916 - val_acc: 0.6402
Epoch 13/55
 - 2s - loss: 0.2943 - acc: 0.9540 - val_loss: 0.4595 - val_acc: 0.9207
Epoch 14/55
 - 2s - loss: 0.2450 - acc: 0.9735 - val_loss: 0.4925 - val_acc: 0.8940
Epoch 15/55
 - 2s - loss: 0.2795 - acc: 0.9568 - val_loss: 0.3741 - val_acc: 0.9128
Epoch 16/55
 - 2s - loss: 0.2550 - acc: 0.9635 - val_loss: 0.4501 - val_acc: 0.8875
```

```
Epoch 17/55
 - 2s - loss: 0.2708 - acc: 0.9604 - val_loss: 0.4031 - val_acc: 0.8955
Epoch 18/55
 - 2s - loss: 0.2060 - acc: 0.9799 - val_loss: 0.3848 - val_acc: 0.8911
Epoch 19/55
 - 2s - loss: 0.2641 - acc: 0.9626 - val_loss: 0.4675 - val_acc: 0.8580
Epoch 20/55
 - 2s - loss: 0.2320 - acc: 0.9683 - val_loss: 0.6059 - val_acc: 0.8882
Epoch 21/55
 - 2s - loss: 0.2413 - acc: 0.9656 - val_loss: 0.3524 - val_acc: 0.9272
Epoch 22/55
 - 2s - loss: 0.2138 - acc: 0.9747 - val_loss: 0.4796 - val_acc: 0.9019
Epoch 23/55
 - 2s - loss: 0.2381 - acc: 0.9656 - val_loss: 0.3494 - val_acc: 0.9337
Epoch 24/55
 - 2s - loss: 0.2135 - acc: 0.9726 - val_loss: 0.4656 - val_acc: 0.8904
Epoch 25/55
 - 2s - loss: 0.2128 - acc: 0.9744 - val_loss: 0.3173 - val_acc: 0.9380
Epoch 26/55
 - 2s - loss: 0.2481 - acc: 0.9629 - val_loss: 0.4904 - val_acc: 0.8630
Epoch 27/55
 - 2s - loss: 0.2069 - acc: 0.9747 - val_loss: 0.4553 - val_acc: 0.9128
Epoch 28/55
 - 2s - loss: 0.2423 - acc: 0.9629 - val_loss: 0.3879 - val_acc: 0.9257
Epoch 29/55
 - 2s - loss: 0.2608 - acc: 0.9583 - val_loss: 0.3438 - val_acc: 0.9279
Epoch 30/55
 - 2s - loss: 0.2052 - acc: 0.9735 - val_loss: 0.4025 - val_acc: 0.9012
Epoch 31/55
 - 2s - loss: 0.2243 - acc: 0.9641 - val_loss: 0.3928 - val_acc: 0.9077
Epoch 32/55
 - 2s - loss: 0.2665 - acc: 0.9571 - val_loss: 0.4382 - val_acc: 0.8976
Epoch 33/55
 - 2s - loss: 0.2097 - acc: 0.9799 - val_loss: 0.3907 - val_acc: 0.8911
Epoch 34/55
 - 2s - loss: 0.1692 - acc: 0.9811 - val_loss: 0.4120 - val_acc: 0.9048
Epoch 35/55
 - 2s - loss: 0.2577 - acc: 0.9604 - val_loss: 0.4248 - val_acc: 0.9099
Epoch 36/55
 - 2s - loss: 0.2214 - acc: 0.9750 - val_loss: 0.4099 - val_acc: 0.9034
Epoch 37/55
 - 2s - loss: 0.1885 - acc: 0.9830 - val_loss: 0.3188 - val_acc: 0.9416
Epoch 38/55
```

```
                   - 2s - loss: 0.2078 - acc: 0.9717 - val_loss: 0.3687 - val_acc: 0.8868
          Epoch 39/55
                   - 2s - loss: 0.2183 - acc: 0.9735 - val_loss: 0.3494 - val_acc: 0.9344
          Epoch 40/55
                   - 2s - loss: 0.1721 - acc: 0.9820 - val_loss: 0.3360 - val_acc: 0.9257
          Epoch 41/55
                   - 2s - loss: 0.1719 - acc: 0.9817 - val_loss: 0.4524 - val_acc: 0.9041
          Epoch 42/55
                   - 2s - loss: 0.1797 - acc: 0.9793 - val_loss: 0.2934 - val_acc: 0.9373
          Epoch 43/55
                   - 2s - loss: 0.1622 - acc: 0.9845 - val_loss: 0.4720 - val_acc: 0.8587
          Epoch 44/55
                   - 2s - loss: 0.2028 - acc: 0.9750 - val_loss: 0.3956 - val_acc: 0.9315
          Epoch 45/55
                   - 2s - loss: 0.2426 - acc: 0.9686 - val_loss: 0.3383 - val_acc: 0.9366
          Epoch 46/55
                   - 2s - loss: 0.1413 - acc: 0.9878 - val_loss: 0.4053 - val_acc: 0.9027
          Epoch 47/55
                   - 2s - loss: 0.1708 - acc: 0.9808 - val_loss: 0.3622 - val_acc: 0.9128
          Epoch 48/55
                   - 2s - loss: 0.1654 - acc: 0.9787 - val_loss: 0.4360 - val_acc: 0.8955
          Epoch 49/55
                   - 2s - loss: 0.2318 - acc: 0.9693 - val_loss: 0.3967 - val_acc: 0.9171
          Epoch 50/55
                   - 2s - loss: 0.1435 - acc: 0.9872 - val_loss: 0.2914 - val_acc: 0.9351
          Epoch 51/55
                   - 2s - loss: 0.1467 - acc: 0.9848 - val_loss: 0.2997 - val_acc: 0.9394
          Epoch 52/55
                   - 2s - loss: 0.1824 - acc: 0.9760 - val_loss: 0.4233 - val_acc: 0.8991
          Epoch 53/55
                   - 2s - loss: 0.2113 - acc: 0.9702 - val_loss: 0.3128 - val_acc: 0.9366
          Epoch 54/55
                   - 2s - loss: 0.1397 - acc: 0.9878 - val_loss: 0.5185 - val_acc: 0.9084
          Epoch 55/55
                   - 2s - loss: 0.1291 - acc: 0.9881 - val_loss: 0.3796 - val_acc: 0.9092
          Train accuracy 0.9823439878234399 Test accuracy: 0.9091564527757751
          --------------------------------------------------------------------------------

          _____
          Layer (type)                 Output Shape              Param #
          ===========================================================
          conv1d_1 (Conv1D)            (None, 126, 32)           896
          _____
          conv1d_2 (Conv1D)            (None, 120, 32)           7200
```

```
_____
dropout_1 (Dropout)          (None, 120, 32)            0
_____
max_pooling1d_1 (MaxPooling1 (None, 24, 32)             0
_____
flatten_1 (Flatten)          (None, 768)                0
_____
dense_1 (Dense)              (None, 16)                 12304
_____
dense_2 (Dense)              (None, 3)                  51
=================================================================
Total params: 20,451
Trainable params: 20,451
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 3s - loss: 39.9318 - acc: 0.5075 - val_loss: 14.2388 - val_acc: 0.5451
Epoch 2/35
 - 2s - loss: 8.1567 - acc: 0.7994 - val_loss: 4.7972 - val_acc: 0.7945
Epoch 3/35
 - 2s - loss: 2.9674 - acc: 0.9224 - val_loss: 2.1537 - val_acc: 0.8248
Epoch 4/35
 - 2s - loss: 1.2865 - acc: 0.9489 - val_loss: 1.1917 - val_acc: 0.8983
Epoch 5/35
 - 2s - loss: 0.7030 - acc: 0.9504 - val_loss: 0.8658 - val_acc: 0.8818
Epoch 6/35
 - 2s - loss: 0.4736 - acc: 0.9644 - val_loss: 0.7227 - val_acc: 0.8825
Epoch 7/35
 - 2s - loss: 0.4091 - acc: 0.9619 - val_loss: 0.6452 - val_acc: 0.9329
Epoch 8/35
 - 2s - loss: 0.3748 - acc: 0.9626 - val_loss: 0.6806 - val_acc: 0.8277
Epoch 9/35
 - 2s - loss: 0.3535 - acc: 0.9674 - val_loss: 0.5845 - val_acc: 0.9279
Epoch 10/35
 - 2s - loss: 0.3225 - acc: 0.9744 - val_loss: 0.6290 - val_acc: 0.8414
Epoch 11/35
 - 2s - loss: 0.2989 - acc: 0.9732 - val_loss: 0.5835 - val_acc: 0.9005
Epoch 12/35
 - 2s - loss: 0.2882 - acc: 0.9778 - val_loss: 0.5502 - val_acc: 0.8868
Epoch 13/35
 - 2s - loss: 0.2669 - acc: 0.9826 - val_loss: 0.5099 - val_acc: 0.9229
```

```
Epoch 14/35
 - 2s - loss: 0.2432 - acc: 0.9869 - val_loss: 0.4735 - val_acc: 0.9452
Epoch 15/35
 - 2s - loss: 0.2572 - acc: 0.9775 - val_loss: 0.5402 - val_acc: 0.9142
Epoch 16/35
 - 2s - loss: 0.2432 - acc: 0.9878 - val_loss: 0.5616 - val_acc: 0.8169
Epoch 17/35
 - 2s - loss: 0.2312 - acc: 0.9839 - val_loss: 0.4245 - val_acc: 0.9409
Epoch 18/35
 - 2s - loss: 0.2066 - acc: 0.9896 - val_loss: 0.4191 - val_acc: 0.9466
Epoch 19/35
 - 2s - loss: 0.1989 - acc: 0.9903 - val_loss: 0.4569 - val_acc: 0.9056
Epoch 20/35
 - 2s - loss: 0.1909 - acc: 0.9909 - val_loss: 0.3871 - val_acc: 0.9618
Epoch 21/35
 - 2s - loss: 0.1835 - acc: 0.9903 - val_loss: 0.3966 - val_acc: 0.9416
Epoch 22/35
 - 2s - loss: 0.1995 - acc: 0.9851 - val_loss: 0.3919 - val_acc: 0.9438
Epoch 23/35
 - 2s - loss: 0.1703 - acc: 0.9927 - val_loss: 0.3549 - val_acc: 0.9676
Epoch 24/35
 - 2s - loss: 0.1770 - acc: 0.9903 - val_loss: 0.3598 - val_acc: 0.9539
Epoch 25/35
 - 2s - loss: 0.1614 - acc: 0.9927 - val_loss: 0.3635 - val_acc: 0.9488
Epoch 26/35
 - 2s - loss: 0.1782 - acc: 0.9875 - val_loss: 0.3761 - val_acc: 0.9373
Epoch 27/35
 - 2s - loss: 0.1811 - acc: 0.9866 - val_loss: 0.3099 - val_acc: 0.9676
Epoch 28/35
 - 2s - loss: 0.1793 - acc: 0.9857 - val_loss: 0.3599 - val_acc: 0.9445
Epoch 29/35
 - 2s - loss: 0.1533 - acc: 0.9918 - val_loss: 0.4931 - val_acc: 0.8839
Epoch 30/35
 - 2s - loss: 0.1569 - acc: 0.9912 - val_loss: 0.3236 - val_acc: 0.9575
Epoch 31/35
 - 2s - loss: 0.1343 - acc: 0.9960 - val_loss: 0.3462 - val_acc: 0.9394
Epoch 32/35
 - 2s - loss: 0.1633 - acc: 0.9863 - val_loss: 0.3575 - val_acc: 0.9531
Epoch 33/35
 - 2s - loss: 0.1436 - acc: 0.9936 - val_loss: 0.3230 - val_acc: 0.9503
Epoch 34/35
 - 2s - loss: 0.2067 - acc: 0.9747 - val_loss: 0.3447 - val_acc: 0.9625
Epoch 35/35
```

```
  - 2s - loss: 0.1447 - acc: 0.9936 - val_loss: 0.3152 - val_acc: 0.9719
Train accuracy 1.0 Test accuracy: 0.9718817591925017
------------------------------------------------------------------------------

_____
Layer (type)                  Output Shape              Param #
===============================================================
conv1d_1 (Conv1D)             (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)             (None, 116, 24)           5400
_____
dropout_1 (Dropout)           (None, 116, 24)           0
_____
max_pooling1d_1 (MaxPooling1  (None, 38, 24)            0
_____
flatten_1 (Flatten)           (None, 912)               0
_____
dense_1 (Dense)               (None, 16)                14608
_____
dense_2 (Dense)               (None, 3)                 51
===============================================================
Total params: 22,107
Trainable params: 22,107
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 75.2065 - acc: 0.4469 - val_loss: 41.6089 - val_acc: 0.5083
Epoch 2/55
 - 2s - loss: 25.3413 - acc: 0.6131 - val_loss: 13.8350 - val_acc: 0.6489
Epoch 3/55
 - 2s - loss: 8.1672 - acc: 0.8612 - val_loss: 4.4951 - val_acc: 0.8681
Epoch 4/55
 - 2s - loss: 2.5159 - acc: 0.9537 - val_loss: 1.6027 - val_acc: 0.9358
Epoch 5/55
 - 2s - loss: 0.8729 - acc: 0.9677 - val_loss: 0.8342 - val_acc: 0.9106
Epoch 6/55
 - 2s - loss: 0.4527 - acc: 0.9696 - val_loss: 0.6095 - val_acc: 0.9366
Epoch 7/55
 - 2s - loss: 0.3111 - acc: 0.9860 - val_loss: 0.5261 - val_acc: 0.9308
Epoch 8/55
 - 2s - loss: 0.2712 - acc: 0.9860 - val_loss: 0.5232 - val_acc: 0.9106
Epoch 9/55
```

```
           - 2s - loss: 0.2479 - acc: 0.9854 - val_loss: 0.4469 - val_acc: 0.9445
         Epoch 10/55
           - 2s - loss: 0.2362 - acc: 0.9826 - val_loss: 0.5294 - val_acc: 0.8782
         Epoch 11/55
           - 2s - loss: 0.2169 - acc: 0.9863 - val_loss: 0.4324 - val_acc: 0.9546
         Epoch 12/55
           - 2s - loss: 0.2171 - acc: 0.9833 - val_loss: 0.4089 - val_acc: 0.9582
         Epoch 13/55
           - 2s - loss: 0.1875 - acc: 0.9909 - val_loss: 0.4325 - val_acc: 0.9221
         Epoch 14/55
           - 2s - loss: 0.1856 - acc: 0.9878 - val_loss: 0.4396 - val_acc: 0.9077
         Epoch 15/55
           - 2s - loss: 0.1937 - acc: 0.9857 - val_loss: 0.3662 - val_acc: 0.9546
         Epoch 16/55
           - 2s - loss: 0.1743 - acc: 0.9878 - val_loss: 0.3499 - val_acc: 0.9567
         Epoch 17/55
           - 2s - loss: 0.1660 - acc: 0.9912 - val_loss: 0.3319 - val_acc: 0.9640
         Epoch 18/55
           - 2s - loss: 0.1499 - acc: 0.9918 - val_loss: 0.3821 - val_acc: 0.9214
         Epoch 19/55
           - 2s - loss: 0.1782 - acc: 0.9826 - val_loss: 0.3086 - val_acc: 0.9798
         Epoch 20/55
           - 2s - loss: 0.1477 - acc: 0.9927 - val_loss: 0.3352 - val_acc: 0.9387
         Epoch 21/55
           - 2s - loss: 0.1426 - acc: 0.9921 - val_loss: 0.3320 - val_acc: 0.9488
         Epoch 22/55
           - 2s - loss: 0.1560 - acc: 0.9869 - val_loss: 0.3335 - val_acc: 0.9402
         Epoch 23/55
           - 2s - loss: 0.1614 - acc: 0.9836 - val_loss: 0.2969 - val_acc: 0.9510
         Epoch 24/55
           - 2s - loss: 0.1488 - acc: 0.9875 - val_loss: 0.3378 - val_acc: 0.9257
         Epoch 25/55
           - 2s - loss: 0.1594 - acc: 0.9860 - val_loss: 0.3266 - val_acc: 0.9495
         Epoch 26/55
           - 2s - loss: 0.1650 - acc: 0.9839 - val_loss: 0.3295 - val_acc: 0.9243
         Epoch 27/55
           - 2s - loss: 0.1577 - acc: 0.9805 - val_loss: 0.3043 - val_acc: 0.9632
         Epoch 28/55
           - 2s - loss: 0.1469 - acc: 0.9915 - val_loss: 0.2842 - val_acc: 0.9647
         Epoch 29/55
           - 2s - loss: 0.1165 - acc: 0.9945 - val_loss: 0.2883 - val_acc: 0.9546
         Epoch 30/55
           - 2s - loss: 0.1270 - acc: 0.9921 - val_loss: 0.2611 - val_acc: 0.9640
```

```
Epoch 31/55
 - 2s - loss: 0.1081 - acc: 0.9963 - val_loss: 0.2516 - val_acc: 0.9654
Epoch 32/55
 - 2s - loss: 0.1611 - acc: 0.9781 - val_loss: 0.3549 - val_acc: 0.9099
Epoch 33/55
 - 2s - loss: 0.1171 - acc: 0.9936 - val_loss: 0.3083 - val_acc: 0.9272
Epoch 34/55
 - 2s - loss: 0.1477 - acc: 0.9863 - val_loss: 0.2706 - val_acc: 0.9560
Epoch 35/55
 - 2s - loss: 0.1137 - acc: 0.9939 - val_loss: 0.2498 - val_acc: 0.9690
Epoch 36/55
 - 2s - loss: 0.1007 - acc: 0.9963 - val_loss: 0.2597 - val_acc: 0.9524
Epoch 37/55
 - 2s - loss: 0.1088 - acc: 0.9915 - val_loss: 0.2581 - val_acc: 0.9416
Epoch 38/55
 - 2s - loss: 0.1374 - acc: 0.9869 - val_loss: 0.2853 - val_acc: 0.9380
Epoch 39/55
 - 2s - loss: 0.1458 - acc: 0.9796 - val_loss: 0.4076 - val_acc: 0.8861
Epoch 40/55
 - 2s - loss: 0.1359 - acc: 0.9906 - val_loss: 0.2528 - val_acc: 0.9640
Epoch 41/55
 - 2s - loss: 0.0930 - acc: 0.9963 - val_loss: 0.2688 - val_acc: 0.9539
Epoch 42/55
 - 1s - loss: 0.1632 - acc: 0.9741 - val_loss: 0.3988 - val_acc: 0.9445
Epoch 43/55
 - 2s - loss: 0.1665 - acc: 0.9866 - val_loss: 0.2538 - val_acc: 0.9697
Epoch 44/55
 - 2s - loss: 0.0977 - acc: 0.9960 - val_loss: 0.2397 - val_acc: 0.9748
Epoch 45/55
 - 2s - loss: 0.0929 - acc: 0.9970 - val_loss: 0.2832 - val_acc: 0.9366
Epoch 46/55
 - 1s - loss: 0.1078 - acc: 0.9918 - val_loss: 0.3236 - val_acc: 0.9185
Epoch 47/55
 - 2s - loss: 0.1023 - acc: 0.9924 - val_loss: 0.2288 - val_acc: 0.9690
Epoch 48/55
 - 2s - loss: 0.1225 - acc: 0.9872 - val_loss: 0.2600 - val_acc: 0.9683
Epoch 49/55
 - 2s - loss: 0.1073 - acc: 0.9945 - val_loss: 0.2595 - val_acc: 0.9676
Epoch 50/55
 - 2s - loss: 0.1503 - acc: 0.9793 - val_loss: 0.3501 - val_acc: 0.9128
Epoch 51/55
 - 1s - loss: 0.1021 - acc: 0.9967 - val_loss: 0.2480 - val_acc: 0.9640
Epoch 52/55
```

```
  - 2s - loss: 0.0791 - acc: 0.9976 - val_loss: 0.2473 - val_acc: 0.9618
Epoch 53/55
  - 1s - loss: 0.0878 - acc: 0.9930 - val_loss: 0.1963 - val_acc: 0.9755
Epoch 54/55
  - 1s - loss: 0.0896 - acc: 0.9960 - val_loss: 0.2208 - val_acc: 0.9697
Epoch 55/55
  - 2s - loss: 0.1051 - acc: 0.9903 - val_loss: 0.2129 - val_acc: 0.9632
Train accuracy 0.9993911719939117 Test accuracy: 0.9632299927901946
----------------------------------------------------------------------------
```

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_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 120, 32)           3104

dropout_1 (Dropout)          (None, 120, 32)           0

max_pooling1d_1 (MaxPooling1 (None, 24, 32)            0

flatten_1 (Flatten)          (None, 768)               0

dense_1 (Dense)              (None, 16)                12304

dense_2 (Dense)              (None, 3)                 51
=================================================================
Total params: 17,507
Trainable params: 17,507
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
  - 2s - loss: 61.4919 - acc: 0.4606 - val_loss: 16.4711 - val_acc: 0.4059
Epoch 2/35
  - 1s - loss: 5.7178 - acc: 0.5872 - val_loss: 1.3135 - val_acc: 0.6078
Epoch 3/35
  - 1s - loss: 0.8733 - acc: 0.7519 - val_loss: 1.0984 - val_acc: 0.5350
Epoch 4/35
  - 1s - loss: 0.7006 - acc: 0.8033 - val_loss: 0.8056 - val_acc: 0.7844
Epoch 5/35
  - 1s - loss: 0.6219 - acc: 0.8435 - val_loss: 0.7070 - val_acc: 0.8976
Epoch 6/35
```

```
          - 1s - loss: 0.5731 - acc: 0.8630 - val_loss: 0.7974 - val_acc: 0.7859
        Epoch 7/35
          - 1s - loss: 0.5244 - acc: 0.8865 - val_loss: 0.8215 - val_acc: 0.6691
        Epoch 8/35
          - 1s - loss: 0.4982 - acc: 0.8989 - val_loss: 0.6755 - val_acc: 0.8392
        Epoch 9/35
          - 1s - loss: 0.5044 - acc: 0.8925 - val_loss: 0.6529 - val_acc: 0.8709
        Epoch 10/35
          - 1s - loss: 0.4666 - acc: 0.8998 - val_loss: 0.8604 - val_acc: 0.6720
        Epoch 11/35
          - 1s - loss: 0.4912 - acc: 0.8925 - val_loss: 0.7170 - val_acc: 0.8154
        Epoch 12/35
          - 1s - loss: 0.4610 - acc: 0.9081 - val_loss: 0.6197 - val_acc: 0.8032
        Epoch 13/35
          - 1s - loss: 0.4677 - acc: 0.8971 - val_loss: 0.7363 - val_acc: 0.7404
        Epoch 14/35
          - 1s - loss: 0.4452 - acc: 0.9120 - val_loss: 0.5767 - val_acc: 0.8890
        Epoch 15/35
          - 1s - loss: 0.4566 - acc: 0.9056 - val_loss: 0.5787 - val_acc: 0.8861
        Epoch 16/35
          - 1s - loss: 0.4208 - acc: 0.9151 - val_loss: 0.8008 - val_acc: 0.7304
        Epoch 17/35
          - 1s - loss: 0.4161 - acc: 0.9139 - val_loss: 0.6994 - val_acc: 0.7549
        Epoch 18/35
          - 1s - loss: 0.4314 - acc: 0.9142 - val_loss: 0.8145 - val_acc: 0.7116
        Epoch 19/35
          - 1s - loss: 0.4175 - acc: 0.9178 - val_loss: 0.6752 - val_acc: 0.8255
        Epoch 20/35
          - 1s - loss: 0.4182 - acc: 0.9224 - val_loss: 0.5501 - val_acc: 0.8745
        Epoch 21/35
          - 1s - loss: 0.4133 - acc: 0.9187 - val_loss: 0.6178 - val_acc: 0.8284
        Epoch 22/35
          - 1s - loss: 0.4188 - acc: 0.9181 - val_loss: 0.7475 - val_acc: 0.8032
        Epoch 23/35
          - 1s - loss: 0.3797 - acc: 0.9318 - val_loss: 0.6183 - val_acc: 0.8760
        Epoch 24/35
          - 1s - loss: 0.3891 - acc: 0.9309 - val_loss: 0.5774 - val_acc: 0.8717
        Epoch 25/35
          - 1s - loss: 0.4003 - acc: 0.9288 - val_loss: 0.6413 - val_acc: 0.8457
        Epoch 26/35
          - 1s - loss: 0.3730 - acc: 0.9409 - val_loss: 0.5568 - val_acc: 0.8601
        Epoch 27/35
          - 1s - loss: 0.3906 - acc: 0.9321 - val_loss: 0.6088 - val_acc: 0.8457
```

```
Epoch 28/35
 - 1s - loss: 0.3661 - acc: 0.9364 - val_loss: 0.4532 - val_acc: 0.9229
Epoch 29/35
 - 1s - loss: 0.3839 - acc: 0.9406 - val_loss: 0.6615 - val_acc: 0.8147
Epoch 30/35
 - 1s - loss: 0.3905 - acc: 0.9342 - val_loss: 0.4304 - val_acc: 0.8998
Epoch 31/35
 - 1s - loss: 0.3816 - acc: 0.9376 - val_loss: 0.5036 - val_acc: 0.8637
Epoch 32/35
 - 1s - loss: 0.3510 - acc: 0.9412 - val_loss: 0.4889 - val_acc: 0.8652
Epoch 33/35
 - 1s - loss: 0.4204 - acc: 0.9233 - val_loss: 0.6419 - val_acc: 0.8111
Epoch 34/35
 - 1s - loss: 0.3452 - acc: 0.9394 - val_loss: 0.4686 - val_acc: 0.8897
Epoch 35/35
 - 1s - loss: 0.3964 - acc: 0.9346 - val_loss: 0.4617 - val_acc: 0.8947
Train accuracy 0.9875190258751902 Test accuracy: 0.8947368421052632
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 32)	7200
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 16)	11792
dense_2 (Dense)	(None, 3)	51

```
Total params: 20,515
Trainable params: 20,515
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 3s - loss: 64.8438 - acc: 0.4703 - val_loss: 29.3459 - val_acc: 0.5299
```

```
Epoch 2/40
 - 2s - loss: 16.7505 - acc: 0.7260 - val_loss: 8.7259 - val_acc: 0.7751
Epoch 3/40
 - 2s - loss: 5.0129 - acc: 0.9072 - val_loss: 2.9108 - val_acc: 0.8688
Epoch 4/40
 - 2s - loss: 1.6114 - acc: 0.9482 - val_loss: 1.2433 - val_acc: 0.9214
Epoch 5/40
 - 2s - loss: 0.6938 - acc: 0.9559 - val_loss: 0.8096 - val_acc: 0.9128
Epoch 6/40
 - 2s - loss: 0.4549 - acc: 0.9598 - val_loss: 0.6997 - val_acc: 0.9149
Epoch 7/40
 - 2s - loss: 0.3748 - acc: 0.9729 - val_loss: 0.6176 - val_acc: 0.9430
Epoch 8/40
 - 2s - loss: 0.3398 - acc: 0.9729 - val_loss: 0.5853 - val_acc: 0.9373
Epoch 9/40
 - 2s - loss: 0.2992 - acc: 0.9811 - val_loss: 0.5649 - val_acc: 0.9250
Epoch 10/40
 - 2s - loss: 0.2866 - acc: 0.9775 - val_loss: 0.5443 - val_acc: 0.9243
Epoch 11/40
 - 2s - loss: 0.2679 - acc: 0.9817 - val_loss: 0.5092 - val_acc: 0.9344
Epoch 12/40
 - 2s - loss: 0.2657 - acc: 0.9784 - val_loss: 0.5219 - val_acc: 0.8969
Epoch 13/40
 - 2s - loss: 0.2711 - acc: 0.9763 - val_loss: 0.4901 - val_acc: 0.9293
Epoch 14/40
 - 2s - loss: 0.2412 - acc: 0.9808 - val_loss: 0.4706 - val_acc: 0.9510
Epoch 15/40
 - 2s - loss: 0.2170 - acc: 0.9893 - val_loss: 0.4346 - val_acc: 0.9474
Epoch 16/40
 - 2s - loss: 0.2210 - acc: 0.9830 - val_loss: 0.4476 - val_acc: 0.9272
Epoch 17/40
 - 2s - loss: 0.2097 - acc: 0.9875 - val_loss: 0.3973 - val_acc: 0.9683
Epoch 18/40
 - 2s - loss: 0.1938 - acc: 0.9896 - val_loss: 0.4473 - val_acc: 0.9164
Epoch 19/40
 - 2s - loss: 0.2281 - acc: 0.9729 - val_loss: 0.3830 - val_acc: 0.9697
Epoch 20/40
 - 2s - loss: 0.2028 - acc: 0.9839 - val_loss: 0.4016 - val_acc: 0.9452
Epoch 21/40
 - 2s - loss: 0.1824 - acc: 0.9896 - val_loss: 0.3990 - val_acc: 0.9387
Epoch 22/40
 - 2s - loss: 0.1676 - acc: 0.9909 - val_loss: 0.4052 - val_acc: 0.9539
Epoch 23/40
```

```
     - 2s - loss: 0.1884 - acc: 0.9848 - val_loss: 0.4336 - val_acc: 0.9106
Epoch 24/40
     - 2s - loss: 0.1795 - acc: 0.9851 - val_loss: 0.3558 - val_acc: 0.9683
Epoch 25/40
     - 2s - loss: 0.1925 - acc: 0.9805 - val_loss: 0.3378 - val_acc: 0.9553
Epoch 26/40
     - 2s - loss: 0.1622 - acc: 0.9903 - val_loss: 0.3996 - val_acc: 0.9344
Epoch 27/40
     - 2s - loss: 0.1673 - acc: 0.9878 - val_loss: 0.3328 - val_acc: 0.9618
Epoch 28/40
     - 2s - loss: 0.1792 - acc: 0.9842 - val_loss: 0.3572 - val_acc: 0.9495
Epoch 29/40
     - 2s - loss: 0.1462 - acc: 0.9945 - val_loss: 0.3223 - val_acc: 0.9733
Epoch 30/40
     - 2s - loss: 0.1579 - acc: 0.9887 - val_loss: 0.3516 - val_acc: 0.9611
Epoch 31/40
     - 2s - loss: 0.1438 - acc: 0.9924 - val_loss: 0.3585 - val_acc: 0.9481
Epoch 32/40
     - 2s - loss: 0.2326 - acc: 0.9665 - val_loss: 0.3432 - val_acc: 0.9625
Epoch 33/40
     - 2s - loss: 0.1495 - acc: 0.9939 - val_loss: 0.3516 - val_acc: 0.9394
Epoch 34/40
     - 2s - loss: 0.1409 - acc: 0.9936 - val_loss: 0.3798 - val_acc: 0.9142
Epoch 35/40
     - 2s - loss: 0.1500 - acc: 0.9887 - val_loss: 0.3599 - val_acc: 0.9344
Epoch 36/40
     - 2s - loss: 0.1385 - acc: 0.9927 - val_loss: 0.3085 - val_acc: 0.9719
Epoch 37/40
     - 2s - loss: 0.1531 - acc: 0.9860 - val_loss: 0.3039 - val_acc: 0.9452
Epoch 38/40
     - 2s - loss: 0.1728 - acc: 0.9826 - val_loss: 0.2972 - val_acc: 0.9690
Epoch 39/40
     - 2s - loss: 0.1488 - acc: 0.9887 - val_loss: 0.3504 - val_acc: 0.9373
Epoch 40/40
     - 2s - loss: 0.1415 - acc: 0.9921 - val_loss: 0.4321 - val_acc: 0.8818
Train accuracy 0.9549467276039008 Test accuracy: 0.8817591925018025
-------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 116, 16)	4720

```
_____
dropout_1 (Dropout)            (None, 116, 16)              0
_____
max_pooling1d_1 (MaxPooling1 (None, 58, 16)               0
_____
flatten_1 (Flatten)            (None, 928)                  0
_____
dense_1 (Dense)                (None, 16)                   14864
_____
dense_2 (Dense)                (None, 3)                    51
======================================================
Total params: 22,323
Trainable params: 22,323
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 62.9197 - acc: 0.4417 - val_loss: 39.5653 - val_acc: 0.5451
Epoch 2/35
 - 1s - loss: 27.0813 - acc: 0.5833 - val_loss: 17.6876 - val_acc: 0.5667
Epoch 3/35
 - 1s - loss: 12.2107 - acc: 0.7683 - val_loss: 8.2120 - val_acc: 0.7837
Epoch 4/35
 - 1s - loss: 5.5473 - acc: 0.9139 - val_loss: 3.8797 - val_acc: 0.8486
Epoch 5/35
 - 1s - loss: 2.5166 - acc: 0.9586 - val_loss: 1.9514 - val_acc: 0.8724
Epoch 6/35
 - 1s - loss: 1.2029 - acc: 0.9726 - val_loss: 1.1020 - val_acc: 0.9019
Epoch 7/35
 - 1s - loss: 0.6543 - acc: 0.9772 - val_loss: 0.7415 - val_acc: 0.9156
Epoch 8/35
 - 1s - loss: 0.4357 - acc: 0.9830 - val_loss: 0.6167 - val_acc: 0.9041
Epoch 9/35
 - 1s - loss: 0.3436 - acc: 0.9851 - val_loss: 0.5313 - val_acc: 0.9207
Epoch 10/35
 - 1s - loss: 0.3028 - acc: 0.9851 - val_loss: 0.5531 - val_acc: 0.8652
Epoch 11/35
 - 1s - loss: 0.2687 - acc: 0.9887 - val_loss: 0.4706 - val_acc: 0.9337
Epoch 12/35
 - 1s - loss: 0.2597 - acc: 0.9851 - val_loss: 0.4340 - val_acc: 0.9459
Epoch 13/35
 - 1s - loss: 0.2394 - acc: 0.9890 - val_loss: 0.4380 - val_acc: 0.9416
```

```
Epoch 14/35
 - 1s - loss: 0.2281 - acc: 0.9875 - val_loss: 0.4145 - val_acc: 0.9531
Epoch 15/35
 - 1s - loss: 0.2214 - acc: 0.9878 - val_loss: 0.4177 - val_acc: 0.9229
Epoch 16/35
 - 1s - loss: 0.2206 - acc: 0.9848 - val_loss: 0.3495 - val_acc: 0.9676
Epoch 17/35
 - 1s - loss: 0.2111 - acc: 0.9866 - val_loss: 0.3731 - val_acc: 0.9337
Epoch 18/35
 - 1s - loss: 0.1937 - acc: 0.9912 - val_loss: 0.3845 - val_acc: 0.9207
Epoch 19/35
 - 1s - loss: 0.1942 - acc: 0.9890 - val_loss: 0.3383 - val_acc: 0.9539
Epoch 20/35
 - 1s - loss: 0.1877 - acc: 0.9942 - val_loss: 0.3387 - val_acc: 0.9531
Epoch 21/35
 - 1s - loss: 0.1713 - acc: 0.9933 - val_loss: 0.3491 - val_acc: 0.9481
Epoch 22/35
 - 1s - loss: 0.1719 - acc: 0.9915 - val_loss: 0.3439 - val_acc: 0.9445
Epoch 23/35
 - 1s - loss: 0.1705 - acc: 0.9912 - val_loss: 0.3120 - val_acc: 0.9712
Epoch 24/35
 - 1s - loss: 0.1756 - acc: 0.9896 - val_loss: 0.3856 - val_acc: 0.9027
Epoch 25/35
 - 1s - loss: 0.1732 - acc: 0.9896 - val_loss: 0.2932 - val_acc: 0.9618
Epoch 26/35
 - 1s - loss: 0.1746 - acc: 0.9887 - val_loss: 0.3392 - val_acc: 0.9164
Epoch 27/35
 - 1s - loss: 0.1536 - acc: 0.9936 - val_loss: 0.2935 - val_acc: 0.9546
Epoch 28/35
 - 1s - loss: 0.1445 - acc: 0.9939 - val_loss: 0.2914 - val_acc: 0.9553
Epoch 29/35
 - 1s - loss: 0.1484 - acc: 0.9927 - val_loss: 0.2737 - val_acc: 0.9603
Epoch 30/35
 - 1s - loss: 0.1447 - acc: 0.9921 - val_loss: 0.2774 - val_acc: 0.9640
Epoch 31/35
 - 1s - loss: 0.1357 - acc: 0.9927 - val_loss: 0.2471 - val_acc: 0.9784
Epoch 32/35
 - 1s - loss: 0.1273 - acc: 0.9976 - val_loss: 0.2758 - val_acc: 0.9575
Epoch 33/35
 - 1s - loss: 0.1362 - acc: 0.9927 - val_loss: 0.2718 - val_acc: 0.9582
Epoch 34/35
 - 1s - loss: 0.1277 - acc: 0.9945 - val_loss: 0.2975 - val_acc: 0.9373
Epoch 35/35
```

```
 - 1s - loss: 0.1422 - acc: 0.9878 - val_loss: 0.2752 - val_acc: 0.9603
Train accuracy 0.9750380517503805 Test accuracy: 0.9603460706560922
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 28)	1792
conv1d_2 (Conv1D)	(None, 118, 32)	4512
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 16)	11792
dense_2 (Dense)	(None, 3)	51

```
Total params: 18,147
Trainable params: 18,147
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 14.7104 - acc: 0.6183 - val_loss: 3.3412 - val_acc: 0.8637
Epoch 2/55
 - 1s - loss: 1.2994 - acc: 0.9528 - val_loss: 0.8177 - val_acc: 0.9265
Epoch 3/55
 - 1s - loss: 0.3896 - acc: 0.9796 - val_loss: 0.5563 - val_acc: 0.9510
Epoch 4/55
 - 1s - loss: 0.2802 - acc: 0.9845 - val_loss: 0.4780 - val_acc: 0.9315
Epoch 5/55
 - 1s - loss: 0.2235 - acc: 0.9881 - val_loss: 0.4527 - val_acc: 0.9329
Epoch 6/55
 - 1s - loss: 0.2076 - acc: 0.9857 - val_loss: 0.3880 - val_acc: 0.9510
Epoch 7/55
 - 1s - loss: 0.1893 - acc: 0.9878 - val_loss: 0.3728 - val_acc: 0.9409
Epoch 8/55
 - 1s - loss: 0.1727 - acc: 0.9878 - val_loss: 0.4007 - val_acc: 0.9164
Epoch 9/55
```

```
     - 1s - loss: 0.1466 - acc: 0.9927 - val_loss: 0.3522 - val_acc: 0.9315
Epoch 10/55
     - 1s - loss: 0.1492 - acc: 0.9924 - val_loss: 0.3521 - val_acc: 0.9402
Epoch 11/55
     - 1s - loss: 0.1513 - acc: 0.9893 - val_loss: 0.2969 - val_acc: 0.9676
Epoch 12/55
     - 1s - loss: 0.1265 - acc: 0.9933 - val_loss: 0.3368 - val_acc: 0.9221
Epoch 13/55
     - 1s - loss: 0.1288 - acc: 0.9924 - val_loss: 0.3086 - val_acc: 0.9510
Epoch 14/55
     - 1s - loss: 0.1138 - acc: 0.9942 - val_loss: 0.2905 - val_acc: 0.9567
Epoch 15/55
     - 1s - loss: 0.1238 - acc: 0.9900 - val_loss: 0.3218 - val_acc: 0.9250
Epoch 16/55
     - 1s - loss: 0.1055 - acc: 0.9957 - val_loss: 0.2455 - val_acc: 0.9733
Epoch 17/55
     - 1s - loss: 0.1348 - acc: 0.9842 - val_loss: 0.2350 - val_acc: 0.9798
Epoch 18/55
     - 1s - loss: 0.0919 - acc: 0.9988 - val_loss: 0.2599 - val_acc: 0.9611
Epoch 19/55
     - 1s - loss: 0.1116 - acc: 0.9887 - val_loss: 0.2621 - val_acc: 0.9596
Epoch 20/55
     - 1s - loss: 0.0968 - acc: 0.9936 - val_loss: 0.2329 - val_acc: 0.9654
Epoch 21/55
     - 1s - loss: 0.1076 - acc: 0.9884 - val_loss: 0.3385 - val_acc: 0.9286
Epoch 22/55
     - 1s - loss: 0.0971 - acc: 0.9954 - val_loss: 0.2309 - val_acc: 0.9690
Epoch 23/55
     - 1s - loss: 0.1038 - acc: 0.9900 - val_loss: 0.3530 - val_acc: 0.9077
Epoch 24/55
     - 1s - loss: 0.1046 - acc: 0.9927 - val_loss: 0.2529 - val_acc: 0.9423
Epoch 25/55
     - 1s - loss: 0.0925 - acc: 0.9942 - val_loss: 0.2045 - val_acc: 0.9719
Epoch 26/55
     - 1s - loss: 0.0907 - acc: 0.9936 - val_loss: 0.2535 - val_acc: 0.9466
Epoch 27/55
     - 1s - loss: 0.1000 - acc: 0.9936 - val_loss: 0.2306 - val_acc: 0.9625
Epoch 28/55
     - 1s - loss: 0.0713 - acc: 0.9982 - val_loss: 0.2201 - val_acc: 0.9661
Epoch 29/55
     - 1s - loss: 0.0842 - acc: 0.9924 - val_loss: 0.2462 - val_acc: 0.9481
Epoch 30/55
     - 1s - loss: 0.0853 - acc: 0.9939 - val_loss: 0.2270 - val_acc: 0.9539
```

```
Epoch 31/55
 - 1s - loss: 0.0704 - acc: 0.9976 - val_loss: 0.2241 - val_acc: 0.9539
Epoch 32/55
 - 1s - loss: 0.1286 - acc: 0.9820 - val_loss: 0.2041 - val_acc: 0.9640
Epoch 33/55
 - 1s - loss: 0.1177 - acc: 0.9884 - val_loss: 0.1876 - val_acc: 0.9719
Epoch 34/55
 - 1s - loss: 0.0686 - acc: 0.9997 - val_loss: 0.2126 - val_acc: 0.9697
Epoch 35/55
 - 1s - loss: 0.0640 - acc: 0.9988 - val_loss: 0.2131 - val_acc: 0.9618
Epoch 36/55
 - 1s - loss: 0.0833 - acc: 0.9933 - val_loss: 0.2057 - val_acc: 0.9640
Epoch 37/55
 - 1s - loss: 0.0632 - acc: 0.9979 - val_loss: 0.2084 - val_acc: 0.9661
Epoch 38/55
 - 1s - loss: 0.0642 - acc: 0.9979 - val_loss: 0.2087 - val_acc: 0.9611
Epoch 39/55
 - 1s - loss: 0.0574 - acc: 0.9997 - val_loss: 0.1659 - val_acc: 0.9769
Epoch 40/55
 - 1s - loss: 0.0897 - acc: 0.9890 - val_loss: 0.3305 - val_acc: 0.9229
Epoch 41/55
 - 1s - loss: 0.1653 - acc: 0.9769 - val_loss: 0.3497 - val_acc: 0.9445
Epoch 42/55
 - 1s - loss: 0.0843 - acc: 0.9991 - val_loss: 0.1875 - val_acc: 0.9748
Epoch 43/55
 - 1s - loss: 0.0573 - acc: 0.9994 - val_loss: 0.2071 - val_acc: 0.9466
Epoch 44/55
 - 1s - loss: 0.0551 - acc: 0.9997 - val_loss: 0.2085 - val_acc: 0.9697
Epoch 45/55
 - 1s - loss: 0.1139 - acc: 0.9830 - val_loss: 0.4662 - val_acc: 0.8731
Epoch 46/55
 - 1s - loss: 0.1311 - acc: 0.9866 - val_loss: 0.2324 - val_acc: 0.9488
Epoch 47/55
 - 1s - loss: 0.0620 - acc: 0.9997 - val_loss: 0.2001 - val_acc: 0.9640
Epoch 48/55
 - 1s - loss: 0.0567 - acc: 0.9988 - val_loss: 0.1758 - val_acc: 0.9740
Epoch 49/55
 - 1s - loss: 0.0550 - acc: 0.9991 - val_loss: 0.1990 - val_acc: 0.9575
Epoch 50/55
 - 1s - loss: 0.0822 - acc: 0.9900 - val_loss: 0.3142 - val_acc: 0.9438
Epoch 51/55
 - 1s - loss: 0.0959 - acc: 0.9915 - val_loss: 0.2027 - val_acc: 0.9603
Epoch 52/55
```

```
 - 1s - loss: 0.0847 - acc: 0.9924 - val_loss: 0.1840 - val_acc: 0.9668
Epoch 53/55
 - 1s - loss: 0.0517 - acc: 0.9997 - val_loss: 0.1993 - val_acc: 0.9596
Epoch 54/55
 - 1s - loss: 0.0626 - acc: 0.9963 - val_loss: 0.2404 - val_acc: 0.9366
Epoch 55/55
 - 1s - loss: 0.0815 - acc: 0.9927 - val_loss: 0.1907 - val_acc: 0.9539
Train accuracy 0.9981735159817352 Test accuracy: 0.9538572458543619
-------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 126, 32)	896
conv1d_2 (Conv1D)	(None, 120, 32)	7200
dropout_1 (Dropout)	(None, 120, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 40, 32)	0
flatten_1 (Flatten)	(None, 1280)	0
dense_1 (Dense)	(None, 16)	20496
dense_2 (Dense)	(None, 3)	51

```
=================================================================
Total params: 28,643
Trainable params: 28,643
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 36.3823 - acc: 0.5269 - val_loss: 8.4028 - val_acc: 0.6424
Epoch 2/35
 - 2s - loss: 2.7223 - acc: 0.7811 - val_loss: 1.0639 - val_acc: 0.6510
Epoch 3/35
 - 1s - loss: 0.6984 - acc: 0.8444 - val_loss: 1.2307 - val_acc: 0.5465
Epoch 4/35
 - 1s - loss: 0.6043 - acc: 0.8688 - val_loss: 0.7267 - val_acc: 0.8673
Epoch 5/35
 - 2s - loss: 0.5443 - acc: 0.8986 - val_loss: 0.6926 - val_acc: 0.8717
Epoch 6/35
```

```
        - 1s - loss: 0.4721 - acc: 0.9145 - val_loss: 0.6233 - val_acc: 0.8955
      Epoch 7/35
        - 2s - loss: 0.4521 - acc: 0.9215 - val_loss: 0.7439 - val_acc: 0.7967
      Epoch 8/35
        - 1s - loss: 0.4647 - acc: 0.9148 - val_loss: 0.5869 - val_acc: 0.9077
      Epoch 9/35
        - 1s - loss: 0.4282 - acc: 0.9309 - val_loss: 0.6773 - val_acc: 0.8551
      Epoch 10/35
        - 2s - loss: 0.4109 - acc: 0.9370 - val_loss: 0.5958 - val_acc: 0.8435
      Epoch 11/35
        - 2s - loss: 0.3945 - acc: 0.9333 - val_loss: 0.6758 - val_acc: 0.8039
      Epoch 12/35
        - 2s - loss: 0.3657 - acc: 0.9425 - val_loss: 0.8042 - val_acc: 0.7289
      Epoch 13/35
        - 1s - loss: 0.3938 - acc: 0.9315 - val_loss: 0.4911 - val_acc: 0.8998
      Epoch 14/35
        - 2s - loss: 0.3504 - acc: 0.9446 - val_loss: 1.0865 - val_acc: 0.6770
      Epoch 15/35
        - 2s - loss: 0.3762 - acc: 0.9440 - val_loss: 0.4385 - val_acc: 0.9394
      Epoch 16/35
        - 2s - loss: 0.3244 - acc: 0.9537 - val_loss: 0.4095 - val_acc: 0.9524
      Epoch 17/35
        - 1s - loss: 0.3182 - acc: 0.9525 - val_loss: 0.4061 - val_acc: 0.9625
      Epoch 18/35
        - 1s - loss: 0.3037 - acc: 0.9562 - val_loss: 0.4258 - val_acc: 0.9373
      Epoch 19/35
        - 2s - loss: 0.2882 - acc: 0.9568 - val_loss: 0.3806 - val_acc: 0.9553
      Epoch 20/35
        - 2s - loss: 0.3101 - acc: 0.9580 - val_loss: 0.3544 - val_acc: 0.9647
      Epoch 21/35
        - 2s - loss: 0.2959 - acc: 0.9565 - val_loss: 0.6346 - val_acc: 0.8421
      Epoch 22/35
        - 1s - loss: 0.2997 - acc: 0.9549 - val_loss: 0.4210 - val_acc: 0.9142
      Epoch 23/35
        - 2s - loss: 0.3076 - acc: 0.9543 - val_loss: 0.3944 - val_acc: 0.9366
      Epoch 24/35
        - 2s - loss: 0.2961 - acc: 0.9586 - val_loss: 0.3902 - val_acc: 0.9387
      Epoch 25/35
        - 2s - loss: 0.2803 - acc: 0.9629 - val_loss: 0.3855 - val_acc: 0.9315
      Epoch 26/35
        - 2s - loss: 0.2748 - acc: 0.9607 - val_loss: 0.3686 - val_acc: 0.9380
      Epoch 27/35
        - 1s - loss: 0.3174 - acc: 0.9568 - val_loss: 0.3496 - val_acc: 0.9560
```

```
Epoch 28/35
 - 1s - loss: 0.2570 - acc: 0.9674 - val_loss: 0.3272 - val_acc: 0.9567
Epoch 29/35
 - 2s - loss: 0.2703 - acc: 0.9619 - val_loss: 0.3418 - val_acc: 0.9618
Epoch 30/35
 - 2s - loss: 0.2671 - acc: 0.9610 - val_loss: 0.3886 - val_acc: 0.9481
Epoch 31/35
 - 1s - loss: 0.2798 - acc: 0.9595 - val_loss: 0.3214 - val_acc: 0.9575
Epoch 32/35
 - 2s - loss: 0.2596 - acc: 0.9644 - val_loss: 0.3815 - val_acc: 0.9265
Epoch 33/35
 - 2s - loss: 0.2874 - acc: 0.9571 - val_loss: 0.3727 - val_acc: 0.9445
Epoch 34/35
 - 2s - loss: 0.2910 - acc: 0.9571 - val_loss: 0.4160 - val_acc: 0.9394
Epoch 35/35
 - 1s - loss: 0.2627 - acc: 0.9629 - val_loss: 0.2809 - val_acc: 0.9697
Train accuracy 0.9966514459665144 Test accuracy: 0.969718817591925
---------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 120, 24)           2328

dropout_1 (Dropout)          (None, 120, 24)           0

max_pooling1d_1 (MaxPooling1 (None, 24, 24)            0

flatten_1 (Flatten)          (None, 576)               0

dense_1 (Dense)              (None, 16)                9232

dense_2 (Dense)              (None, 3)                 51
=================================================================
Total params: 13,659
Trainable params: 13,659
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 45.9541 - acc: 0.4536 - val_loss: 14.6712 - val_acc: 0.6388
```

```
Epoch 2/55
 - 1s - loss: 5.9997 - acc: 0.8773 - val_loss: 1.7479 - val_acc: 0.8926
Epoch 3/55
 - 1s - loss: 0.6600 - acc: 0.9708 - val_loss: 0.5599 - val_acc: 0.9120
Epoch 4/55
 - 1s - loss: 0.2670 - acc: 0.9763 - val_loss: 0.4202 - val_acc: 0.9466
Epoch 5/55
 - 1s - loss: 0.2924 - acc: 0.9659 - val_loss: 0.5029 - val_acc: 0.8983
Epoch 6/55
 - 1s - loss: 0.2346 - acc: 0.9781 - val_loss: 0.3726 - val_acc: 0.9553
Epoch 7/55
 - 1s - loss: 0.1823 - acc: 0.9814 - val_loss: 0.3398 - val_acc: 0.9661
Epoch 8/55
 - 1s - loss: 0.2698 - acc: 0.9680 - val_loss: 0.3717 - val_acc: 0.9503
Epoch 9/55
 - 1s - loss: 0.1670 - acc: 0.9903 - val_loss: 0.3604 - val_acc: 0.9229
Epoch 10/55
 - 1s - loss: 0.2006 - acc: 0.9814 - val_loss: 0.3646 - val_acc: 0.9539
Epoch 11/55
 - 1s - loss: 0.1450 - acc: 0.9936 - val_loss: 0.2808 - val_acc: 0.9589
Epoch 12/55
 - 1s - loss: 0.1869 - acc: 0.9823 - val_loss: 0.3060 - val_acc: 0.9640
Epoch 13/55
 - 1s - loss: 0.1764 - acc: 0.9887 - val_loss: 0.4010 - val_acc: 0.9221
Epoch 14/55
 - 1s - loss: 0.1435 - acc: 0.9927 - val_loss: 0.2969 - val_acc: 0.9430
Epoch 15/55
 - 1s - loss: 0.1917 - acc: 0.9820 - val_loss: 0.4265 - val_acc: 0.9063
Epoch 16/55
 - 1s - loss: 0.1886 - acc: 0.9826 - val_loss: 0.3320 - val_acc: 0.9474
Epoch 17/55
 - 1s - loss: 0.2217 - acc: 0.9805 - val_loss: 0.3297 - val_acc: 0.9380
Epoch 18/55
 - 1s - loss: 0.1786 - acc: 0.9860 - val_loss: 0.3547 - val_acc: 0.8976
Epoch 19/55
 - 1s - loss: 0.1942 - acc: 0.9817 - val_loss: 0.3980 - val_acc: 0.9366
Epoch 20/55
 - 1s - loss: 0.1368 - acc: 0.9948 - val_loss: 0.2492 - val_acc: 0.9647
Epoch 21/55
 - 1s - loss: 0.0963 - acc: 0.9948 - val_loss: 0.2906 - val_acc: 0.9373
Epoch 22/55
 - 1s - loss: 0.1547 - acc: 0.9848 - val_loss: 0.4108 - val_acc: 0.9019
Epoch 23/55
```

```
        - 1s - loss: 0.1940 - acc: 0.9842 - val_loss: 0.3017 - val_acc: 0.9308
Epoch 24/55
        - 1s - loss: 0.2116 - acc: 0.9814 - val_loss: 0.2968 - val_acc: 0.9402
Epoch 25/55
        - 1s - loss: 0.1333 - acc: 0.9909 - val_loss: 0.3389 - val_acc: 0.9128
Epoch 26/55
        - 1s - loss: 0.2062 - acc: 0.9808 - val_loss: 0.3032 - val_acc: 0.9618
Epoch 27/55
        - 1s - loss: 0.1152 - acc: 0.9945 - val_loss: 0.2425 - val_acc: 0.9575
Epoch 28/55
        - 1s - loss: 0.2108 - acc: 0.9772 - val_loss: 0.3406 - val_acc: 0.9632
Epoch 29/55
        - 1s - loss: 0.1668 - acc: 0.9869 - val_loss: 0.3262 - val_acc: 0.9380
Epoch 30/55
        - 1s - loss: 0.1491 - acc: 0.9909 - val_loss: 0.2739 - val_acc: 0.9560
Epoch 31/55
        - 1s - loss: 0.1632 - acc: 0.9854 - val_loss: 0.2978 - val_acc: 0.9488
Epoch 32/55
        - 1s - loss: 0.1118 - acc: 0.9887 - val_loss: 0.3791 - val_acc: 0.9063
Epoch 33/55
        - 1s - loss: 0.1203 - acc: 0.9951 - val_loss: 0.2797 - val_acc: 0.9380
Epoch 34/55
        - 1s - loss: 0.2091 - acc: 0.9820 - val_loss: 0.3148 - val_acc: 0.9387
Epoch 35/55
        - 1s - loss: 0.1353 - acc: 0.9878 - val_loss: 0.2092 - val_acc: 0.9849
Epoch 36/55
        - 1s - loss: 0.0937 - acc: 0.9951 - val_loss: 0.3793 - val_acc: 0.9005
Epoch 37/55
        - 1s - loss: 0.2977 - acc: 0.9674 - val_loss: 0.6978 - val_acc: 0.9668
Epoch 38/55
        - 1s - loss: 0.3690 - acc: 0.9836 - val_loss: 0.2695 - val_acc: 0.9553
Epoch 39/55
        - 1s - loss: 0.0849 - acc: 0.9991 - val_loss: 0.2757 - val_acc: 0.9445
Epoch 40/55
        - 1s - loss: 0.0712 - acc: 0.9976 - val_loss: 0.3605 - val_acc: 0.9171
Epoch 41/55
        - 1s - loss: 0.1129 - acc: 0.9884 - val_loss: 0.4625 - val_acc: 0.9120
Epoch 42/55
        - 1s - loss: 0.2405 - acc: 0.9793 - val_loss: 0.3008 - val_acc: 0.9459
Epoch 43/55
        - 1s - loss: 0.1083 - acc: 0.9942 - val_loss: 0.2397 - val_acc: 0.9596
Epoch 44/55
        - 1s - loss: 0.0669 - acc: 0.9985 - val_loss: 0.2865 - val_acc: 0.9265
```

```
Epoch 45/55
 - 1s - loss: 0.0755 - acc: 0.9948 - val_loss: 0.2644 - val_acc: 0.9510
Epoch 46/55
 - 1s - loss: 0.1231 - acc: 0.9863 - val_loss: 0.2559 - val_acc: 0.9517
Epoch 47/55
 - 1s - loss: 0.0782 - acc: 0.9960 - val_loss: 0.2112 - val_acc: 0.9503
Epoch 48/55
 - 1s - loss: 0.1765 - acc: 0.9799 - val_loss: 0.4129 - val_acc: 0.9056
Epoch 49/55
 - 1s - loss: 0.2140 - acc: 0.9802 - val_loss: 0.2954 - val_acc: 0.9539
Epoch 50/55
 - 1s - loss: 0.0799 - acc: 0.9970 - val_loss: 0.3089 - val_acc: 0.9236
Epoch 51/55
 - 1s - loss: 0.1269 - acc: 0.9881 - val_loss: 0.3483 - val_acc: 0.9358
Epoch 52/55
 - 1s - loss: 0.0911 - acc: 0.9948 - val_loss: 0.3579 - val_acc: 0.9200
Epoch 53/55
 - 1s - loss: 0.0674 - acc: 0.9976 - val_loss: 0.2499 - val_acc: 0.9517
Epoch 54/55
 - 1s - loss: 0.1685 - acc: 0.9872 - val_loss: 0.3338 - val_acc: 0.9308
Epoch 55/55
 - 1s - loss: 0.0807 - acc: 0.9942 - val_loss: 0.3525 - val_acc: 0.9337
Train accuracy 0.9637747337647588 Test accuracy: 0.9336697909156453
--------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 32)	2048
conv1d_2 (Conv1D)	(None, 116, 32)	7200
dropout_1 (Dropout)	(None, 116, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 23, 32)	0
flatten_1 (Flatten)	(None, 736)	0
dense_1 (Dense)	(None, 64)	47168
dense_2 (Dense)	(None, 3)	195

```
Total params: 56,611
Trainable params: 56,611
```

```
        Non-trainable params: 0

        _____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 36.5170 - acc: 0.6493 - val_loss: 21.6438 - val_acc: 0.6936
Epoch 2/35
 - 2s - loss: 13.4174 - acc: 0.9428 - val_loss: 7.9785 - val_acc: 0.9250
Epoch 3/35
 - 1s - loss: 4.8053 - acc: 0.9772 - val_loss: 3.1436 - val_acc: 0.8457
Epoch 4/35
 - 2s - loss: 1.7396 - acc: 0.9848 - val_loss: 1.3414 - val_acc: 0.9423
Epoch 5/35
 - 2s - loss: 0.6754 - acc: 0.9921 - val_loss: 0.7538 - val_acc: 0.9517
Epoch 6/35
 - 2s - loss: 0.3345 - acc: 0.9906 - val_loss: 0.5432 - val_acc: 0.9654
Epoch 7/35
 - 1s - loss: 0.2152 - acc: 0.9930 - val_loss: 0.5017 - val_acc: 0.9315
Epoch 8/35
 - 2s - loss: 0.1851 - acc: 0.9918 - val_loss: 0.4682 - val_acc: 0.9214
Epoch 9/35
 - 2s - loss: 0.1577 - acc: 0.9954 - val_loss: 0.3978 - val_acc: 0.9596
Epoch 10/35
 - 2s - loss: 0.1442 - acc: 0.9967 - val_loss: 0.4096 - val_acc: 0.9358
Epoch 11/35
 - 1s - loss: 0.1291 - acc: 0.9970 - val_loss: 0.3666 - val_acc: 0.9647
Epoch 12/35
 - 1s - loss: 0.1296 - acc: 0.9936 - val_loss: 0.3548 - val_acc: 0.9762
Epoch 13/35
 - 2s - loss: 0.1167 - acc: 0.9954 - val_loss: 0.3621 - val_acc: 0.9704
Epoch 14/35
 - 1s - loss: 0.1069 - acc: 0.9979 - val_loss: 0.3428 - val_acc: 0.9517
Epoch 15/35
 - 2s - loss: 0.1577 - acc: 0.9811 - val_loss: 0.3467 - val_acc: 0.9358
Epoch 16/35
 - 1s - loss: 0.1213 - acc: 0.9970 - val_loss: 0.3017 - val_acc: 0.9791
Epoch 17/35
 - 2s - loss: 0.1014 - acc: 0.9948 - val_loss: 0.2979 - val_acc: 0.9762
Epoch 18/35
 - 1s - loss: 0.0913 - acc: 0.9988 - val_loss: 0.3123 - val_acc: 0.9546
Epoch 19/35
 - 1s - loss: 0.1003 - acc: 0.9954 - val_loss: 0.2832 - val_acc: 0.9820
Epoch 20/35
```

```
 - 2s - loss: 0.0849 - acc: 0.9970 - val_loss: 0.2768 - val_acc: 0.9813
Epoch 21/35
 - 2s - loss: 0.0777 - acc: 0.9994 - val_loss: 0.2969 - val_acc: 0.9726
Epoch 22/35
 - 1s - loss: 0.0775 - acc: 0.9988 - val_loss: 0.2975 - val_acc: 0.9640
Epoch 23/35
 - 1s - loss: 0.1030 - acc: 0.9887 - val_loss: 0.3885 - val_acc: 0.9156
Epoch 24/35
 - 1s - loss: 0.1375 - acc: 0.9903 - val_loss: 0.2670 - val_acc: 0.9625
Epoch 25/35
 - 2s - loss: 0.0789 - acc: 0.9988 - val_loss: 0.2624 - val_acc: 0.9755
Epoch 26/35
 - 2s - loss: 0.0710 - acc: 0.9985 - val_loss: 0.2383 - val_acc: 0.9798
Epoch 27/35
 - 1s - loss: 0.0809 - acc: 0.9957 - val_loss: 0.2357 - val_acc: 0.9791
Epoch 28/35
 - 1s - loss: 0.0669 - acc: 0.9997 - val_loss: 0.2452 - val_acc: 0.9813
Epoch 29/35
 - 1s - loss: 0.0741 - acc: 0.9967 - val_loss: 0.2042 - val_acc: 0.9784
Epoch 30/35
 - 1s - loss: 0.0779 - acc: 0.9963 - val_loss: 0.2188 - val_acc: 0.9776
Epoch 31/35
 - 1s - loss: 0.0621 - acc: 0.9991 - val_loss: 0.2238 - val_acc: 0.9834
Epoch 32/35
 - 2s - loss: 0.0660 - acc: 0.9970 - val_loss: 0.2076 - val_acc: 0.9791
Epoch 33/35
 - 1s - loss: 0.1502 - acc: 0.9784 - val_loss: 0.2104 - val_acc: 0.9661
Epoch 34/35
 - 1s - loss: 0.1008 - acc: 0.9930 - val_loss: 0.2303 - val_acc: 0.9748
Epoch 35/35
 - 1s - loss: 0.0634 - acc: 0.9991 - val_loss: 0.2257 - val_acc: 0.9805
Train accuracy 1.0 Test accuracy: 0.9805335255948089
----------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 124, 32)	1472
conv1d_2 (Conv1D)	(None, 118, 32)	7200
dropout_1 (Dropout)	(None, 118, 32)	0
max_pooling1d_1 (MaxPooling1	(None, 39, 32)	0

```
flatten_1 (Flatten)              (None, 1248)                  0
_____

dense_1 (Dense)                  (None, 64)                    79936
_____

dense_2 (Dense)                  (None, 3)                     195
===============================================================
Total params: 88,803
Trainable params: 88,803
Non-trainable params: 0
_____

None
Train on 3285 samples, validate on 1387 samples
Epoch 1/40
 - 2s - loss: 32.3395 - acc: 0.6560 - val_loss: 2.9890 - val_acc: 0.8198
Epoch 2/40
 - 2s - loss: 0.9840 - acc: 0.9142 - val_loss: 0.7338 - val_acc: 0.8882
Epoch 3/40
 - 2s - loss: 0.4886 - acc: 0.9099 - val_loss: 0.6590 - val_acc: 0.8724
Epoch 4/40
 - 2s - loss: 0.3961 - acc: 0.9437 - val_loss: 0.6766 - val_acc: 0.8825
Epoch 5/40
 - 2s - loss: 0.3993 - acc: 0.9358 - val_loss: 0.5410 - val_acc: 0.9099
Epoch 6/40
 - 2s - loss: 0.3138 - acc: 0.9534 - val_loss: 0.5365 - val_acc: 0.8897
Epoch 7/40
 - 2s - loss: 0.3038 - acc: 0.9607 - val_loss: 0.4810 - val_acc: 0.9416
Epoch 8/40
 - 2s - loss: 0.3128 - acc: 0.9562 - val_loss: 0.6504 - val_acc: 0.8407
Epoch 9/40
 - 2s - loss: 0.2782 - acc: 0.9671 - val_loss: 0.5334 - val_acc: 0.8854
Epoch 10/40
 - 2s - loss: 0.3195 - acc: 0.9534 - val_loss: 0.4970 - val_acc: 0.9135
Epoch 11/40
 - 2s - loss: 0.2409 - acc: 0.9699 - val_loss: 0.4572 - val_acc: 0.9214
Epoch 12/40
 - 2s - loss: 0.3598 - acc: 0.9406 - val_loss: 0.4900 - val_acc: 0.9041
Epoch 13/40
 - 2s - loss: 0.2690 - acc: 0.9689 - val_loss: 0.5049 - val_acc: 0.9099
Epoch 14/40
 - 2s - loss: 0.2373 - acc: 0.9696 - val_loss: 0.5408 - val_acc: 0.8796
Epoch 15/40
 - 2s - loss: 0.2907 - acc: 0.9559 - val_loss: 0.4952 - val_acc: 0.8940
```

```
Epoch 16/40
 - 2s - loss: 0.2054 - acc: 0.9830 - val_loss: 0.4232 - val_acc: 0.8796
Epoch 17/40
 - 2s - loss: 0.2533 - acc: 0.9629 - val_loss: 0.4172 - val_acc: 0.9322
Epoch 18/40
 - 2s - loss: 0.2256 - acc: 0.9735 - val_loss: 0.5628 - val_acc: 0.8645
Epoch 19/40
 - 2s - loss: 0.2713 - acc: 0.9574 - val_loss: 0.5063 - val_acc: 0.8688
Epoch 20/40
 - 2s - loss: 0.2534 - acc: 0.9650 - val_loss: 0.4564 - val_acc: 0.9106
Epoch 21/40
 - 2s - loss: 0.2692 - acc: 0.9632 - val_loss: 0.5149 - val_acc: 0.9156
Epoch 22/40
 - 2s - loss: 0.2345 - acc: 0.9705 - val_loss: 0.5431 - val_acc: 0.8969
Epoch 23/40
 - 2s - loss: 0.2719 - acc: 0.9623 - val_loss: 0.4064 - val_acc: 0.9120
Epoch 24/40
 - 2s - loss: 0.1936 - acc: 0.9796 - val_loss: 0.3901 - val_acc: 0.9041
Epoch 25/40
 - 2s - loss: 0.2517 - acc: 0.9565 - val_loss: 0.7952 - val_acc: 0.7621
Epoch 26/40
 - 2s - loss: 0.3146 - acc: 0.9540 - val_loss: 0.4709 - val_acc: 0.8983
Epoch 27/40
 - 2s - loss: 0.2666 - acc: 0.9604 - val_loss: 0.5467 - val_acc: 0.9012
Epoch 28/40
 - 2s - loss: 0.2573 - acc: 0.9647 - val_loss: 0.4775 - val_acc: 0.8702
Epoch 29/40
 - 2s - loss: 0.2413 - acc: 0.9744 - val_loss: 0.4274 - val_acc: 0.8998
Epoch 30/40
 - 2s - loss: 0.2444 - acc: 0.9689 - val_loss: 0.4532 - val_acc: 0.9077
Epoch 31/40
 - 2s - loss: 0.2161 - acc: 0.9705 - val_loss: 0.5013 - val_acc: 0.8854
Epoch 32/40
 - 2s - loss: 0.2442 - acc: 0.9699 - val_loss: 0.3834 - val_acc: 0.9092
Epoch 33/40
 - 2s - loss: 0.2182 - acc: 0.9735 - val_loss: 0.5061 - val_acc: 0.8796
Epoch 34/40
 - 2s - loss: 0.2144 - acc: 0.9723 - val_loss: 0.5236 - val_acc: 0.8962
Epoch 35/40
 - 2s - loss: 0.3955 - acc: 0.9272 - val_loss: 0.7381 - val_acc: 0.8421
Epoch 36/40
 - 2s - loss: 0.3473 - acc: 0.9498 - val_loss: 0.5851 - val_acc: 0.8500
Epoch 37/40
```

```
 - 2s - loss: 0.2673 - acc: 0.9650 - val_loss: 0.3705 - val_acc: 0.9214
Epoch 38/40
 - 2s - loss: 0.1806 - acc: 0.9817 - val_loss: 0.4008 - val_acc: 0.8998
Epoch 39/40
 - 2s - loss: 0.1968 - acc: 0.9772 - val_loss: 0.5363 - val_acc: 0.9120
Epoch 40/40
 - 2s - loss: 0.1926 - acc: 0.9802 - val_loss: 0.3544 - val_acc: 0.9286
Train accuracy 0.9933028919330289 Test accuracy: 0.9286229271809661
--------------------------------------------------------------------------------
```

Layer (type)	Output Shape	Param #
conv1d_1 (Conv1D)	(None, 122, 42)	2688
conv1d_2 (Conv1D)	(None, 116, 16)	4720
dropout_1 (Dropout)	(None, 116, 16)	0
max_pooling1d_1 (MaxPooling1	(None, 58, 16)	0
flatten_1 (Flatten)	(None, 928)	0
dense_1 (Dense)	(None, 64)	59456
dense_2 (Dense)	(None, 3)	195

```
Total params: 67,059
Trainable params: 67,059
Non-trainable params: 0
```

```
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
 - 2s - loss: 39.2574 - acc: 0.7123 - val_loss: 9.8314 - val_acc: 0.6698
Epoch 2/35
 - 1s - loss: 3.0654 - acc: 0.8965 - val_loss: 0.7157 - val_acc: 0.9193
Epoch 3/35
 - 1s - loss: 0.4338 - acc: 0.9394 - val_loss: 0.8115 - val_acc: 0.7765
Epoch 4/35
 - 1s - loss: 0.3198 - acc: 0.9546 - val_loss: 0.4578 - val_acc: 0.9279
Epoch 5/35
 - 1s - loss: 0.2615 - acc: 0.9656 - val_loss: 0.5053 - val_acc: 0.8609
Epoch 6/35
```

```
              - 1s - loss: 0.2365 - acc: 0.9668 - val_loss: 0.4122 - val_acc: 0.8955
         Epoch 7/35
              - 1s - loss: 0.2311 - acc: 0.9647 - val_loss: 0.3572 - val_acc: 0.9380
         Epoch 8/35
              - 1s - loss: 0.2148 - acc: 0.9686 - val_loss: 0.4848 - val_acc: 0.8947
         Epoch 9/35
              - 1s - loss: 0.2069 - acc: 0.9671 - val_loss: 0.4527 - val_acc: 0.8940
         Epoch 10/35
              - 1s - loss: 0.1891 - acc: 0.9747 - val_loss: 0.3375 - val_acc: 0.9128
         Epoch 11/35
              - 1s - loss: 0.2024 - acc: 0.9686 - val_loss: 0.2970 - val_acc: 0.9344
         Epoch 12/35
              - 1s - loss: 0.1980 - acc: 0.9699 - val_loss: 0.2638 - val_acc: 0.9510
         Epoch 13/35
              - 1s - loss: 0.1987 - acc: 0.9717 - val_loss: 0.2964 - val_acc: 0.9380
         Epoch 14/35
              - 1s - loss: 0.1952 - acc: 0.9723 - val_loss: 0.2912 - val_acc: 0.9474
         Epoch 15/35
              - 1s - loss: 0.1870 - acc: 0.9741 - val_loss: 1.8683 - val_acc: 0.5429
         Epoch 16/35
              - 1s - loss: 0.2094 - acc: 0.9674 - val_loss: 0.2178 - val_acc: 0.9632
         Epoch 17/35
              - 1s - loss: 0.1702 - acc: 0.9747 - val_loss: 0.6252 - val_acc: 0.8421
         Epoch 18/35
              - 1s - loss: 0.1850 - acc: 0.9729 - val_loss: 0.4333 - val_acc: 0.8745
         Epoch 19/35
              - 1s - loss: 0.1739 - acc: 0.9732 - val_loss: 0.3107 - val_acc: 0.9445
         Epoch 20/35
              - 1s - loss: 0.1847 - acc: 0.9714 - val_loss: 0.2925 - val_acc: 0.9351
         Epoch 21/35
              - 1s - loss: 0.1740 - acc: 0.9693 - val_loss: 0.6757 - val_acc: 0.7837
         Epoch 22/35
              - 1s - loss: 0.1787 - acc: 0.9738 - val_loss: 0.2865 - val_acc: 0.9229
         Epoch 23/35
              - 1s - loss: 0.1875 - acc: 0.9708 - val_loss: 0.2656 - val_acc: 0.9503
         Epoch 24/35
              - 1s - loss: 0.1706 - acc: 0.9744 - val_loss: 0.3151 - val_acc: 0.9430
         Epoch 25/35
              - 1s - loss: 0.1808 - acc: 0.9760 - val_loss: 0.3587 - val_acc: 0.9077
         Epoch 26/35
              - 1s - loss: 0.1790 - acc: 0.9708 - val_loss: 0.2661 - val_acc: 0.9510
         Epoch 27/35
              - 1s - loss: 0.1766 - acc: 0.9766 - val_loss: 0.2671 - val_acc: 0.9459
```

```
Epoch 28/35
 - 1s - loss: 0.1967 - acc: 0.9738 - val_loss: 0.4268 - val_acc: 0.9286
Epoch 29/35
 - 1s - loss: 0.1514 - acc: 0.9808 - val_loss: 0.2709 - val_acc: 0.9387
Epoch 30/35
 - 1s - loss: 0.1831 - acc: 0.9714 - val_loss: 0.3091 - val_acc: 0.9503
Epoch 31/35
 - 1s - loss: 0.1624 - acc: 0.9778 - val_loss: 0.2603 - val_acc: 0.9459
Epoch 32/35
 - 1s - loss: 0.1989 - acc: 0.9705 - val_loss: 0.2610 - val_acc: 0.9560
Epoch 33/35
 - 1s - loss: 0.1760 - acc: 0.9750 - val_loss: 0.3056 - val_acc: 0.9229
Epoch 34/35
 - 1s - loss: 0.1696 - acc: 0.9744 - val_loss: 0.2369 - val_acc: 0.9394
Epoch 35/35
 - 1s - loss: 0.1895 - acc: 0.9735 - val_loss: 0.2752 - val_acc: 0.9322
Train accuracy 0.9884322678843227 Test accuracy: 0.9322278298485941
-----------------------------------------------------------------------------
```

```
_____
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 28)           1792

conv1d_2 (Conv1D)            (None, 118, 32)           4512

dropout_1 (Dropout)          (None, 118, 32)           0

max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0

flatten_1 (Flatten)          (None, 736)               0

dense_1 (Dense)              (None, 64)                47168

dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 53,667
Trainable params: 53,667
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/55
 - 2s - loss: 26.9340 - acc: 0.7549 - val_loss: 2.3801 - val_acc: 0.7974
```

```
Epoch 2/55
 - 2s - loss: 0.7593 - acc: 0.9537 - val_loss: 0.6876 - val_acc: 0.9308
Epoch 3/55
 - 2s - loss: 0.3472 - acc: 0.9671 - val_loss: 0.6061 - val_acc: 0.9092
Epoch 4/55
 - 2s - loss: 0.3164 - acc: 0.9598 - val_loss: 0.5474 - val_acc: 0.9373
Epoch 5/55
 - 2s - loss: 0.2510 - acc: 0.9778 - val_loss: 0.5382 - val_acc: 0.9193
Epoch 6/55
 - 2s - loss: 0.2800 - acc: 0.9638 - val_loss: 0.4893 - val_acc: 0.9510
Epoch 7/55
 - 2s - loss: 0.2978 - acc: 0.9635 - val_loss: 0.4826 - val_acc: 0.9229
Epoch 8/55
 - 2s - loss: 0.2259 - acc: 0.9775 - val_loss: 0.4997 - val_acc: 0.9185
Epoch 9/55
 - 2s - loss: 0.2326 - acc: 0.9674 - val_loss: 0.4630 - val_acc: 0.9293
Epoch 10/55
 - 2s - loss: 0.2120 - acc: 0.9790 - val_loss: 0.5121 - val_acc: 0.8818
Epoch 11/55
 - 2s - loss: 0.2241 - acc: 0.9729 - val_loss: 0.4184 - val_acc: 0.9272
Epoch 12/55
 - 2s - loss: 0.2141 - acc: 0.9726 - val_loss: 0.4389 - val_acc: 0.9164
Epoch 13/55
 - 2s - loss: 0.2222 - acc: 0.9735 - val_loss: 0.6670 - val_acc: 0.8839
Epoch 14/55
 - 2s - loss: 0.1708 - acc: 0.9854 - val_loss: 0.3869 - val_acc: 0.9373
Epoch 15/55
 - 2s - loss: 0.2236 - acc: 0.9680 - val_loss: 0.3781 - val_acc: 0.9445
Epoch 16/55
 - 2s - loss: 0.1550 - acc: 0.9881 - val_loss: 0.3680 - val_acc: 0.9229
Epoch 17/55
 - 2s - loss: 0.2223 - acc: 0.9702 - val_loss: 0.9123 - val_acc: 0.6907
Epoch 18/55
 - 2s - loss: 0.1919 - acc: 0.9817 - val_loss: 0.4474 - val_acc: 0.8803
Epoch 19/55
 - 2s - loss: 0.2035 - acc: 0.9723 - val_loss: 0.4579 - val_acc: 0.9171
Epoch 20/55
 - 2s - loss: 0.1635 - acc: 0.9851 - val_loss: 0.3845 - val_acc: 0.9056
Epoch 21/55
 - 2s - loss: 0.1869 - acc: 0.9750 - val_loss: 0.4326 - val_acc: 0.8955
Epoch 22/55
 - 2s - loss: 0.2132 - acc: 0.9705 - val_loss: 0.4289 - val_acc: 0.9156
Epoch 23/55
```

```
             - 2s - loss: 0.1542 - acc: 0.9833 - val_loss: 0.3889 - val_acc: 0.9027
         Epoch 24/55
             - 2s - loss: 0.1448 - acc: 0.9866 - val_loss: 0.3399 - val_acc: 0.9279
         Epoch 25/55
             - 2s - loss: 0.1904 - acc: 0.9726 - val_loss: 0.3455 - val_acc: 0.9265
         Epoch 26/55
             - 2s - loss: 0.1965 - acc: 0.9750 - val_loss: 0.3679 - val_acc: 0.9229
         Epoch 27/55
             - 2s - loss: 0.1618 - acc: 0.9842 - val_loss: 0.4143 - val_acc: 0.9200
         Epoch 28/55
             - 2s - loss: 0.1732 - acc: 0.9799 - val_loss: 0.3439 - val_acc: 0.9272
         Epoch 29/55
             - 2s - loss: 0.1903 - acc: 0.9753 - val_loss: 0.3231 - val_acc: 0.9193
         Epoch 30/55
             - 2s - loss: 0.1524 - acc: 0.9830 - val_loss: 0.3996 - val_acc: 0.9056
         Epoch 31/55
             - 2s - loss: 0.1493 - acc: 0.9839 - val_loss: 0.3175 - val_acc: 0.9308
         Epoch 32/55
             - 2s - loss: 0.2135 - acc: 0.9668 - val_loss: 0.3285 - val_acc: 0.9265
         Epoch 33/55
             - 2s - loss: 0.2010 - acc: 0.9735 - val_loss: 0.4204 - val_acc: 0.8976
         Epoch 34/55
             - 2s - loss: 0.1682 - acc: 0.9793 - val_loss: 0.4075 - val_acc: 0.9394
         Epoch 35/55
             - 2s - loss: 0.1737 - acc: 0.9802 - val_loss: 0.3428 - val_acc: 0.9221
         Epoch 36/55
             - 2s - loss: 0.1865 - acc: 0.9732 - val_loss: 0.3634 - val_acc: 0.9120
         Epoch 37/55
             - 2s - loss: 0.1786 - acc: 0.9784 - val_loss: 0.3929 - val_acc: 0.9272
         Epoch 38/55
             - 2s - loss: 0.1515 - acc: 0.9836 - val_loss: 0.3186 - val_acc: 0.9279
         Epoch 39/55
             - 2s - loss: 0.1335 - acc: 0.9860 - val_loss: 0.4310 - val_acc: 0.8991
         Epoch 40/55
             - 2s - loss: 0.1908 - acc: 0.9756 - val_loss: 0.3905 - val_acc: 0.9005
         Epoch 41/55
             - 2s - loss: 0.2038 - acc: 0.9699 - val_loss: 0.4572 - val_acc: 0.8818
         Epoch 42/55
             - 2s - loss: 0.1515 - acc: 0.9845 - val_loss: 0.3307 - val_acc: 0.9120
         Epoch 43/55
             - 2s - loss: 0.1750 - acc: 0.9756 - val_loss: 0.3770 - val_acc: 0.9056
         Epoch 44/55
             - 2s - loss: 0.1554 - acc: 0.9808 - val_loss: 0.3206 - val_acc: 0.9142
```

```
Epoch 45/55
 - 2s - loss: 0.1957 - acc: 0.9738 - val_loss: 0.4420 - val_acc: 0.8940
Epoch 46/55
 - 2s - loss: 0.1680 - acc: 0.9784 - val_loss: 0.4666 - val_acc: 0.9106
Epoch 47/55
 - 2s - loss: 0.1731 - acc: 0.9775 - val_loss: 0.4677 - val_acc: 0.8601
Epoch 48/55
 - 2s - loss: 0.1705 - acc: 0.9769 - val_loss: 0.3764 - val_acc: 0.8926
Epoch 49/55
 - 2s - loss: 0.1443 - acc: 0.9857 - val_loss: 0.3452 - val_acc: 0.9279
Epoch 50/55
 - 2s - loss: 0.1815 - acc: 0.9686 - val_loss: 0.4480 - val_acc: 0.8882
Epoch 51/55
 - 2s - loss: 0.1755 - acc: 0.9775 - val_loss: 0.3454 - val_acc: 0.9084
Epoch 52/55
 - 2s - loss: 0.1935 - acc: 0.9717 - val_loss: 0.3336 - val_acc: 0.9099
Epoch 53/55
 - 2s - loss: 0.1340 - acc: 0.9848 - val_loss: 0.2921 - val_acc: 0.9322
Epoch 54/55
 - 2s - loss: 0.1894 - acc: 0.9738 - val_loss: 0.3660 - val_acc: 0.9373
Epoch 55/55
 - 2s - loss: 0.1930 - acc: 0.9720 - val_loss: 0.3936 - val_acc: 0.9019
Train accuracy 0.9844748858447488 Test accuracy: 0.9019466474405191
------------------------------------------------------------------------------
```

In [11]:
```python
from hyperas.utils import eval_hyperopt_space
total_trials = dict()
for t, trial in enumerate(trials):
        vals = trial.get('misc').get('vals')
        z = eval_hyperopt_space(space, vals)
        total_trials['M'+str(t+1)] = z
#best Hyper params from hyperas
best_params = eval_hyperopt_space(space, best_run)
best_params
```

Out[11]:
```
{'Dense': 64,
 'Dense_1': 32,
 'Dropout': 0.6725241946290972,
 'choiceval': 'adam',
 'filters': 32,
 'filters_1': 32,
 'kernel_size': 7,
 'kernel_size_1': 7,
 'l2': 0.548595947917793,
 'l2_1': 0.28312064960787986,
 'lr': 0.00083263584783479,
 'lr_1': 0.0020986605171288,
 'nb_epoch': 35,
 'pool_size': 5}
```

In [18]:
```python
import keras
```

In [23]:
```python
#Hyperas model
def model_hyperas(space,verbose=1):
    np.random.seed(0)
    tf.set_random_seed(0)
    sess = tf.Session(graph=tf.get_default_graph())
    K.set_session(sess)
    # Initiliazing the sequential model
    model = Sequential()
    model.add(Conv1D(filters=space['filters'], kernel_size=space['kernel_size'],activation='relu',
                     kernel_initializer='he_uniform',
                     kernel_regularizer=l2(space['l2']),input_shape=(128,9)))
    model.add(Conv1D(filters=space['filters_1'], kernel_size=space['kernel_size_1'],
                activation='relu',kernel_regularizer=l2(space['l2_1']),kernel_initializer='he_uniform'))
    model.add(Dropout(space['Dropout']))
    model.add(MaxPooling1D(pool_size=space['pool_size']))
    model.add(Flatten())
    model.add(Dense(space['Dense'], activation='relu'))
    model.add(Dense(3, activation='softmax'))
    adam = keras.optimizers.Adam(lr=space['lr'])
    rmsprop = keras.optimizers.RMSprop(lr=space['lr_1'])
    choiceval = space['choiceval']
    if choiceval == 'adam':
        optim = adam
    else:
        optim = rmsprop
    print(model.summary())
    model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
    result = model.fit(X_train_d, Y_train_d,
                    batch_size=space['Dense_1'],
                    nb_epoch=space['nb_epoch'],
                    verbose=verbose,
                    validation_data=(X_val_d, Y_val_d))
    #K.clear_session()
    return model,result
```

```
In [24]: best_model,result = model_hyperas(best_params)
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048
_____
conv1d_2 (Conv1D)            (None, 116, 32)           7200
_____
dropout_1 (Dropout)          (None, 116, 32)           0
_____
max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0
_____
flatten_1 (Flatten)          (None, 736)               0
_____
dense_1 (Dense)              (None, 64)                47168
_____
dense_2 (Dense)              (None, 3)                 195
=================================================================
Total params: 56,611
Trainable params: 56,611
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/35
3285/3285 [==============================] - 2s 553us/step - loss: 36.5170 - acc: 0.6493 - val_loss: 21.6438
- val_acc: 0.6936
Epoch 2/35
3285/3285 [==============================] - 1s 331us/step - loss: 13.4174 - acc: 0.9428 - val_loss: 7.9785 -
val_acc: 0.9250
Epoch 3/35
3285/3285 [==============================] - 1s 320us/step - loss: 4.8053 - acc: 0.9772 - val_loss: 3.1436 -
val_acc: 0.8457
Epoch 4/35
3285/3285 [==============================] - 1s 319us/step - loss: 1.7396 - acc: 0.9851 - val_loss: 1.3414 -
val_acc: 0.9423
Epoch 5/35
3285/3285 [==============================] - 1s 319us/step - loss: 0.6754 - acc: 0.9921 - val_loss: 0.7540 -
val_acc: 0.9517
Epoch 6/35
3285/3285 [==============================] - 1s 316us/step - loss: 0.3342 - acc: 0.9906 - val_loss: 0.5434 -
val_acc: 0.9654
Epoch 7/35
3285/3285 [==============================] - 1s 316us/step - loss: 0.2152 - acc: 0.9930 - val_loss: 0.5026 -
```

```
val_acc: 0.9308
Epoch 8/35
3285/3285 [==============================] - 1s 322us/step - loss: 0.1851 - acc: 0.9918 - val_loss: 0.4687 -
val_acc: 0.9207
Epoch 9/35
3285/3285 [==============================] - 1s 320us/step - loss: 0.1573 - acc: 0.9954 - val_loss: 0.3979 -
val_acc: 0.9589
Epoch 10/35
3285/3285 [==============================] - 1s 320us/step - loss: 0.1468 - acc: 0.9960 - val_loss: 0.4149 -
val_acc: 0.9293
Epoch 11/35
3285/3285 [==============================] - 1s 330us/step - loss: 0.1295 - acc: 0.9960 - val_loss: 0.3815 -
val_acc: 0.9495
Epoch 12/35
3285/3285 [==============================] - 1s 325us/step - loss: 0.1278 - acc: 0.9942 - val_loss: 0.3490 -
val_acc: 0.9762
Epoch 13/35
3285/3285 [==============================] - 1s 326us/step - loss: 0.1144 - acc: 0.9960 - val_loss: 0.3637 -
val_acc: 0.9726
Epoch 14/35
3285/3285 [==============================] - 1s 320us/step - loss: 0.1066 - acc: 0.9979 - val_loss: 0.3378 -
val_acc: 0.9553
Epoch 15/35
3285/3285 [==============================] - 1s 320us/step - loss: 0.1332 - acc: 0.9896 - val_loss: 0.3065 -
val_acc: 0.9719
Epoch 16/35
3285/3285 [==============================] - 1s 322us/step - loss: 0.1043 - acc: 0.9973 - val_loss: 0.3214 -
val_acc: 0.9654
Epoch 17/35
3285/3285 [==============================] - 1s 320us/step - loss: 0.1074 - acc: 0.9951 - val_loss: 0.2908 -
val_acc: 0.9712
Epoch 18/35
3285/3285 [==============================] - 1s 319us/step - loss: 0.0913 - acc: 0.9982 - val_loss: 0.3016 -
val_acc: 0.9625
Epoch 19/35
3285/3285 [==============================] - 1s 317us/step - loss: 0.1172 - acc: 0.9884 - val_loss: 0.2784 -
val_acc: 0.9805
Epoch 20/35
3285/3285 [==============================] - 1s 318us/step - loss: 0.1035 - acc: 0.9921 - val_loss: 0.2836 -
val_acc: 0.9632
Epoch 21/35
3285/3285 [==============================] - 1s 317us/step - loss: 0.0959 - acc: 0.9948 - val_loss: 0.2899 -
val_acc: 0.9769
```

```
Epoch 22/35
3285/3285 [==============================] - 1s 319us/step - loss: 0.0769 - acc: 0.9994 - val_loss: 0.2944 -
val_acc: 0.9690
Epoch 23/35
3285/3285 [==============================] - 1s 319us/step - loss: 0.0766 - acc: 0.9985 - val_loss: 0.2612 -
val_acc: 0.9697
Epoch 24/35
3285/3285 [==============================] - 1s 319us/step - loss: 0.1604 - acc: 0.9732 - val_loss: 0.4175 -
val_acc: 0.8940
Epoch 25/35
3285/3285 [==============================] - 1s 316us/step - loss: 0.1246 - acc: 0.9951 - val_loss: 0.2583 -
val_acc: 0.9676
Epoch 26/35
3285/3285 [==============================] - 1s 317us/step - loss: 0.0749 - acc: 0.9997 - val_loss: 0.2711 -
val_acc: 0.9553
Epoch 27/35
3285/3285 [==============================] - 1s 318us/step - loss: 0.0703 - acc: 0.9997 - val_loss: 0.2728 -
val_acc: 0.9712
Epoch 28/35
3285/3285 [==============================] - 1s 318us/step - loss: 0.0794 - acc: 0.9957 - val_loss: 0.2454 -
val_acc: 0.9813
Epoch 29/35
3285/3285 [==============================] - 1s 316us/step - loss: 0.0679 - acc: 0.9985 - val_loss: 0.2333 -
val_acc: 0.9798
Epoch 30/35
3285/3285 [==============================] - 1s 318us/step - loss: 0.0769 - acc: 0.9942 - val_loss: 0.2243 -
val_acc: 0.9805
Epoch 31/35
3285/3285 [==============================] - 1s 318us/step - loss: 0.0952 - acc: 0.9924 - val_loss: 0.2394 -
val_acc: 0.9805
Epoch 32/35
3285/3285 [==============================] - 1s 323us/step - loss: 0.0615 - acc: 0.9994 - val_loss: 0.2289 -
val_acc: 0.9820
Epoch 33/35
3285/3285 [==============================] - 1s 318us/step - loss: 0.0574 - acc: 0.9988 - val_loss: 0.2460 -
val_acc: 0.9726
Epoch 34/35
3285/3285 [==============================] - 1s 316us/step - loss: 0.1272 - acc: 0.9784 - val_loss: 0.4408 -
val_acc: 0.9250
Epoch 35/35
3285/3285 [==============================] - 1s 318us/step - loss: 0.1743 - acc: 0.9860 - val_loss: 0.2274 -
val_acc: 0.9704
```

In [21]: `_,acc_val = best_model.evaluate(X_val_d,Y_val_d,verbose=0)`
`_,acc_train = best_model.evaluate(X_train_d,Y_train_d,verbose=0)`
`print('Train_accuracy',acc_train,'test_accuracy',acc_val)`

```
Train_accuracy 1.0 test_accuracy 0.9704397981254506
```

We can observe that some models are having around 0.99 accuracy for some epochs. will investgate some models(model 59, 99).

In [47]: `M59 = total_trials['M59']`
`M59`

Out[47]:
```
{'Dense': 32,
 'Dense_1': 32,
 'Dropout': 0.48642317342570957,
 'choiceval': 'adam',
 'filters': 32,
 'filters_1': 32,
 'kernel_size': 7,
 'kernel_size_1': 7,
 'l2': 0.10401484931072974,
 'l2_1': 0.7228970346142163,
 'lr': 0.000772514731035696,
 'lr_1': 0.003074353392879209,
 'nb_epoch': 35,
 'pool_size': 5}
```

In [62]:
```python
K.clear_session()
M59['nb_epoch'] = 70
best_model_all,result = model_hyperas(M59)
```

```
Layer (type)                  Output Shape               Param #
=================================================================
conv1d_1 (Conv1D)             (None, 122, 32)            2048

conv1d_2 (Conv1D)             (None, 116, 32)            7200

dropout_1 (Dropout)           (None, 116, 32)            0

max_pooling1d_1 (MaxPooling1  (None, 23, 32)             0

flatten_1 (Flatten)           (None, 736)                0

dense_1 (Dense)               (None, 32)                 23584

dense_2 (Dense)               (None, 3)                  99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/70
3285/3285 [==============================] - 2s 597us/step - loss: 30.8432 - acc: 0.5963 - val_loss: 14.3953
 - val_acc: 0.7808
Epoch 2/70
3285/3285 [==============================] - 1s 312us/step - loss: 7.8188 - acc: 0.9209 - val_loss: 4.0805 -
val_acc: 0.8926
Epoch 3/70
3285/3285 [==============================] - 1s 313us/step - loss: 2.3103 - acc: 0.9863 - val_loss: 1.6611 -
val_acc: 0.8666
Epoch 4/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.9391 - acc: 0.9875 - val_loss: 0.8736 -
val_acc: 0.9452
Epoch 5/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.4885 - acc: 0.9933 - val_loss: 0.6108 -
val_acc: 0.9459
Epoch 6/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.3024 - acc: 0.9948 - val_loss: 0.4641 -
val_acc: 0.9582
Epoch 7/70
3285/3285 [==============================] - 1s 313us/step - loss: 0.2201 - acc: 0.9954 - val_loss: 0.4053 -
```

```
val_acc: 0.9582
Epoch 8/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.1842 - acc: 0.9942 - val_loss: 0.4262 -
val_acc: 0.9056
Epoch 9/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.1602 - acc: 0.9967 - val_loss: 0.3393 -
val_acc: 0.9495
Epoch 10/70
3285/3285 [==============================] - 1s 313us/step - loss: 0.1459 - acc: 0.9970 - val_loss: 0.4134 -
val_acc: 0.8832
Epoch 11/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.1402 - acc: 0.9945 - val_loss: 0.3054 -
val_acc: 0.9611
Epoch 12/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.1285 - acc: 0.9970 - val_loss: 0.3474 -
val_acc: 0.9120
Epoch 13/70
3285/3285 [==============================] - 1s 317us/step - loss: 0.1155 - acc: 0.9985 - val_loss: 0.2674 -
val_acc: 0.9733
Epoch 14/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.1013 - acc: 0.9997 - val_loss: 0.2624 -
val_acc: 0.9726
Epoch 15/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.1029 - acc: 0.9967 - val_loss: 0.2534 -
val_acc: 0.9769
Epoch 16/70
3285/3285 [==============================] - 1s 313us/step - loss: 0.0954 - acc: 0.9985 - val_loss: 0.2426 -
val_acc: 0.9798
Epoch 17/70
3285/3285 [==============================] - 1s 313us/step - loss: 0.0997 - acc: 0.9960 - val_loss: 0.2372 -
val_acc: 0.9733
Epoch 18/70
3285/3285 [==============================] - 1s 313us/step - loss: 0.0949 - acc: 0.9973 - val_loss: 0.2542 -
val_acc: 0.9560
Epoch 19/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.1709 - acc: 0.9744 - val_loss: 0.2684 -
val_acc: 0.9863
Epoch 20/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.1247 - acc: 0.9970 - val_loss: 0.2157 -
val_acc: 0.9791
Epoch 21/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0822 - acc: 0.9994 - val_loss: 0.2185 -
val_acc: 0.9769
```

```
Epoch 22/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.0757 - acc: 0.9994 - val_loss: 0.2226 -
val_acc: 0.9712
Epoch 23/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0787 - acc: 0.9985 - val_loss: 0.2192 -
val_acc: 0.9704
Epoch 24/70
3285/3285 [==============================] - 1s 315us/step - loss: 0.0778 - acc: 0.9985 - val_loss: 0.2143 -
val_acc: 0.9762
Epoch 25/70
3285/3285 [==============================] - 1s 323us/step - loss: 0.0711 - acc: 0.9991 - val_loss: 0.2230 -
val_acc: 0.9683
Epoch 26/70
3285/3285 [==============================] - 1s 314us/step - loss: 0.0691 - acc: 1.0000 - val_loss: 0.2136 -
val_acc: 0.9625
Epoch 27/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.0662 - acc: 0.9997 - val_loss: 0.2110 -
val_acc: 0.9726
Epoch 28/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0678 - acc: 0.9988 - val_loss: 0.2034 -
val_acc: 0.9733
Epoch 29/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0651 - acc: 0.9988 - val_loss: 0.2382 -
val_acc: 0.9409
Epoch 30/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0836 - acc: 0.9939 - val_loss: 0.1809 -
val_acc: 0.9776
Epoch 31/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0618 - acc: 0.9991 - val_loss: 0.1661 -
val_acc: 0.9813
Epoch 32/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0718 - acc: 0.9942 - val_loss: 0.2447 -
val_acc: 0.9243
Epoch 33/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0659 - acc: 0.9988 - val_loss: 0.1770 -
val_acc: 0.9798
Epoch 34/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0736 - acc: 0.9939 - val_loss: 0.2253 -
val_acc: 0.9488
Epoch 35/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.1024 - acc: 0.9872 - val_loss: 0.2004 -
val_acc: 0.9697
Epoch 36/70
```

```
3285/3285 [==============================] - 1s 311us/step - loss: 0.0790 - acc: 0.9967 - val_loss: 0.1588 -
val_acc: 0.9834
Epoch 37/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0555 - acc: 0.9991 - val_loss: 0.1750 -
val_acc: 0.9719
Epoch 38/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0731 - acc: 0.9945 - val_loss: 0.1918 -
val_acc: 0.9668
Epoch 39/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0523 - acc: 0.9997 - val_loss: 0.1727 -
val_acc: 0.9784
Epoch 40/70
3285/3285 [==============================] - 1s 313us/step - loss: 0.0496 - acc: 0.9997 - val_loss: 0.1779 -
val_acc: 0.9791
Epoch 41/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.0468 - acc: 1.0000 - val_loss: 0.1658 -
val_acc: 0.9798
Epoch 42/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.1016 - acc: 0.9860 - val_loss: 0.2262 -
val_acc: 0.9474
Epoch 43/70
3285/3285 [==============================] - 1s 312us/step - loss: 0.1060 - acc: 0.9896 - val_loss: 0.1898 -
val_acc: 0.9567
Epoch 44/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0531 - acc: 0.9997 - val_loss: 0.1729 -
val_acc: 0.9762
Epoch 45/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0484 - acc: 1.0000 - val_loss: 0.1584 -
val_acc: 0.9798
Epoch 46/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0448 - acc: 1.0000 - val_loss: 0.1779 -
val_acc: 0.9719
Epoch 47/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0447 - acc: 0.9997 - val_loss: 0.1695 -
val_acc: 0.9748
Epoch 48/70
3285/3285 [==============================] - 1s 309us/step - loss: 0.0443 - acc: 0.9997 - val_loss: 0.1743 -
val_acc: 0.9676
Epoch 49/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0435 - acc: 1.0000 - val_loss: 0.1537 -
val_acc: 0.9813
Epoch 50/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0445 - acc: 0.9994 - val_loss: 0.1616 -
```

```
val_acc: 0.9784
Epoch 51/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0477 - acc: 0.9979 - val_loss: 0.1727 -
val_acc: 0.9668
Epoch 52/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0388 - acc: 1.0000 - val_loss: 0.1729 -
val_acc: 0.9661
Epoch 53/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0387 - acc: 1.0000 - val_loss: 0.1752 -
val_acc: 0.9726
Epoch 54/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0454 - acc: 0.9985 - val_loss: 0.1591 -
val_acc: 0.9791
Epoch 55/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0723 - acc: 0.9918 - val_loss: 0.3355 -
val_acc: 0.9185
Epoch 56/70
3285/3285 [==============================] - 1s 309us/step - loss: 0.0712 - acc: 0.9973 - val_loss: 0.1457 -
val_acc: 0.9798
Epoch 57/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0404 - acc: 1.0000 - val_loss: 0.1419 -
val_acc: 0.9784
Epoch 58/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0399 - acc: 0.9994 - val_loss: 0.2314 -
val_acc: 0.9171
Epoch 59/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0866 - acc: 0.9875 - val_loss: 0.3363 -
val_acc: 0.9193
Epoch 60/70
3285/3285 [==============================] - 1s 308us/step - loss: 0.0687 - acc: 0.9973 - val_loss: 0.1326 -
val_acc: 0.9784
Epoch 61/70
3285/3285 [==============================] - 1s 309us/step - loss: 0.0385 - acc: 1.0000 - val_loss: 0.1571 -
val_acc: 0.9755
Epoch 62/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0370 - acc: 1.0000 - val_loss: 0.1691 -
val_acc: 0.9661
Epoch 63/70
3285/3285 [==============================] - 1s 309us/step - loss: 0.0416 - acc: 0.9985 - val_loss: 0.1648 -
val_acc: 0.9784
Epoch 64/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0354 - acc: 0.9997 - val_loss: 0.1901 -
val_acc: 0.9640
```

```
Epoch 65/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0348 - acc: 0.9997 - val_loss: 0.1648 -
val_acc: 0.9726
Epoch 66/70
3285/3285 [==============================] - 1s 309us/step - loss: 0.0340 - acc: 1.0000 - val_loss: 0.1467 -
val_acc: 0.9805
Epoch 67/70
3285/3285 [==============================] - 1s 309us/step - loss: 0.0327 - acc: 0.9997 - val_loss: 0.1658 -
val_acc: 0.9755
Epoch 68/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0624 - acc: 0.9921 - val_loss: 0.3186 -
val_acc: 0.9185
Epoch 69/70
3285/3285 [==============================] - 1s 310us/step - loss: 0.0514 - acc: 0.9976 - val_loss: 0.1876 -
val_acc: 0.9755
Epoch 70/70
3285/3285 [==============================] - 1s 311us/step - loss: 0.0376 - acc: 0.9994 - val_loss: 0.1400 -
val_acc: 0.9769
```

```
In [64]: plt.figure(figsize=(12,8))
         plt.plot(result.history['loss'],label='Train loss')
         plt.plot(result.history['val_loss'],label = 'Validation loss')
         plt.xlabel('epoch no')
         plt.ylabel('loss')
         plt.legend()
         plt.show()
```
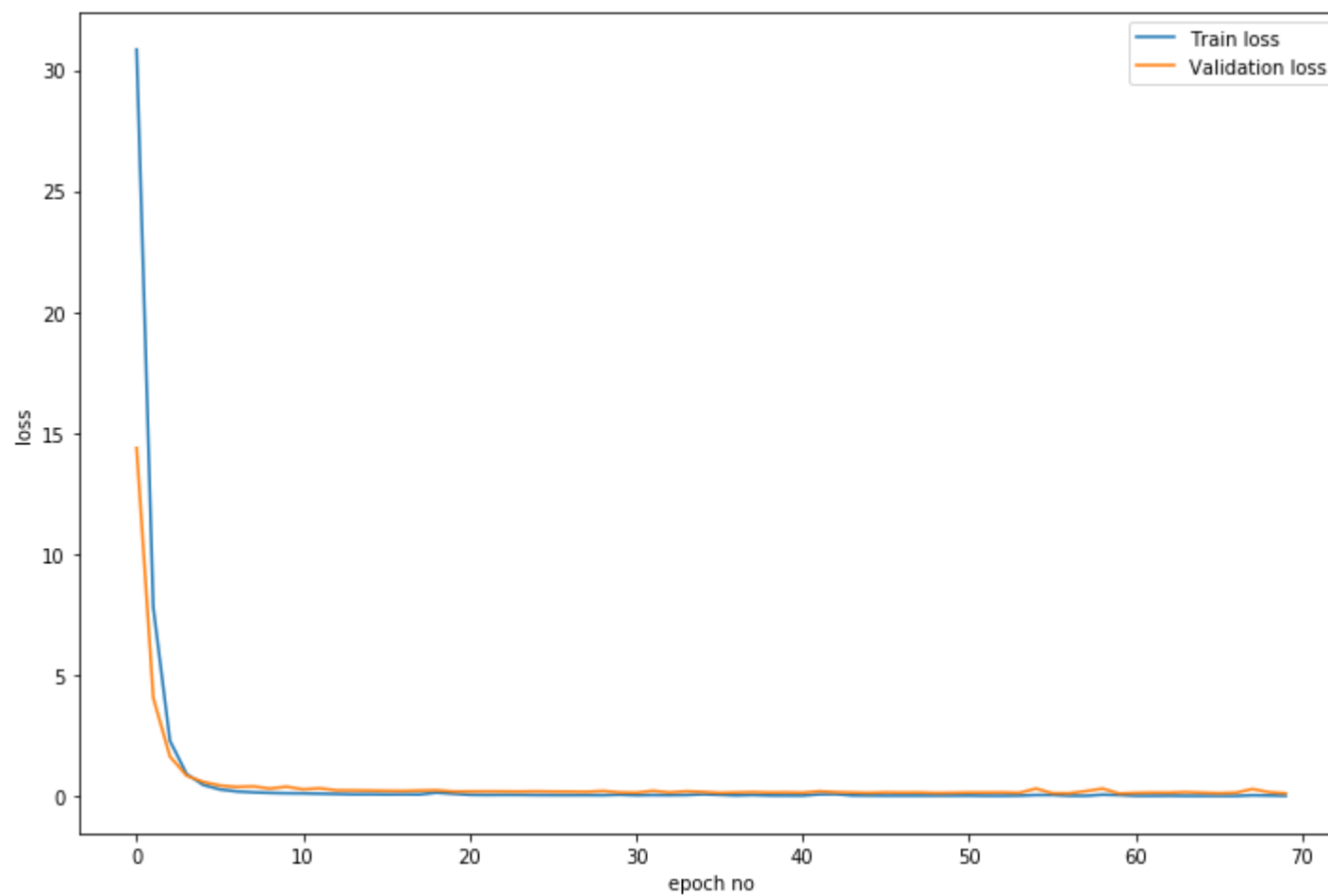
```
In [65]: plt.figure(figsize=(12,8))
         plt.plot(result.history['acc'],label='Train acc')
         plt.plot(result.history['val_acc'],label = 'Validation acc')
         plt.xlabel('epoch no')
         plt.ylabel('acc')
         plt.legend()
         plt.show()
```
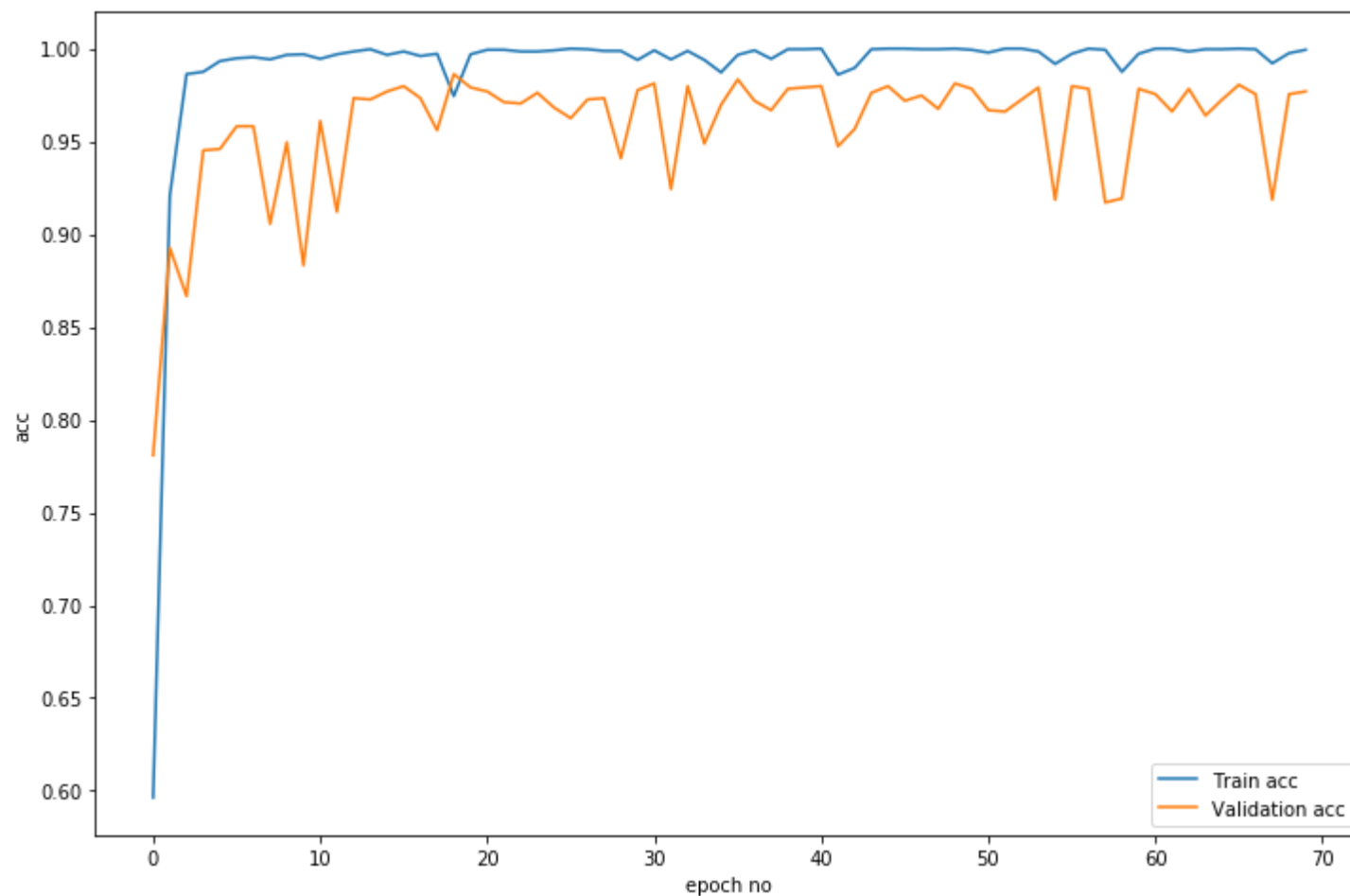
```
In [45]: ##upto 19 epoces will give good score
         K.clear_session()
         M59['nb_epoch'] = 19
         best_model,result = model_hyperas(M59)
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_1 (Conv1D)            (None, 122, 32)           2048

conv1d_2 (Conv1D)            (None, 116, 32)           7200

dropout_1 (Dropout)          (None, 116, 32)           0

max_pooling1d_1 (MaxPooling1 (None, 23, 32)            0

flatten_1 (Flatten)          (None, 736)               0

dense_1 (Dense)              (None, 32)                23584

dense_2 (Dense)              (None, 3)                 99
=================================================================
Total params: 32,931
Trainable params: 32,931
Non-trainable params: 0
_____
None
Train on 3285 samples, validate on 1387 samples
Epoch 1/19
3285/3285 [==============================] - 2s 587us/step - loss: 30.8432 - acc: 0.5963 - val_loss: 14.3953
- val_acc: 0.7808
Epoch 2/19
3285/3285 [==============================] - 1s 311us/step - loss: 7.8188 - acc: 0.9209 - val_loss: 4.0805 -
val_acc: 0.8926
Epoch 3/19
3285/3285 [==============================] - 1s 312us/step - loss: 2.3103 - acc: 0.9863 - val_loss: 1.6611 -
val_acc: 0.8666
Epoch 4/19
3285/3285 [==============================] - 1s 310us/step - loss: 0.9391 - acc: 0.9875 - val_loss: 0.8736 -
val_acc: 0.9452
Epoch 5/19
3285/3285 [==============================] - 1s 311us/step - loss: 0.4885 - acc: 0.9933 - val_loss: 0.6108 -
val_acc: 0.9459
Epoch 6/19
3285/3285 [==============================] - 1s 311us/step - loss: 0.3024 - acc: 0.9948 - val_loss: 0.4641 -
val_acc: 0.9582
Epoch 7/19
3285/3285 [==============================] - 1s 313us/step - loss: 0.2201 - acc: 0.9954 - val_loss: 0.4053 -
```

```
val_acc: 0.9582
Epoch 8/19
3285/3285 [==============================] - 1s 312us/step - loss: 0.1842 - acc: 0.9942 - val_loss: 0.4262 -
val_acc: 0.9056
Epoch 9/19
3285/3285 [==============================] - 1s 310us/step - loss: 0.1602 - acc: 0.9967 - val_loss: 0.3393 -
val_acc: 0.9495
Epoch 10/19
3285/3285 [==============================] - 1s 312us/step - loss: 0.1459 - acc: 0.9970 - val_loss: 0.4134 -
val_acc: 0.8832
Epoch 11/19
3285/3285 [==============================] - 1s 312us/step - loss: 0.1402 - acc: 0.9945 - val_loss: 0.3054 -
val_acc: 0.9611
Epoch 12/19
3285/3285 [==============================] - 1s 313us/step - loss: 0.1285 - acc: 0.9970 - val_loss: 0.3474 -
val_acc: 0.9120
Epoch 13/19
3285/3285 [==============================] - 1s 312us/step - loss: 0.1155 - acc: 0.9985 - val_loss: 0.2674 -
val_acc: 0.9733
Epoch 14/19
3285/3285 [==============================] - 1s 310us/step - loss: 0.1013 - acc: 0.9997 - val_loss: 0.2624 -
val_acc: 0.9726
Epoch 15/19
3285/3285 [==============================] - 1s 315us/step - loss: 0.1029 - acc: 0.9967 - val_loss: 0.2534 -
val_acc: 0.9769
Epoch 16/19
3285/3285 [==============================] - 1s 312us/step - loss: 0.0954 - acc: 0.9985 - val_loss: 0.2426 -
val_acc: 0.9798
Epoch 17/19
3285/3285 [==============================] - 1s 313us/step - loss: 0.0997 - acc: 0.9960 - val_loss: 0.2372 -
val_acc: 0.9733
Epoch 18/19
3285/3285 [==============================] - 1s 310us/step - loss: 0.0949 - acc: 0.9973 - val_loss: 0.2542 -
val_acc: 0.9560
Epoch 19/19
3285/3285 [==============================] - 1s 313us/step - loss: 0.1709 - acc: 0.9744 - val_loss: 0.2684 -
val_acc: 0.9863
```

In [49]:
```python
from sklearn import metrics
ACTIVITIES = {
    0: 'WALKING',
    1: 'WALKING_UPSTAIRS',
    2: 'WALKING_DOWNSTAIRS',
}

# Utility function to print the confusion matrix
def confusion_matrix_cnn(Y_true, Y_pred):
    Y_true = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_true, axis=1)])
    Y_pred = pd.Series([ACTIVITIES[y] for y in np.argmax(Y_pred, axis=1)])

    #return pd.crosstab(Y_true, Y_pred, rownames=['True'], colnames=['Pred'])
    return metrics.confusion_matrix(Y_true, Y_pred)

# Confusion Matrix
print(confusion_matrix_cnn(Y_val_d, best_model.predict(X_val_d)))
```
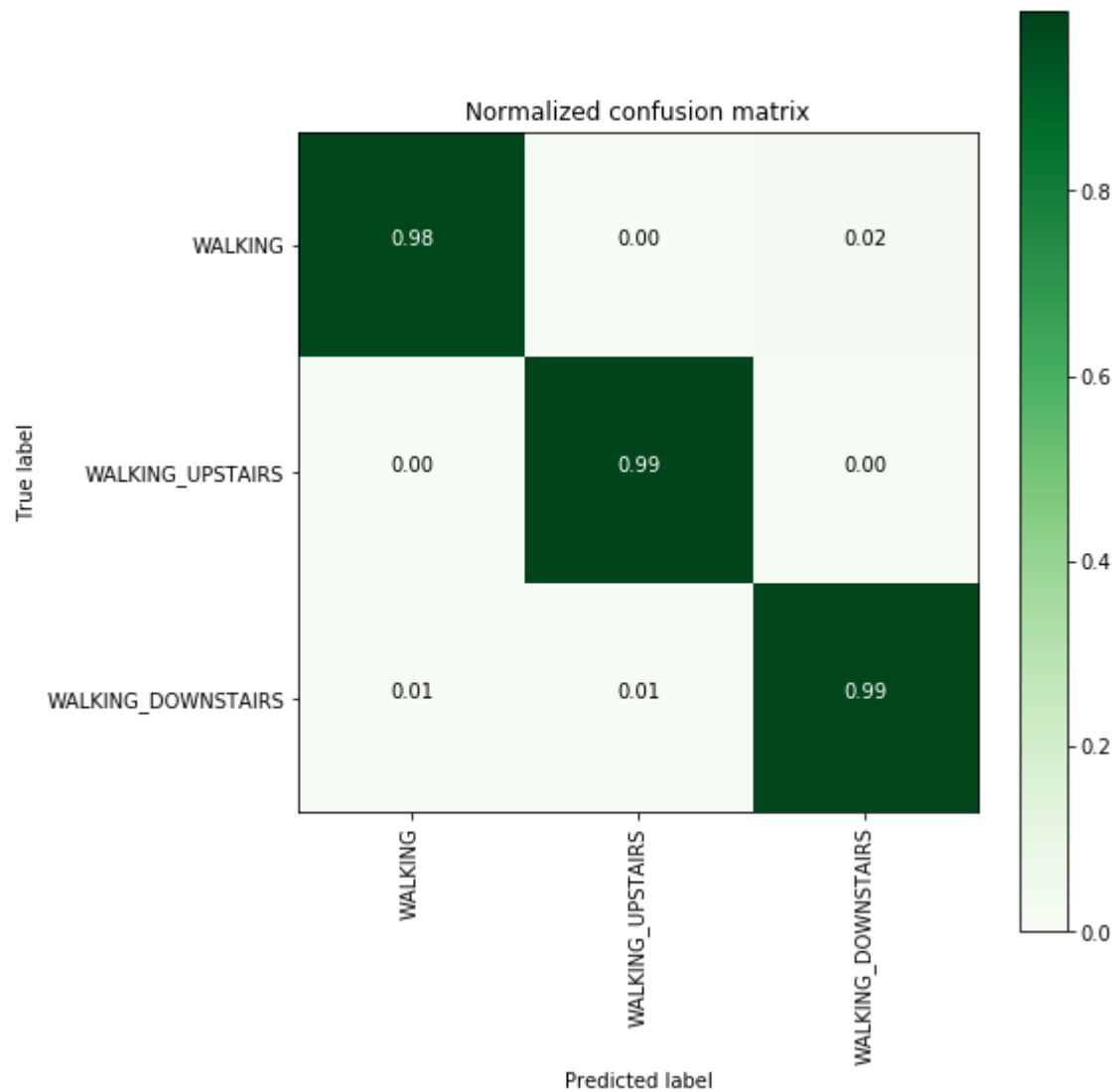
```
[[486   0  10]
 [  1 417   2]
 [  3   3 465]]
```

```
In [57]: plt.figure(figsize=(8,8))
         cm = confusion_matrix_cnn(Y_val_d, best_model.predict(X_val_d))
         plot_confusion_matrix(cm, classes=['WALKING','WALKING_UPSTAIRS','WALKING_DOWNSTAIRS'],
                               normalize=True, title='Normalized confusion matrix', cmap = plt.cm.Greens)
         plt.show()
```

<matplotlib.figure.Figure at 0x147481785470>

it is also giving good scores than previous

```
In [58]: #saving model
         best_model.save('final_model_dynamic.h5')
```

```python
In [154]: def data():
              """
              Obtain the dataset from multiple files.
              Returns: X_train, X_test, y_train, y_test
              """
              # Data directory
              DATADIR = 'UCI_HAR_Dataset'
              # Raw data signals
              # Signals are from Accelerometer and Gyroscope
              # The signals are in x,y,z directions
              # Sensor signals are filtered to have only body acceleration
              # excluding the acceleration due to gravity
              # Triaxial acceleration from the accelerometer is total acceleration
              SIGNALS = [
                  "body_acc_x",
                  "body_acc_y",
                  "body_acc_z",
                  "body_gyro_x",
                  "body_gyro_y",
                  "body_gyro_z",
                  "total_acc_x",
                  "total_acc_y",
                  "total_acc_z"
                  ]
              # Utility function to read the data from csv file
              def _read_csv(filename):
                  return pd.read_csv(filename, delim_whitespace=True, header=None)

              # Utility function to load the load
              def load_signals(subset):
                  signals_data = []

                  for signal in SIGNALS:
                      filename = f'UCI_HAR_Dataset/{subset}/Inertial Signals/{signal}_{subset}.txt'
                      signals_data.append( _read_csv(filename).as_matrix())

                      # Transpose is used to change the dimensionality of the output,
                      # aggregating the signals by combination of sample/timestep.
                      # Resultant shape is (7352 train/2947 test samples, 128 timesteps, 9 signals)
                      return np.transpose(signals_data, (1, 2, 0))

              def load_y(subset):
```

```
        """
        The objective that we are trying to predict is a integer, from 1 to 6,
        that represents a human activity. We return a binary representation of
        every sample objective as a 6 bits vector using One Hot Encoding
        (https://pandas.pydata.org/pandas-docs/stable/generated/pandas.get_dummies.html)
        """
        filename = f'UCI_HAR_Dataset/{subset}/y_{subset}.txt'
        y = _read_csv(filename)[0]
        return y

    X_train, X_val = load_signals('train'), load_signals('test')
    Y_train, Y_val = load_y('train'), load_y('test')

    return X_train, Y_train, X_val,  Y_val
```

In [155]:
```
X_train, Y_train, X_val,  Y_val = data()
```

In [167]:
```
print('shape of test Y',Y_val.shape)
```

```
shape of test Y (2947,)
```

Final prediction pipeline

In [159]:
```
##loading keras models and picle files for scaling data
from keras.models import load_model
import pickle
model_2class = load_model('final_model_2class.h5')
model_dynamic = load_model('final_model_dynamic.h5')
model_static = load_model('final_model_static.h5')
scale_2class = pickle.load(open('Scale_2class.p','rb'))
scale_static = pickle.load(open('Scale_static.p','rb'))
scale_dynamic = pickle.load(open('Scale_dynamic.p','rb'))
```

In [162]:
```
##scaling the data
def transform_data(X,scale):
    X_temp = X.reshape((X.shape[0] * X.shape[1], X.shape[2]))
    X_temp = scale.transform(X_temp)
    return X_temp.reshape(X.shape)
```

In [169]:
```python
#predicting output activity
def predict_activity(X):
    ##predicting whether dynamic or static
    predict_2class = model_2class.predict(transform_data(X,scale_2class))
    Y_pred_2class =  np.argmax(predict_2class, axis=1)
    #static data filter
    X_static = X[Y_pred_2class==1]
    #dynamic data filter
    X_dynamic = X[Y_pred_2class==0]
    #predicting static activities
    predict_static = model_static.predict(transform_data(X_static,scale_static))
    predict_static = np.argmax(predict_static,axis=1)
    #adding 4 because need to get inal prediction lable as output
    predict_static = predict_static + 4
    #predicting dynamic activites
    predict_dynamic = model_dynamic.predict(transform_data(X_dynamic,scale_dynamic))
    predict_dynamic = np.argmax(predict_dynamic,axis=1)
    #adding 1 because need to get inal prediction lable as output
    predict_dynamic = predict_dynamic + 1
    ##appending final output to one list in the same sequence of input data
    i,j = 0,0
    final_pred = []
    for mask in Y_pred_2class:
        if mask == 1:
            final_pred.append(predict_static[i])
            i = i + 1
        else:
            final_pred.append(predict_dynamic[j])
            j = j + 1
    return final_pred
```

In [170]:
```python
##predicting
final_pred_val = predict_activity(X_val)
final_pred_train = predict_activity(X_train)
```

In [173]:
```python
##accuracy of train and test
from sklearn.metrics import accuracy_score
print('Accuracy of train data',accuracy_score(Y_train,final_pred_train))
print('Accuracy of validation data',accuracy_score(Y_val,final_pred_val))
```

```
Accuracy of train data 0.9832698585418934
Accuracy of validation data 0.9684424838819138
```

In [182]:
```python
#confusion metric
cm = metrics.confusion_matrix(Y_val, final_pred_val,labels=range(1,7))
cm
```

Out[182]:
```
array([[486,  10,   0,   0,   0,   0],
       [  3, 465,   3,   0,   0,   0],
       [  1,   2, 417,   0,   0,   0],
       [  1,   2,   0, 447,  41,   0],
       [  0,   0,   0,  27, 505,   0],
       [  0,   0,   0,   3,   0, 534]])
```

```python
In [184]: plt.figure(figsize=(8,8))
          labels=['WALKING','WALKING_UPSTAIRS','WALKING_DOWNSTAIRS','SITTING','STANDING','LAYING']
          plot_confusion_matrix(cm, classes=labels,
                       normalize=True, title='Normalized confusion matrix', cmap = plt.cm.Greens)
          plt.show()
```


Normalized confusion matrix
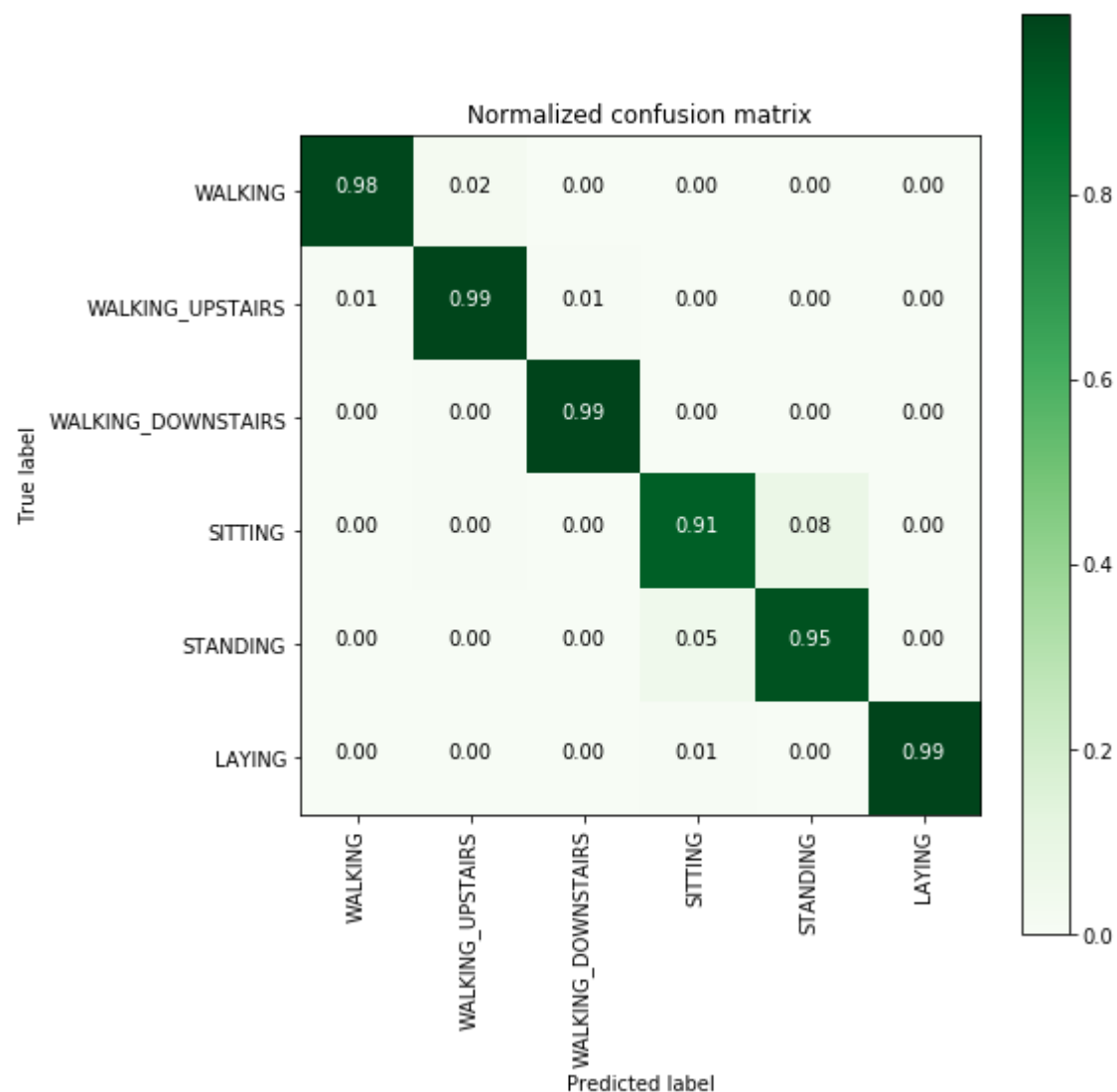
Divide and Conquer approch with CNN is giving good result with final test accuracy of ~0.97. and train accuracy ~0.98.

In [ ]: