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

- ***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

In [1]:

```
import numpy as np
import pandas as pd
```

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(3)
```

Out[3]:

	tBodyAccmeanX	tBodyAccmeanY	tBodyAccmeanZ	tBodyAccstdX	tBodyAccstdY	tBodyAccstdZ	tBodyAccmadX	tBodyAccmadY	t
0	0.288585	-0.020294	-0.132905	-0.995279	-0.983111	-0.913526	-0.995112	-0.983185	
1	0.278419	-0.016411	-0.123520	-0.998245	-0.975300	-0.960322	-0.998807	-0.974914	
2	0.279653	-0.019467	-0.113462	-0.995380	-0.967187	-0.978944	-0.996520	-0.963668	

3 rows × 564 columns

In [3]:

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

In [4]:

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

In [5]:

```
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 [7]:

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

Function to plot the confusion matrix

In [8]:

```
import itertools
import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import confusion_matrix
plt.rcParams["font.family"] = 'DejaVu Sans'

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 [9]:

```
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:
        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
```

In [10]:

```
# Importing tensorflow
np.random.seed(36)
import tensorflow as tf
tf.set_random_seed(36)
```

```
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:519:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint8 = np.dtype([("qint8", np.int8, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:520:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint8 = np.dtype([("quint8", np.uint8, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:521:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint16 = np.dtype([("qint16", np.int16, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:522:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint16 = np.dtype([("quint16", np.uint16, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:523:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint32 = np.dtype([("qint32", np.int32, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:528:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  np_resource = np.dtype([("resource", np.ubyte, 1)])
```

In [ ]:

```
#https://github.com/maxpumperla/hyperas
#how to tune hyperparameters for keras models
#pip install hyperas
#https://www.kaggle.com/kt66nf/hyperparameter-optimization-using-keras-hyperas
```

In [13]:

```
# 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
```

```
from keras.regularizers import l2
import keras
```

In [17]:

```
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 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 [34]:

```
##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()


    # 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)

    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 [ ]:

```
###############this took almost 6 hours to run,so please be patient while running this############
```

In [36]:

```
##gives train and validation data
#https://www.kaggle.com/kt66nf/hyperparameter-optimization-using-keras-hyperas
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 = 'HAR_PREDICTION_MODELS',
                                    return_space = True)
```

```
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:35: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:51: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
```

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

try:
    import numpy as np
except:
    pass

try:
    import pandas as pd
except:
    pass

try:
    import itertools
except:
    pass

try:
```

```
  -
    import numpy as np
except:
    pass

try:
    import matplotlib.pyplot as plt
except:
    pass

try:
    from sklearn.metrics import confusion_matrix
except:
    pass

try:
    from datetime import datetime
except:
    pass

try:
    import tensorflow as tf
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:
    from hyperas.utils import eval_hyperopt_space
except:
    pass

try:
    from keras.regularizers import l2
except:
    pass

try:
    import keras
except:
    pass

try:
    from keras.models import load_model
except:
    pass

try:
    from sklearn.externals import joblib
except:
```

```
    pass

try:
    import tensorflow as tf
except:
    pass

>>> Hyperas search space:

def get_space():
    return {
        'LSTM': hp.choice('LSTM', [28,32,36]),
        'l2': hp.uniform('l2', 0,0.001),
        'Dropout': hp.uniform('Dropout', 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'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'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:
   9:
  10:     # Configuring the parameters
  11:     model.add(LSTM(space['LSTM'],recurrent_regularizer=l2(space['l2']),input_shape=(128,
9),name='LSTM1_1'))
  12:     # Adding a dropout layer
  13:     model.add(Dropout(space['Dropout'],name='Dropout1_1'))
  14:     # Adding a dense output layer with sigmoid activation
  15:     model.add(Dense(6, activation='sigmoid'))
  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=16,
  33:               nb_epoch=30,
  34:               verbose=2,
  35:               validation_data=(X_val, Y_val))
  36:
  37:     score, acc = model.evaluate(X_val, Y_val, verbose=0)
  38:     print('Test accuracy:', acc)
  39:     print('-----------------------------------------------------------------------------------------
')
  40:     return {'loss': -acc, 'status': STATUS_OK, 'model': model}
  41:
```

```
/home/ubuntu/Downloads/HumanActivityRecognition_assignment/HAR/temp_model.py:137: FutureWarning: M
ethod .as_matrix will be removed in a future version. Use .values instead.
  signals_data.append( _read_csv(filename).as_matrix())


  0%|          | 0/15 [00:00<?, ?it/s, best loss: ?]

/home/ubuntu/Downloads/HumanActivityRecognition_assignment/HAR/temp_model.py:153: FutureWarning: M
ethod .as_matrix will be removed in a future version. Use .values instead.
  return pd.get_dummies(y).as_matrix()


Model: "sequential_3"
_________________________________________________________________
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
  0%|          | 0/15 [00:00<?, ?it/s, best loss: ?]
```

```
/home/ubuntu/Downloads/HumanActivityRecognition_assignment/HAR/temp_model.py:194: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epochs`.
  validation_data=(X_val, Y_val))
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 49s - loss: 1.0765 - acc: 0.5280 - val_loss: 0.8225 - val_acc: 0.6332

Epoch 2/30
 - 48s - loss: 0.6435 - acc: 0.7580 - val_loss: 0.6260 - val_acc: 0.8161

Epoch 3/30
 - 48s - loss: 0.4144 - acc: 0.8898 - val_loss: 0.5381 - val_acc: 0.8337

Epoch 4/30
 - 47s - loss: 0.3392 - acc: 0.9076 - val_loss: 0.5409 - val_acc: 0.8409

Epoch 5/30
 - 47s - loss: 0.2957 - acc: 0.9226 - val_loss: 0.7107 - val_acc: 0.8595

Epoch 6/30
 - 47s - loss: 0.2665 - acc: 0.9259 - val_loss: 0.5275 - val_acc: 0.8463

Epoch 7/30
 - 47s - loss: 0.2813 - acc: 0.9255 - val_loss: 0.7581 - val_acc: 0.8656

Epoch 8/30
 - 47s - loss: 0.2742 - acc: 0.9289 - val_loss: 0.7151 - val_acc: 0.8836

Epoch 9/30
 - 47s - loss: 0.2424 - acc: 0.9300 - val_loss: 0.5431 - val_acc: 0.8782

Epoch 10/30
 - 47s - loss: 0.2130 - acc: 0.9363 - val_loss: 0.5577 - val_acc: 0.8904

Epoch 11/30
 - 48s - loss: 0.2213 - acc: 0.9332 - val_loss: 0.5889 - val_acc: 0.8975

Epoch 12/30
 - 48s - loss: 0.2117 - acc: 0.9325 - val_loss: 0.4157 - val_acc: 0.9040

Epoch 13/30
 - 47s - loss: 0.1975 - acc: 0.9392 - val_loss: 0.7433 - val_acc: 0.8782

Epoch 14/30
 - 47s - loss: 0.2071 - acc: 0.9400 - val_loss: 0.7096 - val_acc: 0.8558

Epoch 15/30
 - 47s - loss: 0.2121 - acc: 0.9406 - val_loss: 0.4863 - val_acc: 0.8972

Epoch 16/30
 - 47s - loss: 0.2144 - acc: 0.9353 - val_loss: 0.5298 - val_acc: 0.8873

Epoch 17/30
 - 47s - loss: 0.1965 - acc: 0.9397 - val_loss: 0.5801 - val_acc: 0.8823

Epoch 18/30
 - 47s - loss: 0.1911 - acc: 0.9385 - val_loss: 0.8684 - val_acc: 0.8860

Epoch 19/30
 - 47s - loss: 0.1782 - acc: 0.9423 - val_loss: 0.9555 - val_acc: 0.8775

Epoch 20/30
 - 47s - loss: 0.1896 - acc: 0.9429 - val_loss: 0.6469 - val_acc: 0.8843

Epoch 21/30
 - 47s - loss: 0.1878 - acc: 0.9452 - val_loss: 0.8967 - val_acc: 0.8836

Epoch 22/30
 - 47s - loss: 0.2103 - acc: 0.9415 - val_loss: 0.4768 - val_acc: 0.8975

Epoch 23/30
 - 47s - loss: 0.1857 - acc: 0.9440 - val_loss: 0.5832 - val_acc: 0.8965

Epoch 24/30
```

```
Epoch 24/30
 - 47s - loss: 0.1904 - acc: 0.9414 - val_loss: 0.7450 - val_acc: 0.8975

Epoch 25/30
 - 47s - loss: 0.1863 - acc: 0.9419 - val_loss: 0.6997 - val_acc: 0.9060

Epoch 26/30
 - 47s - loss: 0.1755 - acc: 0.9460 - val_loss: 0.4977 - val_acc: 0.8911

Epoch 27/30
 - 47s - loss: 0.1712 - acc: 0.9441 - val_loss: 0.7787 - val_acc: 0.9030

Epoch 28/30
 - 47s - loss: 0.1911 - acc: 0.9437 - val_loss: 0.5952 - val_acc: 0.9040

Epoch 29/30
 - 47s - loss: 0.1894 - acc: 0.9455 - val_loss: 0.6635 - val_acc: 0.9009

Epoch 30/30
 - 48s - loss: 0.1729 - acc: 0.9491 - val_loss: 0.6771 - val_acc: 0.9087

Test accuracy:
0.9087207329487614
--------------------------------------------------------------------------------
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 36)                6624
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 36)                0
_________________________________________________________________
dense_2 (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
 - 49s - loss: 1.5905 - acc: 0.4113 - val_loss: 1.9952 - val_acc: 0.4846

Epoch 2/30
 - 49s - loss: 1.2917 - acc: 0.5582 - val_loss: 0.9916 - val_acc: 0.6322

Epoch 3/30
 - 48s - loss: 0.8858 - acc: 0.6567 - val_loss: 0.9702 - val_acc: 0.6386

Epoch 4/30
 - 48s - loss: 0.8230 - acc: 0.7384 - val_loss: 0.8147 - val_acc: 0.7167

Epoch 5/30
 - 48s - loss: 0.6361 - acc: 0.8169 - val_loss: 0.6860 - val_acc: 0.7516

Epoch 6/30
 - 47s - loss: 0.4287 - acc: 0.8949 - val_loss: 0.5029 - val_acc: 0.8772

Epoch 7/30
 - 48s - loss: 0.4247 - acc: 0.8924 - val_loss: 0.5315 - val_acc: 0.8792

Epoch 8/30
 - 47s - loss: 0.4145 - acc: 0.9015 - val_loss: 0.5186 - val_acc: 0.8890

Epoch 9/30
 - 47s - loss: 0.3165 - acc: 0.9266 - val_loss: 0.4438 - val_acc: 0.8826

Epoch 10/30
 - 47s - loss: 0.3411 - acc: 0.9161 - val_loss: 0.5447 - val_acc: 0.8836

Epoch 11/30
 - 48s - loss: 0.2846 - acc: 0.9285 - val_loss: 0.4738 - val_acc: 0.8772

Epoch 12/30
 - 48s - loss: 0.2924 - acc: 0.9291 - val_loss: 0.5284 - val_acc: 0.8836

Epoch 13/30
 - 48s - loss: 0.2619 - acc: 0.9302 - val_loss: 0.5332 - val_acc: 0.8965
```

```
Epoch 14/30
 - 48s - loss: 0.3030 - acc: 0.9295 - val_loss: 0.4133 - val_acc: 0.9135

Epoch 15/30
 - 47s - loss: 0.2595 - acc: 0.9372 - val_loss: 0.4491 - val_acc: 0.9053

Epoch 16/30
 - 48s - loss: 0.2481 - acc: 0.9350 - val_loss: 0.5292 - val_acc: 0.8724

Epoch 17/30
 - 47s - loss: 0.2493 - acc: 0.9366 - val_loss: 0.4607 - val_acc: 0.9030

Epoch 18/30
 - 47s - loss: 0.2568 - acc: 0.9387 - val_loss: 0.4777 - val_acc: 0.8856

Epoch 19/30
 - 48s - loss: 0.2300 - acc: 0.9406 - val_loss: 0.5495 - val_acc: 0.8778

Epoch 20/30
 - 49s - loss: 0.2584 - acc: 0.9402 - val_loss: 0.4981 - val_acc: 0.9084

Epoch 21/30
 - 48s - loss: 0.2154 - acc: 0.9384 - val_loss: 0.3866 - val_acc: 0.9060

Epoch 22/30
 - 48s - loss: 0.2234 - acc: 0.9397 - val_loss: 0.3758 - val_acc: 0.9179

Epoch 23/30
 - 48s - loss: 0.2640 - acc: 0.9351 - val_loss: 0.4379 - val_acc: 0.9074

Epoch 24/30
 - 48s - loss: 0.2259 - acc: 0.9368 - val_loss: 0.4628 - val_acc: 0.8850

Epoch 25/30
 - 48s - loss: 0.2791 - acc: 0.9340 - val_loss: 0.4987 - val_acc: 0.8992

Epoch 26/30
 - 48s - loss: 0.2561 - acc: 0.9369 - val_loss: 0.5101 - val_acc: 0.9040

Epoch 27/30
 - 47s - loss: 0.2119 - acc: 0.9400 - val_loss: 0.4718 - val_acc: 0.9002

Epoch 28/30
 - 47s - loss: 0.2088 - acc: 0.9414 - val_loss: 0.5210 - val_acc: 0.8870

Epoch 29/30
 - 48s - loss: 0.2342 - acc: 0.9411 - val_loss: 0.4797 - val_acc: 0.9046

Epoch 30/30
 - 47s - loss: 0.2082 - acc: 0.9389 - val_loss: 0.5678 - val_acc: 0.8931

Test accuracy:
0.8931116389548693
--------------------------------------------------------------------------------
Model: "sequential_5"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 36)                6624
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 36)                0
_________________________________________________________________
dense_3 (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
 - 48s - loss: 1.0352 - acc: 0.5427 - val_loss: 0.7584 - val_acc: 0.6213

Epoch 2/30
 - 50s - loss: 0.6763 - acc: 0.7316 - val_loss: 0.7384 - val_acc: 0.7346
```

```
Epoch 3/30
 - 48s - loss: 0.5334 - acc: 0.8233 - val_loss: 0.6477 - val_acc: 0.7933

Epoch 4/30
 - 48s - loss: 0.3414 - acc: 0.9076 - val_loss: 0.4991 - val_acc: 0.8643

Epoch 5/30
 - 48s - loss: 0.2863 - acc: 0.9174 - val_loss: 0.8726 - val_acc: 0.8032

Epoch 6/30
 - 48s - loss: 0.2459 - acc: 0.9295 - val_loss: 0.4268 - val_acc: 0.8792

Epoch 7/30
 - 48s - loss: 0.2301 - acc: 0.9351 - val_loss: 0.3520 - val_acc: 0.8877

Epoch 8/30
 - 48s - loss: 0.2221 - acc: 0.9348 - val_loss: 0.4086 - val_acc: 0.8948

Epoch 9/30
 - 48s - loss: 0.2049 - acc: 0.9382 - val_loss: 0.3732 - val_acc: 0.8968

Epoch 10/30
 - 48s - loss: 0.1908 - acc: 0.9430 - val_loss: 0.6786 - val_acc: 0.8741

Epoch 11/30
 - 48s - loss: 0.1953 - acc: 0.9412 - val_loss: 0.3910 - val_acc: 0.9114

Epoch 12/30
 - 48s - loss: 0.1831 - acc: 0.9422 - val_loss: 0.3914 - val_acc: 0.8758

Epoch 13/30
 - 48s - loss: 0.1728 - acc: 0.9484 - val_loss: 0.4960 - val_acc: 0.8931

Epoch 14/30
 - 49s - loss: 0.1796 - acc: 0.9460 - val_loss: 0.3399 - val_acc: 0.9182

Epoch 15/30
 - 51s - loss: 0.1692 - acc: 0.9457 - val_loss: 0.4192 - val_acc: 0.9118

Epoch 16/30
 - 49s - loss: 0.1730 - acc: 0.9489 - val_loss: 0.3585 - val_acc: 0.9131

Epoch 17/30
 - 47s - loss: 0.1753 - acc: 0.9484 - val_loss: 0.3912 - val_acc: 0.9046

Epoch 18/30
 - 48s - loss: 0.1749 - acc: 0.9493 - val_loss: 0.5871 - val_acc: 0.8843

Epoch 19/30
 - 48s - loss: 0.1560 - acc: 0.9514 - val_loss: 0.5416 - val_acc: 0.9060

Epoch 20/30
 - 48s - loss: 0.1707 - acc: 0.9495 - val_loss: 0.3533 - val_acc: 0.9152

Epoch 21/30
 - 48s - loss: 0.1507 - acc: 0.9538 - val_loss: 0.5940 - val_acc: 0.8826

Epoch 22/30
 - 48s - loss: 0.1540 - acc: 0.9553 - val_loss: 0.4250 - val_acc: 0.9111

Epoch 23/30
 - 48s - loss: 0.1578 - acc: 0.9529 - val_loss: 0.4951 - val_acc: 0.9172

Epoch 24/30
 - 48s - loss: 0.1530 - acc: 0.9567 - val_loss: 0.3862 - val_acc: 0.9196

Epoch 25/30
 - 48s - loss: 0.1576 - acc: 0.9553 - val_loss: 0.4798 - val_acc: 0.9169

Epoch 26/30
 - 47s - loss: 0.1560 - acc: 0.9562 - val_loss: 0.4934 - val_acc: 0.9179

Epoch 27/30
 - 47s - loss: 0.1582 - acc: 0.9555 - val_loss: 0.3373 - val_acc: 0.9220

Epoch 28/30
 - 48s - loss: 0.1489 - acc: 0.9572 - val_loss: 0.3409 - val_acc: 0.9135
```

```
 - 48s - loss: 0.1469 - acc: 0.9572 - val_loss: 0.5469 - val_acc: 0.9155

Epoch 29/30
 - 47s - loss: 0.1530 - acc: 0.9551 - val_loss: 0.7102 - val_acc: 0.9040

Epoch 30/30
 - 48s - loss: 0.1465 - acc: 0.9565 - val_loss: 0.4131 - val_acc: 0.9277

Test accuracy:
0.9277231082456736
--------------------------------------------------------------------------------
Model: "sequential_6"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 28)                4256
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 28)                0
_________________________________________________________________
dense_4 (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
 - 48s - loss: 1.1684 - acc: 0.4746 - val_loss: 0.8644 - val_acc: 0.5786

Epoch 2/30
 - 47s - loss: 0.7769 - acc: 0.6336 - val_loss: 0.8785 - val_acc: 0.6183

Epoch 3/30
 - 47s - loss: 0.7174 - acc: 0.6766 - val_loss: 0.8194 - val_acc: 0.6912

Epoch 4/30
 - 47s - loss: 0.5231 - acc: 0.8225 - val_loss: 0.5654 - val_acc: 0.8541

Epoch 5/30
 - 47s - loss: 0.3912 - acc: 0.8965 - val_loss: 0.4121 - val_acc: 0.8935

Epoch 6/30
 - 47s - loss: 0.3127 - acc: 0.9124 - val_loss: 0.3452 - val_acc: 0.9026

Epoch 7/30
 - 47s - loss: 0.2988 - acc: 0.9203 - val_loss: 0.4192 - val_acc: 0.8850

Epoch 8/30
 - 47s - loss: 0.2858 - acc: 0.9227 - val_loss: 0.3723 - val_acc: 0.9019

Epoch 9/30
 - 47s - loss: 0.2826 - acc: 0.9263 - val_loss: 0.4906 - val_acc: 0.8928

Epoch 10/30
 - 49s - loss: 0.2799 - acc: 0.9275 - val_loss: 0.4545 - val_acc: 0.9057

Epoch 11/30
 - 49s - loss: 0.2430 - acc: 0.9357 - val_loss: 0.4321 - val_acc: 0.9006

Epoch 12/30
 - 49s - loss: 0.2540 - acc: 0.9308 - val_loss: 0.4711 - val_acc: 0.8931

Epoch 13/30
 - 50s - loss: 0.2234 - acc: 0.9363 - val_loss: 0.6690 - val_acc: 0.8843

Epoch 14/30
 - 48s - loss: 0.2279 - acc: 0.9347 - val_loss: 0.3349 - val_acc: 0.8972

Epoch 15/30
 - 49s - loss: 0.2075 - acc: 0.9404 - val_loss: 0.3785 - val_acc: 0.9077

Epoch 16/30
 - 49s - loss: 0.1890 - acc: 0.9425 - val_loss: 0.4302 - val_acc: 0.8755

Epoch 17/30
 - 49s - loss: 0.2106 - acc: 0.9350 - val_loss: 0.4933 - val_acc: 0.9019
```

```
Epoch 18/30
 - 48s - loss: 0.1982 - acc: 0.9411 - val_loss: 0.5538 - val_acc: 0.8928

Epoch 19/30
 - 49s - loss: 0.1986 - acc: 0.9430 - val_loss: 0.5988 - val_acc: 0.8918

Epoch 20/30
 - 49s - loss: 0.1977 - acc: 0.9427 - val_loss: 0.5528 - val_acc: 0.8894

Epoch 21/30
 - 48s - loss: 0.2019 - acc: 0.9434 - val_loss: 0.5869 - val_acc: 0.8965

Epoch 22/30
 - 47s - loss: 0.1805 - acc: 0.9468 - val_loss: 0.4104 - val_acc: 0.9067

Epoch 23/30
 - 47s - loss: 0.1671 - acc: 0.9459 - val_loss: 0.8881 - val_acc: 0.8928

Epoch 24/30
 - 49s - loss: 0.1869 - acc: 0.9446 - val_loss: 0.8154 - val_acc: 0.8656

Epoch 25/30
 - 51s - loss: 0.1828 - acc: 0.9457 - val_loss: 0.8436 - val_acc: 0.8694

Epoch 26/30
 - 48s - loss: 0.1732 - acc: 0.9449 - val_loss: 0.6146 - val_acc: 0.8941

Epoch 27/30
 - 47s - loss: 0.1627 - acc: 0.9510 - val_loss: 0.4706 - val_acc: 0.8999

Epoch 28/30
 - 47s - loss: 0.1618 - acc: 0.9455 - val_loss: 0.5530 - val_acc: 0.9016

Epoch 29/30
 - 47s - loss: 0.1623 - acc: 0.9493 - val_loss: 0.6685 - val_acc: 0.8870

Epoch 30/30
 - 47s - loss: 0.1687 - acc: 0.9524 - val_loss: 0.4736 - val_acc: 0.9108

Test accuracy:
0.9107567017305734
_________________________________________________________________________________
Model: "sequential_7"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 32)                5376
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 32)                0
_________________________________________________________________
dense_5 (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
 - 48s - loss: 1.4560 - acc: 0.3889 - val_loss: 1.5249 - val_acc: 0.3461

Epoch 2/30
 - 47s - loss: 1.4181 - acc: 0.3841 - val_loss: 1.3289 - val_acc: 0.3549

Epoch 3/30
 - 47s - loss: 0.9954 - acc: 0.5715 - val_loss: 0.8800 - val_acc: 0.5775

Epoch 4/30
 - 47s - loss: 0.7690 - acc: 0.6563 - val_loss: 0.8090 - val_acc: 0.6362

Epoch 5/30
 - 47s - loss: 0.6588 - acc: 0.7474 - val_loss: 0.7602 - val_acc: 0.7536

Epoch 6/30
 - 48s - loss: 0.5166 - acc: 0.8380 - val_loss: 0.9366 - val_acc: 0.8049

Epoch 7/30
```

```
Epoch 7/30
 - 48s - loss: 0.4080 - acc: 0.8936 - val_loss: 0.6863 - val_acc: 0.8239

Epoch 8/30
 - 47s - loss: 0.3790 - acc: 0.8953 - val_loss: 0.6339 - val_acc: 0.8490

Epoch 9/30
 - 47s - loss: 0.3641 - acc: 0.9027 - val_loss: 0.6423 - val_acc: 0.8612

Epoch 10/30
 - 47s - loss: 0.2849 - acc: 0.9248 - val_loss: 0.6985 - val_acc: 0.8303

Epoch 11/30
 - 47s - loss: 0.2738 - acc: 0.9261 - val_loss: 0.6714 - val_acc: 0.8649

Epoch 12/30
 - 47s - loss: 0.2821 - acc: 0.9191 - val_loss: 0.5488 - val_acc: 0.8622

Epoch 13/30
 - 48s - loss: 0.2610 - acc: 0.9266 - val_loss: 0.6488 - val_acc: 0.8453

Epoch 14/30
 - 48s - loss: 0.3394 - acc: 0.9098 - val_loss: 0.5526 - val_acc: 0.8504

Epoch 15/30
 - 47s - loss: 0.2839 - acc: 0.9280 - val_loss: 0.6021 - val_acc: 0.8690

Epoch 16/30
 - 47s - loss: 0.3027 - acc: 0.9196 - val_loss: 0.5780 - val_acc: 0.8734

Epoch 17/30
 - 48s - loss: 0.2433 - acc: 0.9351 - val_loss: 0.5348 - val_acc: 0.8761

Epoch 18/30
 - 47s - loss: 0.2707 - acc: 0.9251 - val_loss: 0.5594 - val_acc: 0.8884

Epoch 19/30
 - 47s - loss: 0.2757 - acc: 0.9270 - val_loss: 0.7236 - val_acc: 0.8704

Epoch 20/30
 - 47s - loss: 0.2327 - acc: 0.9346 - val_loss: 0.5942 - val_acc: 0.8846

Epoch 21/30
 - 47s - loss: 0.2358 - acc: 0.9340 - val_loss: 0.7620 - val_acc: 0.8700

Epoch 22/30
 - 47s - loss: 0.2180 - acc: 0.9368 - val_loss: 0.6039 - val_acc: 0.8724

Epoch 23/30
 - 47s - loss: 0.2034 - acc: 0.9392 - val_loss: 0.7702 - val_acc: 0.8721

Epoch 24/30
 - 47s - loss: 0.2654 - acc: 0.9207 - val_loss: 0.5712 - val_acc: 0.8439

Epoch 25/30
 - 47s - loss: 0.3935 - acc: 0.8968 - val_loss: 0.6789 - val_acc: 0.8500

Epoch 26/30
 - 47s - loss: 0.2911 - acc: 0.9240 - val_loss: 0.5973 - val_acc: 0.8748

Epoch 27/30
 - 47s - loss: 0.2440 - acc: 0.9362 - val_loss: 0.6476 - val_acc: 0.8894

Epoch 28/30
 - 47s - loss: 0.2341 - acc: 0.9384 - val_loss: 0.7216 - val_acc: 0.8792

Epoch 29/30
 - 47s - loss: 0.2210 - acc: 0.9344 - val_loss: 0.6222 - val_acc: 0.8846

Epoch 30/30
 - 48s - loss: 0.2244 - acc: 0.9354 - val_loss: 0.6204 - val_acc: 0.8887

Test accuracy:
0.8887003732609433
_________________________________________________________________________________
Model: "sequential_8"
_________________________________________________________________
```

```
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 32)                5376
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 32)                0
_________________________________________________________________
dense_6 (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
 - 48s - loss: 1.3497 - acc: 0.4279 - val_loss: 1.0763 - val_acc: 0.5514

Epoch 2/30
 - 48s - loss: 0.8906 - acc: 0.6174 - val_loss: 0.7975 - val_acc: 0.6166

Epoch 3/30
 - 47s - loss: 0.7544 - acc: 0.6722 - val_loss: 0.8736 - val_acc: 0.6899

Epoch 4/30
 - 47s - loss: 0.6020 - acc: 0.8109 - val_loss: 0.5255 - val_acc: 0.8521

Epoch 5/30
 - 47s - loss: 0.3789 - acc: 0.9095 - val_loss: 0.4587 - val_acc: 0.8829

Epoch 6/30
 - 47s - loss: 0.3918 - acc: 0.9040 - val_loss: 0.5192 - val_acc: 0.8812

Epoch 7/30
 - 48s - loss: 0.3167 - acc: 0.9217 - val_loss: 0.4762 - val_acc: 0.8877

Epoch 8/30
 - 49s - loss: 0.2974 - acc: 0.9346 - val_loss: 0.4914 - val_acc: 0.8955

Epoch 9/30
 - 49s - loss: 0.3305 - acc: 0.9241 - val_loss: 0.5678 - val_acc: 0.8789

Epoch 10/30
 - 49s - loss: 0.2938 - acc: 0.9316 - val_loss: 0.5216 - val_acc: 0.8924

Epoch 11/30
 - 47s - loss: 0.2833 - acc: 0.9355 - val_loss: 0.5207 - val_acc: 0.8853

Epoch 12/30
 - 47s - loss: 0.2562 - acc: 0.9392 - val_loss: 0.6896 - val_acc: 0.8717

Epoch 13/30
 - 47s - loss: 0.2257 - acc: 0.9410 - val_loss: 0.4378 - val_acc: 0.8924

Epoch 14/30
 - 47s - loss: 0.2008 - acc: 0.9430 - val_loss: 0.6586 - val_acc: 0.8744

Epoch 15/30
 - 47s - loss: 0.2223 - acc: 0.9408 - val_loss: 0.5332 - val_acc: 0.8768

Epoch 16/30
 - 47s - loss: 0.2227 - acc: 0.9403 - val_loss: 0.5713 - val_acc: 0.8928

Epoch 17/30
 - 47s - loss: 0.2172 - acc: 0.9410 - val_loss: 0.4956 - val_acc: 0.8890

Epoch 18/30
 - 47s - loss: 0.1974 - acc: 0.9395 - val_loss: 0.5167 - val_acc: 0.8935

Epoch 19/30
 - 47s - loss: 0.1893 - acc: 0.9412 - val_loss: 0.4982 - val_acc: 0.8979

Epoch 20/30
 - 47s - loss: 0.2010 - acc: 0.9415 - val_loss: 0.5607 - val_acc: 0.8955

Epoch 21/30
 - 47s - loss: 0.1853 - acc: 0.9470 - val_loss: 0.5420 - val_acc: 0.8924
```

```
Epoch 22/30
 - 48s - loss: 0.1551 - acc: 0.9479 - val_loss: 0.5426 - val_acc: 0.9013

Epoch 23/30
 - 47s - loss: 0.2143 - acc: 0.9406 - val_loss: 0.5943 - val_acc: 0.8999

Epoch 24/30
 - 47s - loss: 0.2552 - acc: 0.9388 - val_loss: 0.6261 - val_acc: 0.8904

Epoch 25/30
 - 47s - loss: 0.2041 - acc: 0.9450 - val_loss: 0.5693 - val_acc: 0.8728

Epoch 26/30
 - 47s - loss: 0.1988 - acc: 0.9429 - val_loss: 0.5216 - val_acc: 0.9009

Epoch 27/30
 - 47s - loss: 0.2720 - acc: 0.9321 - val_loss: 0.5381 - val_acc: 0.8999

Epoch 28/30
 - 47s - loss: 0.1800 - acc: 0.9464 - val_loss: 0.4940 - val_acc: 0.9036

Epoch 29/30
 - 47s - loss: 0.1794 - acc: 0.9453 - val_loss: 0.4642 - val_acc: 0.9060

Epoch 30/30
 - 47s - loss: 0.1893 - acc: 0.9441 - val_loss: 0.5989 - val_acc: 0.8860

Test accuracy:
0.8859857482185273
--------------------------------------------------------------------------------
Model: "sequential_9"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 28)                4256
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 28)                0
_________________________________________________________________
dense_7 (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
 - 48s - loss: 1.2272 - acc: 0.4630 - val_loss: 0.9042 - val_acc: 0.5887

Epoch 2/30
 - 48s - loss: 0.8384 - acc: 0.5944 - val_loss: 1.0125 - val_acc: 0.5745

Epoch 3/30
 - 48s - loss: 0.8053 - acc: 0.6235 - val_loss: 0.7570 - val_acc: 0.6108

Epoch 4/30
 - 47s - loss: 0.7063 - acc: 0.6604 - val_loss: 0.7514 - val_acc: 0.6305

Epoch 5/30
 - 47s - loss: 0.6973 - acc: 0.6561 - val_loss: 0.8143 - val_acc: 0.6491

Epoch 6/30
 - 48s - loss: 0.7020 - acc: 0.6540 - val_loss: 0.7204 - val_acc: 0.6335

Epoch 7/30
 - 47s - loss: 0.6749 - acc: 0.6601 - val_loss: 0.7312 - val_acc: 0.6172

Epoch 8/30
 - 47s - loss: 0.8255 - acc: 0.6170 - val_loss: 0.7617 - val_acc: 0.6128

Epoch 9/30
 - 48s - loss: 0.7529 - acc: 0.6472 - val_loss: 0.7445 - val_acc: 0.6759

Epoch 10/30
 - 48s - loss: 1.0347 - acc: 0.5743 - val_loss: 1.0302 - val_acc: 0.5860

Epoch 11/30
```

```
 - 49s - loss: 0.8666 - acc: 0.6192 - val_loss: 0.8467 - val_acc: 0.6183

Epoch 12/30
 - 49s - loss: 0.7709 - acc: 0.6545 - val_loss: 0.7718 - val_acc: 0.6193

Epoch 13/30
 - 49s - loss: 0.6950 - acc: 0.6782 - val_loss: 0.7124 - val_acc: 0.6664

Epoch 14/30
 - 50s - loss: 0.6902 - acc: 0.6760 - val_loss: 0.6996 - val_acc: 0.6580

Epoch 15/30
 - 50s - loss: 0.6639 - acc: 0.7100 - val_loss: 0.6598 - val_acc: 0.7740

Epoch 16/30
 - 48s - loss: 0.4964 - acc: 0.8064 - val_loss: 0.5821 - val_acc: 0.7913

Epoch 17/30
 - 48s - loss: 0.4449 - acc: 0.8233 - val_loss: 0.5794 - val_acc: 0.8062

Epoch 18/30
 - 48s - loss: 0.5208 - acc: 0.8164 - val_loss: 0.7269 - val_acc: 0.7184

Epoch 19/30
 - 47s - loss: 0.4843 - acc: 0.8379 - val_loss: 0.4562 - val_acc: 0.8846

Epoch 20/30
 - 48s - loss: 0.3683 - acc: 0.8951 - val_loss: 0.4703 - val_acc: 0.8724

Epoch 21/30
 - 48s - loss: 0.3719 - acc: 0.8939 - val_loss: 0.6020 - val_acc: 0.8619

Epoch 22/30
 - 47s - loss: 0.3502 - acc: 0.9098 - val_loss: 0.5416 - val_acc: 0.8588

Epoch 23/30
 - 48s - loss: 0.3064 - acc: 0.9211 - val_loss: 0.5043 - val_acc: 0.8673

Epoch 24/30
 - 48s - loss: 0.3325 - acc: 0.9181 - val_loss: 0.4439 - val_acc: 0.8907

Epoch 25/30
 - 47s - loss: 0.2628 - acc: 0.9279 - val_loss: 0.4133 - val_acc: 0.8921

Epoch 26/30
 - 47s - loss: 0.2293 - acc: 0.9377 - val_loss: 0.4005 - val_acc: 0.9067

Epoch 27/30
 - 47s - loss: 0.2831 - acc: 0.9187 - val_loss: 0.4426 - val_acc: 0.8870

Epoch 28/30
 - 48s - loss: 0.2376 - acc: 0.9344 - val_loss: 0.4595 - val_acc: 0.8999

Epoch 29/30
 - 48s - loss: 0.2324 - acc: 0.9363 - val_loss: 0.5168 - val_acc: 0.8809

Epoch 30/30
 - 47s - loss: 0.2363 - acc: 0.9374 - val_loss: 0.4208 - val_acc: 0.8955

Test accuracy:
0.8954869358669834
--------------------------------------------------------------------------------
Model: "sequential_10"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 32)                5376
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 32)                0
_________________________________________________________________
dense_8 (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
 - 48s - loss: 1.3057 - acc: 0.4480 - val_loss: 1.1087 - val_acc: 0.4496

Epoch 2/30
 - 47s - loss: 1.0298 - acc: 0.5411 - val_loss: 0.8245 - val_acc: 0.5904

Epoch 3/30
 - 48s - loss: 1.3271 - acc: 0.4588 - val_loss: 1.5698 - val_acc: 0.3726

Epoch 4/30
 - 48s - loss: 1.3772 - acc: 0.4777 - val_loss: 1.2122 - val_acc: 0.5694

Epoch 5/30
 - 48s - loss: 1.1680 - acc: 0.5564 - val_loss: 1.0010 - val_acc: 0.6478

Epoch 6/30
 - 48s - loss: 1.0633 - acc: 0.6005 - val_loss: 0.9348 - val_acc: 0.6651

Epoch 7/30
 - 48s - loss: 0.8950 - acc: 0.6676 - val_loss: 0.8738 - val_acc: 0.6627

Epoch 8/30
 - 48s - loss: 1.4656 - acc: 0.4947 - val_loss: 1.2511 - val_acc: 0.5914

Epoch 9/30
 - 48s - loss: 1.3666 - acc: 0.5249 - val_loss: 1.3846 - val_acc: 0.5999

Epoch 10/30
 - 48s - loss: 1.2271 - acc: 0.5905 - val_loss: 1.1817 - val_acc: 0.6172

Epoch 11/30
 - 48s - loss: 1.0876 - acc: 0.6280 - val_loss: 1.1329 - val_acc: 0.6183

Epoch 12/30
 - 48s - loss: 1.0227 - acc: 0.6503 - val_loss: 0.9891 - val_acc: 0.6379

Epoch 13/30
 - 48s - loss: 1.0081 - acc: 0.6643 - val_loss: 1.0701 - val_acc: 0.6437

Epoch 14/30
 - 48s - loss: 0.9605 - acc: 0.6843 - val_loss: 1.0610 - val_acc: 0.6841

Epoch 15/30
 - 48s - loss: 0.9149 - acc: 0.7229 - val_loss: 0.9716 - val_acc: 0.7218

Epoch 16/30
 - 47s - loss: 0.9429 - acc: 0.6907 - val_loss: 0.9774 - val_acc: 0.6834

Epoch 17/30
 - 48s - loss: 0.9840 - acc: 0.6715 - val_loss: 0.9012 - val_acc: 0.7282

Epoch 18/30
 - 47s - loss: 0.8613 - acc: 0.7295 - val_loss: 0.8657 - val_acc: 0.7509

Epoch 19/30
 - 48s - loss: 0.7588 - acc: 0.7696 - val_loss: 0.8247 - val_acc: 0.7679

Epoch 20/30
 - 48s - loss: 0.7041 - acc: 0.7888 - val_loss: 0.8019 - val_acc: 0.7581

Epoch 21/30
 - 47s - loss: 0.6292 - acc: 0.8128 - val_loss: 0.8361 - val_acc: 0.7825

Epoch 22/30
 - 48s - loss: 0.6033 - acc: 0.8288 - val_loss: 0.7589 - val_acc: 0.7910

Epoch 23/30
 - 48s - loss: 0.5201 - acc: 0.8754 - val_loss: 0.8866 - val_acc: 0.8280

Epoch 24/30
 - 48s - loss: 0.4718 - acc: 0.9015 - val_loss: 0.7533 - val_acc: 0.8449

Epoch 25/30
 - 48s - loss: 0.4222 - acc: 0.9140 - val_loss: 0.6640 - val_acc: 0.8517

Epoch 26/30
```

```
 - 47s - loss: 0.3858 - acc: 0.9176 - val_loss: 0.7622 - val_acc: 0.8537

Epoch 27/30
 - 48s - loss: 0.4162 - acc: 0.9101 - val_loss: 0.6581 - val_acc: 0.8646

Epoch 28/30
 - 48s - loss: 0.3448 - acc: 0.9282 - val_loss: 0.6928 - val_acc: 0.8626

Epoch 29/30
 - 48s - loss: 0.3038 - acc: 0.9366 - val_loss: 0.7257 - val_acc: 0.8761

Epoch 30/30
 - 48s - loss: 0.2801 - acc: 0.9361 - val_loss: 0.6581 - val_acc: 0.8839

Test accuracy:
0.8839497794367153
--------------------------------------------------------------------------------
Model: "sequential_11"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 32)                5376
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 32)                0
_________________________________________________________________
dense_9 (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
 - 48s - loss: 1.1735 - acc: 0.4795 - val_loss: 0.9963 - val_acc: 0.6020

Epoch 2/30
 - 47s - loss: 0.9469 - acc: 0.6190 - val_loss: 0.9252 - val_acc: 0.6145

Epoch 3/30
 - 48s - loss: 0.7992 - acc: 0.6439 - val_loss: 0.8111 - val_acc: 0.6603

Epoch 4/30
 - 48s - loss: 0.8679 - acc: 0.6454 - val_loss: 0.9011 - val_acc: 0.6518

Epoch 5/30
 - 48s - loss: 0.7811 - acc: 0.6805 - val_loss: 0.7611 - val_acc: 0.6841

Epoch 6/30
 - 48s - loss: 0.6653 - acc: 0.7199 - val_loss: 0.7138 - val_acc: 0.7309

Epoch 7/30
 - 48s - loss: 0.5886 - acc: 0.7920 - val_loss: 0.5292 - val_acc: 0.8303

Epoch 8/30
 - 47s - loss: 0.5222 - acc: 0.8279 - val_loss: 0.8306 - val_acc: 0.7221

Epoch 9/30
 - 47s - loss: 0.5729 - acc: 0.8154 - val_loss: 0.5848 - val_acc: 0.8290

Epoch 10/30
 - 48s - loss: 0.4629 - acc: 0.8538 - val_loss: 0.5618 - val_acc: 0.8242

Epoch 11/30
 - 47s - loss: 0.4175 - acc: 0.8905 - val_loss: 0.5776 - val_acc: 0.8677

Epoch 12/30
 - 47s - loss: 0.3864 - acc: 0.8977 - val_loss: 0.5687 - val_acc: 0.8510

Epoch 13/30
 - 48s - loss: 0.4198 - acc: 0.8945 - val_loss: 0.5084 - val_acc: 0.8761

Epoch 14/30
 - 47s - loss: 0.3678 - acc: 0.9074 - val_loss: 0.4996 - val_acc: 0.8897

Epoch 15/30
 - 47s - loss: 0.3133 - acc: 0.9232 - val_loss: 0.5400 - val_acc: 0.8843
```

```
Epoch 16/30
 - 47s - loss: 0.3127 - acc: 0.9261 - val_loss: 0.4648 - val_acc: 0.8870

Epoch 17/30
 - 48s - loss: 0.4945 - acc: 0.8677 - val_loss: 0.5529 - val_acc: 0.8758

Epoch 18/30
 - 48s - loss: 0.3486 - acc: 0.9189 - val_loss: 0.6159 - val_acc: 0.8839

Epoch 19/30
 - 48s - loss: 0.2942 - acc: 0.9285 - val_loss: 0.4997 - val_acc: 0.8887

Epoch 20/30
 - 48s - loss: 0.3242 - acc: 0.9221 - val_loss: 0.4618 - val_acc: 0.9046

Epoch 21/30
 - 47s - loss: 0.2715 - acc: 0.9320 - val_loss: 0.5546 - val_acc: 0.8887

Epoch 22/30
 - 47s - loss: 0.3810 - acc: 0.8936 - val_loss: 0.5173 - val_acc: 0.8449

Epoch 23/30
 - 48s - loss: 0.3724 - acc: 0.9155 - val_loss: 0.5992 - val_acc: 0.8958

Epoch 24/30
 - 47s - loss: 0.4097 - acc: 0.9210 - val_loss: 0.5306 - val_acc: 0.8931

Epoch 25/30
 - 47s - loss: 0.3462 - acc: 0.9264 - val_loss: 0.5416 - val_acc: 0.8996

Epoch 26/30
 - 47s - loss: 0.2882 - acc: 0.9325 - val_loss: 0.5485 - val_acc: 0.8999

Epoch 27/30
 - 48s - loss: 0.2830 - acc: 0.9297 - val_loss: 0.6225 - val_acc: 0.8778

Epoch 28/30
 - 48s - loss: 0.2926 - acc: 0.9275 - val_loss: 0.5800 - val_acc: 0.8945

Epoch 29/30
 - 48s - loss: 0.2594 - acc: 0.9321 - val_loss: 0.6206 - val_acc: 0.8806

Epoch 30/30
 - 48s - loss: 0.2240 - acc: 0.9368 - val_loss: 0.6307 - val_acc: 0.8911

Test accuracy:
0.8910756701730573
--------------------------------------------------------------------------------
Model: "sequential_12"
_________________________________________________________________
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
 - 49s - loss: 1.4093 - acc: 0.3886 - val_loss: 1.4341 - val_acc: 0.3963

Epoch 2/30
 - 48s - loss: 1.3049 - acc: 0.4146 - val_loss: 1.1875 - val_acc: 0.4717

Epoch 3/30
 - 48s - loss: 0.8772 - acc: 0.5894 - val_loss: 0.8211 - val_acc: 0.6108

Epoch 4/30
 - 47s - loss: 0.7455 - acc: 0.6421 - val_loss: 0.8718 - val_acc: 0.5911
```

```
Epoch 5/30
 - 48s - loss: 0.6808 - acc: 0.6586 - val_loss: 0.7138 - val_acc: 0.6237

Epoch 6/30
 - 48s - loss: 0.6227 - acc: 0.6734 - val_loss: 0.7014 - val_acc: 0.6162

Epoch 7/30
 - 47s - loss: 0.6419 - acc: 0.6863 - val_loss: 0.6920 - val_acc: 0.7112

Epoch 8/30
 - 48s - loss: 0.5126 - acc: 0.7748 - val_loss: 0.6525 - val_acc: 0.7228

Epoch 9/30
 - 48s - loss: 0.4774 - acc: 0.7935 - val_loss: 0.6853 - val_acc: 0.7214

Epoch 10/30
 - 47s - loss: 0.4535 - acc: 0.8025 - val_loss: 0.5877 - val_acc: 0.7591

Epoch 11/30
 - 48s - loss: 0.4136 - acc: 0.8030 - val_loss: 0.6017 - val_acc: 0.7435

Epoch 12/30
 - 47s - loss: 0.3912 - acc: 0.8220 - val_loss: 0.5443 - val_acc: 0.7601

Epoch 13/30
 - 48s - loss: 0.3420 - acc: 0.8713 - val_loss: 0.5643 - val_acc: 0.8704

Epoch 14/30
 - 48s - loss: 0.2847 - acc: 0.9184 - val_loss: 0.5148 - val_acc: 0.8592

Epoch 15/30
 - 48s - loss: 0.3017 - acc: 0.9074 - val_loss: 0.5226 - val_acc: 0.8656

Epoch 16/30
 - 48s - loss: 0.2417 - acc: 0.9293 - val_loss: 0.4696 - val_acc: 0.8873

Epoch 17/30
 - 48s - loss: 0.2481 - acc: 0.9293 - val_loss: 0.4036 - val_acc: 0.9009

Epoch 18/30
 - 48s - loss: 0.2237 - acc: 0.9365 - val_loss: 0.4845 - val_acc: 0.8829

Epoch 19/30
 - 48s - loss: 0.6749 - acc: 0.8030 - val_loss: 0.7031 - val_acc: 0.8008

Epoch 20/30
 - 47s - loss: 0.5088 - acc: 0.8663 - val_loss: 0.5823 - val_acc: 0.8456

Epoch 21/30
 - 48s - loss: 0.4318 - acc: 0.8935 - val_loss: 0.5438 - val_acc: 0.8534

Epoch 22/30
 - 47s - loss: 0.3849 - acc: 0.8916 - val_loss: 0.6767 - val_acc: 0.8592

Epoch 23/30
 - 47s - loss: 0.7930 - acc: 0.7918 - val_loss: 1.0369 - val_acc: 0.6617

Epoch 24/30
 - 48s - loss: 1.0542 - acc: 0.6087 - val_loss: 0.9936 - val_acc: 0.5843

Epoch 25/30
 - 48s - loss: 1.1429 - acc: 0.5265 - val_loss: 0.9606 - val_acc: 0.5477

Epoch 26/30
 - 47s - loss: 1.0781 - acc: 0.5690 - val_loss: 1.1139 - val_acc: 0.5524

Epoch 27/30
 - 47s - loss: 1.1306 - acc: 0.5638 - val_loss: 1.0498 - val_acc: 0.5741

Epoch 28/30
 - 47s - loss: 1.4540 - acc: 0.4732 - val_loss: 1.3877 - val_acc: 0.4119

Epoch 29/30
 - 47s - loss: 1.3532 - acc: 0.4880 - val_loss: 1.2338 - val_acc: 0.5745

Epoch 30/30
 - 47s - loss: 1.1957 - acc: 0.5794 - val_loss: 1.1692 - val_acc: 0.6176
```

```
Test accuracy:
0.6175771971698693
-----------------------------------------------------------------------------------------
Model: "sequential_13"
_________________________________________________________________
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
 - 48s - loss: 1.5036 - acc: 0.3721 - val_loss: 1.4804 - val_acc: 0.4052

Epoch 2/30
 - 48s - loss: 1.3677 - acc: 0.4293 - val_loss: 1.4101 - val_acc: 0.4136

Epoch 3/30
 - 47s - loss: 1.3361 - acc: 0.4378 - val_loss: 1.4546 - val_acc: 0.3946

Epoch 4/30
 - 48s - loss: 1.3234 - acc: 0.4283 - val_loss: 1.4073 - val_acc: 0.4469

Epoch 5/30
 - 47s - loss: 1.1556 - acc: 0.5152 - val_loss: 0.9518 - val_acc: 0.5874

Epoch 6/30
 - 47s - loss: 0.9367 - acc: 0.5869 - val_loss: 0.8529 - val_acc: 0.6040

Epoch 7/30
 - 47s - loss: 0.8383 - acc: 0.6200 - val_loss: 0.9352 - val_acc: 0.5962

Epoch 8/30
 - 48s - loss: 0.8209 - acc: 0.6337 - val_loss: 0.8502 - val_acc: 0.6132

Epoch 9/30
 - 47s - loss: 0.8034 - acc: 0.6337 - val_loss: 0.8220 - val_acc: 0.6155

Epoch 10/30
 - 47s - loss: 0.7740 - acc: 0.6440 - val_loss: 0.8115 - val_acc: 0.6176

Epoch 11/30
 - 47s - loss: 0.7544 - acc: 0.6500 - val_loss: 0.8022 - val_acc: 0.6244

Epoch 12/30
 - 48s - loss: 0.7302 - acc: 0.6551 - val_loss: 0.8233 - val_acc: 0.6264

Epoch 13/30
 - 47s - loss: 1.2253 - acc: 0.5016 - val_loss: 0.9342 - val_acc: 0.6213

Epoch 14/30
 - 48s - loss: 0.9128 - acc: 0.6208 - val_loss: 0.9580 - val_acc: 0.6186

Epoch 15/30
 - 47s - loss: 0.7716 - acc: 0.6560 - val_loss: 0.8903 - val_acc: 0.6176

Epoch 16/30
 - 48s - loss: 0.9308 - acc: 0.6352 - val_loss: 0.8461 - val_acc: 0.6183

Epoch 17/30
 - 47s - loss: 0.7765 - acc: 0.6598 - val_loss: 0.8139 - val_acc: 0.6440

Epoch 18/30
 - 47s - loss: 0.7423 - acc: 0.6730 - val_loss: 0.7597 - val_acc: 0.6539

Epoch 19/30
 - 48s - loss: 1.1219 - acc: 0.5574 - val_loss: 1.2385 - val_acc: 0.5792
```

```
Epoch 20/30
 - 48s - loss: 1.1130 - acc: 0.5482 - val_loss: 1.0493 - val_acc: 0.6244

Epoch 21/30
 - 48s - loss: 0.7798 - acc: 0.6674 - val_loss: 0.8771 - val_acc: 0.6451

Epoch 22/30
 - 48s - loss: 0.7536 - acc: 0.6672 - val_loss: 0.7972 - val_acc: 0.6264

Epoch 23/30
 - 47s - loss: 0.7726 - acc: 0.6585 - val_loss: 0.9059 - val_acc: 0.5636

Epoch 24/30
 - 47s - loss: 0.7044 - acc: 0.6708 - val_loss: 0.7371 - val_acc: 0.6651

Epoch 25/30
 - 47s - loss: 0.6918 - acc: 0.6865 - val_loss: 0.7405 - val_acc: 0.6953

Epoch 26/30
 - 47s - loss: 0.6329 - acc: 0.7133 - val_loss: 0.6529 - val_acc: 0.6854

Epoch 27/30
 - 47s - loss: 0.6111 - acc: 0.7699 - val_loss: 0.6528 - val_acc: 0.7733

Epoch 28/30
 - 47s - loss: 0.4664 - acc: 0.8259 - val_loss: 0.7181 - val_acc: 0.8117

Epoch 29/30
 - 48s - loss: 0.4499 - acc: 0.8511 - val_loss: 0.5405 - val_acc: 0.8429

Epoch 30/30
 - 48s - loss: 0.3249 - acc: 0.9074 - val_loss: 0.5258 - val_acc: 0.8717

Test accuracy:
0.8717339667458432
--------------------------------------------------------------------------------------------
Model: "sequential_14"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 32)                5376
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 32)                0
_________________________________________________________________
dense_12 (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
 - 49s - loss: 1.0185 - acc: 0.5690 - val_loss: 0.7257 - val_acc: 0.7435

Epoch 2/30
 - 48s - loss: 0.5661 - acc: 0.8101 - val_loss: 0.5722 - val_acc: 0.8358

Epoch 3/30
 - 48s - loss: 0.3655 - acc: 0.9036 - val_loss: 0.5505 - val_acc: 0.8670

Epoch 4/30
 - 48s - loss: 0.2852 - acc: 0.9212 - val_loss: 0.5054 - val_acc: 0.8755

Epoch 5/30
 - 48s - loss: 0.2374 - acc: 0.9302 - val_loss: 0.5404 - val_acc: 0.8470

Epoch 6/30
 - 48s - loss: 0.2238 - acc: 0.9334 - val_loss: 0.5199 - val_acc: 0.8823

Epoch 7/30
 - 47s - loss: 0.2030 - acc: 0.9411 - val_loss: 0.4903 - val_acc: 0.8975

Epoch 8/30
 - 48s - loss: 0.2027 - acc: 0.9384 - val_loss: 0.6882 - val_acc: 0.8700

Epoch 9/30
```

```
 - 48s - loss: 0.1986 - acc: 0.9404 - val_loss: 0.4586 - val_acc: 0.8935

Epoch 10/30
 - 47s - loss: 0.1820 - acc: 0.9425 - val_loss: 0.3605 - val_acc: 0.9084

Epoch 11/30
 - 48s - loss: 0.1875 - acc: 0.9430 - val_loss: 0.4102 - val_acc: 0.9013

Epoch 12/30
 - 48s - loss: 0.1707 - acc: 0.9475 - val_loss: 0.5914 - val_acc: 0.9087

Epoch 13/30
 - 47s - loss: 0.1753 - acc: 0.9452 - val_loss: 0.4529 - val_acc: 0.8935

Epoch 14/30
 - 48s - loss: 0.1660 - acc: 0.9467 - val_loss: 0.8369 - val_acc: 0.8785

Epoch 15/30
 - 47s - loss: 0.1692 - acc: 0.9501 - val_loss: 0.4042 - val_acc: 0.9087

Epoch 16/30
 - 47s - loss: 0.1504 - acc: 0.9523 - val_loss: 0.3465 - val_acc: 0.9203

Epoch 17/30
 - 47s - loss: 0.1530 - acc: 0.9505 - val_loss: 0.4193 - val_acc: 0.8945

Epoch 18/30
 - 47s - loss: 0.1558 - acc: 0.9512 - val_loss: 0.7624 - val_acc: 0.8768

Epoch 19/30
 - 48s - loss: 0.1549 - acc: 0.9535 - val_loss: 0.4556 - val_acc: 0.9165

Epoch 20/30
 - 47s - loss: 0.1500 - acc: 0.9547 - val_loss: 0.6842 - val_acc: 0.8996

Epoch 21/30
 - 48s - loss: 0.1543 - acc: 0.9547 - val_loss: 0.5005 - val_acc: 0.9023

Epoch 22/30
 - 47s - loss: 0.1459 - acc: 0.9566 - val_loss: 0.4307 - val_acc: 0.9223

Epoch 23/30
 - 47s - loss: 0.1463 - acc: 0.9576 - val_loss: 0.4388 - val_acc: 0.9223

Epoch 24/30
 - 48s - loss: 0.1309 - acc: 0.9566 - val_loss: 0.3682 - val_acc: 0.9291

Epoch 25/30
 - 48s - loss: 0.1410 - acc: 0.9576 - val_loss: 0.4324 - val_acc: 0.9237

Epoch 26/30
 - 47s - loss: 0.1352 - acc: 0.9580 - val_loss: 0.3331 - val_acc: 0.9264

Epoch 27/30
 - 47s - loss: 0.1311 - acc: 0.9595 - val_loss: 0.5203 - val_acc: 0.8985

Epoch 28/30
 - 47s - loss: 0.1341 - acc: 0.9606 - val_loss: 0.4270 - val_acc: 0.9192

Epoch 29/30
 - 47s - loss: 0.1360 - acc: 0.9601 - val_loss: 0.5365 - val_acc: 0.9128

Epoch 30/30
 - 48s - loss: 0.1420 - acc: 0.9576 - val_loss: 0.3482 - val_acc: 0.9335

Test accuracy:
0.9334916864608076
--------------------------------------------------------------------------------
Model: "sequential_15"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 36)                6624
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 36)                0
_________________________________________________________________
dense 13 (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
 - 49s - loss: 1.1180 - acc: 0.4920 - val_loss: 0.9505 - val_acc: 0.6261

Epoch 2/30
 - 48s - loss: 0.5942 - acc: 0.7614 - val_loss: 0.6106 - val_acc: 0.8280

Epoch 3/30
 - 48s - loss: 0.3447 - acc: 0.9105 - val_loss: 0.5645 - val_acc: 0.8663

Epoch 4/30
 - 48s - loss: 0.2692 - acc: 0.9264 - val_loss: 0.4972 - val_acc: 0.8914

Epoch 5/30
 - 48s - loss: 0.2622 - acc: 0.9308 - val_loss: 0.4671 - val_acc: 0.8989

Epoch 6/30
 - 48s - loss: 0.2207 - acc: 0.9359 - val_loss: 0.5131 - val_acc: 0.8633

Epoch 7/30
 - 48s - loss: 0.2070 - acc: 0.9377 - val_loss: 0.5187 - val_acc: 0.8931

Epoch 8/30
 - 48s - loss: 0.1969 - acc: 0.9376 - val_loss: 0.5381 - val_acc: 0.9046

Epoch 9/30
 - 48s - loss: 0.1881 - acc: 0.9392 - val_loss: 0.5140 - val_acc: 0.8856

Epoch 10/30
 - 48s - loss: 0.2053 - acc: 0.9395 - val_loss: 0.5801 - val_acc: 0.9026

Epoch 11/30
 - 48s - loss: 0.1900 - acc: 0.9448 - val_loss: 0.4917 - val_acc: 0.9033

Epoch 12/30
 - 48s - loss: 0.1820 - acc: 0.9421 - val_loss: 0.5004 - val_acc: 0.8643

Epoch 13/30
 - 48s - loss: 0.1750 - acc: 0.9502 - val_loss: 0.4908 - val_acc: 0.9074

Epoch 14/30
 - 48s - loss: 0.1660 - acc: 0.9445 - val_loss: 0.6623 - val_acc: 0.9030

Epoch 15/30
 - 48s - loss: 0.1732 - acc: 0.9474 - val_loss: 0.4783 - val_acc: 0.9121

Epoch 16/30
 - 48s - loss: 0.1777 - acc: 0.9501 - val_loss: 0.6836 - val_acc: 0.8958

Epoch 17/30
 - 48s - loss: 0.1751 - acc: 0.9543 - val_loss: 0.4408 - val_acc: 0.9148

Epoch 18/30
 - 48s - loss: 0.1702 - acc: 0.9521 - val_loss: 0.4838 - val_acc: 0.8958

Epoch 19/30
 - 48s - loss: 0.1532 - acc: 0.9546 - val_loss: 0.7981 - val_acc: 0.8904

Epoch 20/30
 - 48s - loss: 0.1629 - acc: 0.9558 - val_loss: 0.4647 - val_acc: 0.9230

Epoch 21/30
 - 48s - loss: 0.1515 - acc: 0.9540 - val_loss: 0.8746 - val_acc: 0.9036

Epoch 22/30
 - 48s - loss: 0.1644 - acc: 0.9542 - val_loss: 0.5854 - val_acc: 0.9111

Epoch 23/30
 - 48s - loss: 0.1506 - acc: 0.9553 - val_loss: 0.6680 - val_acc: 0.9067

Epoch 24/30
```

```
Epoch 24/30
 - 48s - loss: 0.1760 - acc: 0.9544 - val_loss: 0.6245 - val_acc: 0.9053

Epoch 25/30
 - 48s - loss: 0.1581 - acc: 0.9531 - val_loss: 0.8651 - val_acc: 0.8955

Epoch 26/30
 - 48s - loss: 0.1529 - acc: 0.9570 - val_loss: 0.4977 - val_acc: 0.9216

Epoch 27/30
 - 48s - loss: 0.1587 - acc: 0.9581 - val_loss: 0.4613 - val_acc: 0.9148

Epoch 28/30
 - 48s - loss: 0.1474 - acc: 0.9557 - val_loss: 0.6027 - val_acc: 0.9169

Epoch 29/30
 - 48s - loss: 0.1497 - acc: 0.9572 - val_loss: 0.6629 - val_acc: 0.8996

Epoch 30/30
 - 48s - loss: 0.1453 - acc: 0.9582 - val_loss: 0.7137 - val_acc: 0.9074

Test accuracy:
0.9073634204275535
--------------------------------------------------------------------------------
Model: "sequential_16"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 28)                4256
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 28)                0
_________________________________________________________________
dense_14 (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
 - 49s - loss: 1.1837 - acc: 0.5035 - val_loss: 0.9108 - val_acc: 0.5962

Epoch 2/30
 - 48s - loss: 0.8756 - acc: 0.6319 - val_loss: 1.0326 - val_acc: 0.6125

Epoch 3/30
 - 47s - loss: 0.7471 - acc: 0.7314 - val_loss: 0.6651 - val_acc: 0.7645

Epoch 4/30
 - 48s - loss: 0.5355 - acc: 0.8094 - val_loss: 0.6101 - val_acc: 0.8215

Epoch 5/30
 - 48s - loss: 0.4246 - acc: 0.8716 - val_loss: 0.5977 - val_acc: 0.8575

Epoch 6/30
 - 48s - loss: 0.3634 - acc: 0.9021 - val_loss: 0.4658 - val_acc: 0.8680

Epoch 7/30
 - 48s - loss: 0.3098 - acc: 0.9193 - val_loss: 0.5094 - val_acc: 0.8643

Epoch 8/30
 - 48s - loss: 0.3984 - acc: 0.9117 - val_loss: 0.5792 - val_acc: 0.8639

Epoch 9/30
 - 48s - loss: 0.3230 - acc: 0.9242 - val_loss: 0.4970 - val_acc: 0.8670

Epoch 10/30
 - 48s - loss: 0.2444 - acc: 0.9393 - val_loss: 0.4638 - val_acc: 0.8809

Epoch 11/30
 - 48s - loss: 0.3361 - acc: 0.9253 - val_loss: 0.4748 - val_acc: 0.8941

Epoch 12/30
 - 48s - loss: 0.2657 - acc: 0.9317 - val_loss: 0.4429 - val_acc: 0.8772

Epoch 13/30
 - 48s - loss: 0.3026 - acc: 0.9300 - val_loss: 0.6944 - val_acc: 0.8616
```

```
Epoch 14/30
 - 48s - loss: 0.2484 - acc: 0.9366 - val_loss: 0.4102 - val_acc: 0.8965

Epoch 15/30
 - 48s - loss: 0.2600 - acc: 0.9309 - val_loss: 0.4303 - val_acc: 0.8972

Epoch 16/30
 - 47s - loss: 0.2197 - acc: 0.9412 - val_loss: 0.4614 - val_acc: 0.8958

Epoch 17/30
 - 48s - loss: 0.1959 - acc: 0.9400 - val_loss: 0.4583 - val_acc: 0.8985

Epoch 18/30
 - 48s - loss: 0.2176 - acc: 0.9400 - val_loss: 0.4585 - val_acc: 0.8884

Epoch 19/30
 - 48s - loss: 0.2343 - acc: 0.9347 - val_loss: 0.4853 - val_acc: 0.8982

Epoch 20/30
 - 48s - loss: 0.2024 - acc: 0.9422 - val_loss: 0.5139 - val_acc: 0.8955

Epoch 21/30
 - 48s - loss: 0.2029 - acc: 0.9399 - val_loss: 0.4324 - val_acc: 0.9043

Epoch 22/30
 - 48s - loss: 0.2015 - acc: 0.9404 - val_loss: 0.5672 - val_acc: 0.9002

Epoch 23/30
 - 48s - loss: 0.2319 - acc: 0.9395 - val_loss: 0.4732 - val_acc: 0.9033

Epoch 24/30
 - 48s - loss: 0.2048 - acc: 0.9389 - val_loss: 0.5392 - val_acc: 0.8945

Epoch 25/30
 - 47s - loss: 0.2129 - acc: 0.9412 - val_loss: 0.5514 - val_acc: 0.8768

Epoch 26/30
 - 48s - loss: 0.2099 - acc: 0.9422 - val_loss: 0.4285 - val_acc: 0.9067

Epoch 27/30
 - 48s - loss: 0.3120 - acc: 0.9274 - val_loss: 0.5283 - val_acc: 0.8948

Epoch 28/30
 - 48s - loss: 0.2480 - acc: 0.9427 - val_loss: 0.6737 - val_acc: 0.8734

Epoch 29/30
 - 48s - loss: 0.2344 - acc: 0.9440 - val_loss: 0.3997 - val_acc: 0.9074

Epoch 30/30
 - 48s - loss: 0.1860 - acc: 0.9453 - val_loss: 0.4419 - val_acc: 0.9019

Test accuracy:
0.9019341703427214
--------------------------------------------------------------------------------
Model: "sequential_17"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
LSTM1_1 (LSTM)               (None, 36)                6624
_________________________________________________________________
Dropout1_1 (Dropout)         (None, 36)                0
_________________________________________________________________
dense_15 (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
 - 49s - loss: 1.0899 - acc: 0.5454 - val_loss: 0.8818 - val_acc: 0.6400

Epoch 2/30
 - 48s - loss: 0.6493 - acc: 0.7716 - val_loss: 0.5493 - val_acc: 0.8575
```

```
Epoch 3/30
 - 48s - loss: 0.4104 - acc: 0.8925 - val_loss: 0.6928 - val_acc: 0.8252

Epoch 4/30
 - 48s - loss: 0.3213 - acc: 0.9134 - val_loss: 0.5909 - val_acc: 0.8649

Epoch 5/30
 - 48s - loss: 0.2763 - acc: 0.9223 - val_loss: 0.3457 - val_acc: 0.9070

Epoch 6/30
 - 48s - loss: 0.2604 - acc: 0.9241 - val_loss: 0.3747 - val_acc: 0.8856

Epoch 7/30
 - 48s - loss: 0.2550 - acc: 0.9260 - val_loss: 0.3928 - val_acc: 0.8962

Epoch 8/30
 - 48s - loss: 0.2203 - acc: 0.9346 - val_loss: 0.4639 - val_acc: 0.8972

Epoch 9/30
 - 48s - loss: 0.2302 - acc: 0.9304 - val_loss: 0.3555 - val_acc: 0.8935

Epoch 10/30
 - 48s - loss: 0.2192 - acc: 0.9346 - val_loss: 0.4863 - val_acc: 0.8836

Epoch 11/30
 - 48s - loss: 0.2173 - acc: 0.9335 - val_loss: 0.6099 - val_acc: 0.8558

Epoch 12/30
 - 48s - loss: 0.2172 - acc: 0.9368 - val_loss: 0.4700 - val_acc: 0.8833

Epoch 13/30
 - 48s - loss: 0.2326 - acc: 0.9361 - val_loss: 0.4298 - val_acc: 0.8968

Epoch 14/30
 - 48s - loss: 0.2059 - acc: 0.9378 - val_loss: 0.3540 - val_acc: 0.9223

Epoch 15/30
 - 48s - loss: 0.1987 - acc: 0.9391 - val_loss: 0.4579 - val_acc: 0.9172

Epoch 16/30
 - 48s - loss: 0.2094 - acc: 0.9389 - val_loss: 0.5147 - val_acc: 0.9030

Epoch 17/30
 - 48s - loss: 0.1949 - acc: 0.9416 - val_loss: 0.3508 - val_acc: 0.9145

Epoch 18/30
 - 48s - loss: 0.1932 - acc: 0.9460 - val_loss: 0.4674 - val_acc: 0.9128

Epoch 19/30
 - 48s - loss: 0.2119 - acc: 0.9415 - val_loss: 0.5891 - val_acc: 0.9067

Epoch 20/30
 - 48s - loss: 0.1855 - acc: 0.9502 - val_loss: 0.6002 - val_acc: 0.8996

Epoch 21/30
 - 48s - loss: 0.1940 - acc: 0.9489 - val_loss: 0.4308 - val_acc: 0.9175

Epoch 22/30
 - 48s - loss: 0.1917 - acc: 0.9470 - val_loss: 0.5048 - val_acc: 0.9206

Epoch 23/30
 - 48s - loss: 0.2014 - acc: 0.9457 - val_loss: 0.4892 - val_acc: 0.9152

Epoch 24/30
 - 48s - loss: 0.1812 - acc: 0.9494 - val_loss: 0.6909 - val_acc: 0.9033

Epoch 25/30
 - 48s - loss: 0.1830 - acc: 0.9489 - val_loss: 0.4817 - val_acc: 0.9196

Epoch 26/30
 - 48s - loss: 0.1811 - acc: 0.9508 - val_loss: 0.6191 - val_acc: 0.9087

Epoch 27/30
 - 48s - loss: 0.1863 - acc: 0.9516 - val_loss: 0.4684 - val_acc: 0.9158

Epoch 28/30
 - 48s - loss: 0.1945 - acc: 0.9470 - val_loss: 0.4935 - val_acc: 0.9033
```

```
 - 48s - loss: 0.1945 - acc: 0.9470 - val_loss: 0.4955 - val_acc: 0.9055

Epoch 29/30
 - 48s - loss: 0.1801 - acc: 0.9512 - val_loss: 0.4445 - val_acc: 0.9250

Epoch 30/30
 - 48s - loss: 0.1866 - acc: 0.9494 - val_loss: 0.6414 - val_acc: 0.9121

Test accuracy:
0.9121140142517815
----------------------------------------------------------------------------------------------
100%|██████████| 15/15 [5:58:24<00:00, 1434.57s/it, best loss: -0.9334916864608076]
```

In [37]:

```
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': [0.5190059752947982], 'LSTM': [1], 'choiceval': [1], 'l2': [0.0007371698374615214], 'l
r': [0.01942874904782045], 'lr_1': [0.015993860150909475]}

{'Dropout': 0.5190059752947982, 'LSTM': 32, 'choiceval': 'rmsprop', 'l2': 0.0007371698374615214, '
lr': 0.01942874904782045, 'lr_1': 0.015993860150909475}
-------------------------------------------------
Model 2 parameters
{'Dropout': [0.3522212869436163], 'LSTM': [2], 'choiceval': [0], 'l2': [0.0008366666847115819], 'l
r': [0.023605271151689124], 'lr_1': [0.015140941766877332]}

{'Dropout': 0.3522212869436163, 'LSTM': 36, 'choiceval': 'adam', 'l2': 0.0008366666847115819,
'lr': 0.023605271151689124, 'lr_1': 0.015140941766877332}
-------------------------------------------------
Model 3 parameters
{'Dropout': [0.4624763011513043], 'LSTM': [2], 'choiceval': [1], 'l2': [0.0009758185183456943], 'l
r': [0.013618600574440736], 'lr_1': [0.014402022095061829]}

{'Dropout': 0.4624763011513043, 'LSTM': 36, 'choiceval': 'rmsprop', 'l2': 0.0009758185183456943, '
lr': 0.013618600574440736, 'lr_1': 0.014402022095061829}
-------------------------------------------------
Model 4 parameters
{'Dropout': [0.5482402774099263], 'LSTM': [0], 'choiceval': [1], 'l2': [0.00041266207281071243], '
lr': [0.01675112837971219], 'lr_1': [0.009417276849790152]}

{'Dropout': 0.5482402774099263, 'LSTM': 28, 'choiceval': 'rmsprop', 'l2': 0.00041266207281071243,
'lr': 0.01675112837971219, 'lr_1': 0.009417276849790152}
-------------------------------------------------
Model 5 parameters
{'Dropout': [0.3774990884907725], 'LSTM': [1], 'choiceval': [0], 'l2': [0.0003746350041674067], 'l
r': [0.01834130504525777], 'lr_1': [0.0229410270349058]}

{'Dropout': 0.3774990884907725, 'LSTM': 32, 'choiceval': 'adam', 'l2': 0.0003746350041674067,
'lr': 0.01834130504525777, 'lr_1': 0.0229410270349058}
-------------------------------------------------
Model 6 parameters
{'Dropout': [0.36612769130873457], 'LSTM': [1], 'choiceval': [0], 'l2': [0.0006883693507416478], '
lr': [0.017446396677831936], 'lr_1': [0.015805655140931824]}

{'Dropout': 0.36612769130873457, 'LSTM': 32, 'choiceval': 'adam', 'l2': 0.0006883693507416478,
'lr': 0.017446396677831936, 'lr_1': 0.015805655140931824}
-------------------------------------------------
Model 7 parameters
{'Dropout': [0.49380744098707813], 'LSTM': [0], 'choiceval': [0], 'l2': [0.00033513936081413357],
'lr': [0.01068491666284852], 'lr_1': [0.01643494651558678]}

{'Dropout': 0.49380744098707813, 'LSTM': 28, 'choiceval': 'adam', 'l2': 0.00033513936081413357,
'lr': 0.01068491666284852, 'lr_1': 0.01643494651558678}
-------------------------------------------------
Model 8 parameters
```

```
{'Dropout': [0.40865420439323175], 'LSTM': [1], 'choiceval': [0], 'l2': [0.000258985915829989],
'lr': [0.010314137826059229], 'lr_1': [0.009310543992889801]}

{'Dropout': 0.40865420439323175, 'LSTM': 32, 'choiceval': 'adam', 'l2': 0.000258985915829989,
'lr': 0.010314137826059229, 'lr_1': 0.009310543992889801}
--------------------------------------------------
Model 9 parameters
{'Dropout': [0.4549262343143784], 'LSTM': [1], 'choiceval': [0], 'l2': [0.0004437546321946204], 'l
r': [0.023536039320918772], 'lr_1': [0.012611516495429879]}

{'Dropout': 0.4549262343143784, 'LSTM': 32, 'choiceval': 'adam', 'l2': 0.0004437546321946204,
'lr': 0.023536039320918772, 'lr_1': 0.012611516495429879}
--------------------------------------------------
Model 10 parameters
{'Dropout': [0.4268130731072923], 'LSTM': [0], 'choiceval': [0], 'l2': [9.225974322037534e-05], 'l
r': [0.01235075833910319], 'lr_1': [0.018058999803996133]}

{'Dropout': 0.4268130731072923, 'LSTM': 28, 'choiceval': 'adam', 'l2': 9.225974322037534e-05,
'lr': 0.01235075833910319, 'lr_1': 0.018058999803996133}
--------------------------------------------------
Model 11 parameters
{'Dropout': [0.46953652082220954], 'LSTM': [1], 'choiceval': [0], 'l2': [0.0005106207029550342], '
lr': [0.013696392786995321], 'lr_1': [0.009420957669947726]}

{'Dropout': 0.46953652082220954, 'LSTM': 32, 'choiceval': 'adam', 'l2': 0.0005106207029550342,
'lr': 0.013696392786995321, 'lr_1': 0.009420957669947726}
--------------------------------------------------
Model 12 parameters
{'Dropout': [0.4137988869052149], 'LSTM': [1], 'choiceval': [1], 'l2': [0.0009457487322332761], 'l
r': [0.021003723896153827], 'lr_1': [0.014111778261744532]}

{'Dropout': 0.4137988869052149, 'LSTM': 32, 'choiceval': 'rmsprop', 'l2': 0.0009457487322332761, '
lr': 0.021003723896153827, 'lr_1': 0.014111778261744532}
--------------------------------------------------
Model 13 parameters
{'Dropout': [0.39301954874273576], 'LSTM': [2], 'choiceval': [1], 'l2': [0.000376241262719619],
'lr': [0.02028522715636994], 'lr_1': [0.02075108210315991]}

{'Dropout': 0.39301954874273576, 'LSTM': 36, 'choiceval': 'rmsprop', 'l2': 0.000376241262719619, '
lr': 0.02028522715636994, 'lr_1': 0.02075108210315991}
--------------------------------------------------
Model 14 parameters
{'Dropout': [0.3709325062320313], 'LSTM': [0], 'choiceval': [0], 'l2': [0.0007102309264917989], 'l
r': [0.016347608866364167], 'lr_1': [0.024543333891182614]}

{'Dropout': 0.3709325062320313, 'LSTM': 28, 'choiceval': 'adam', 'l2': 0.0007102309264917989,
'lr': 0.016347608866364167, 'lr_1': 0.024543333891182614}
--------------------------------------------------
Model 15 parameters
{'Dropout': [0.44909767403125833], 'LSTM': [2], 'choiceval': [1], 'l2': [0.0008869747685138522], '
lr': [0.010099240007717829], 'lr_1': [0.024293576282946767]}

{'Dropout': 0.44909767403125833, 'LSTM': 36, 'choiceval': 'rmsprop', 'l2': 0.0008869747685138522,
'lr': 0.010099240007717829, 'lr_1': 0.024293576282946767}
--------------------------------------------------
```

In [38]:

```
best_run
```

Out[38]:

```
{'Dropout': 0.4137988869052149,
 'LSTM': 1,
 'choiceval': 1,
 'l2': 0.0009457487322332761,
 'lr': 0.021003723896153827,
 'lr_1': 0.014111778261744532}
```

In [39]:

```
#BEST MODEL PARAMS
total_trials['M14']
```

Out[39]:

```
{'Dropout': 0.3709325062320313,
 'LSTM': 28,
 'choiceval': 'adam',
 'l2': 0.0007102309264917989,
 'lr': 0.016347608866364167,
 'lr_1': 0.024543333891182614}
```

In [40]:

```
#layers of best model
best_model.layers
```

Out[40]:

```
[<keras.layers.recurrent.LSTM at 0x7ff7901a4cc0>,
 <keras.layers.core.Dropout at 0x7ff79009ca90>,
 <keras.layers.core.Dense at 0x7ff7900a57b8>]
```

In [41]:

```
best_model
```

Out[41]:

```
<keras.engine.sequential.Sequential at 0x7ff7900fb630>
```

In [43]:

```
X_train, Y_train, X_val, Y_val = data()
```

```
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:35: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:51: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
```

In [44]:

```
_,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 0.9334916864608076
validation accuracy 0.9334916864608076
```

In [42]:

```
from keras.models import load_model

best_model.save('best_model.h5')
```

using CNN with hyperparameter tuning

In [ ]:

```
#citation link: reference
#https://github.com/maxpumperla/hyperas
#how to tune hyperparameters for keras models
#pip install hyperas
#https://www.kaggle.com/kt66nf/hyperparameter-optimization-using-keras-hyperas
```

In [8]:

```
from sklearn.preprocessing import StandardScaler
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()
            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 [9]:

```
X_train, Y_train, X_val,  Y_val = data_scaled()
```

```
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:58: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:74: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
```

In [10]:

```
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.
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:519:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint8 = np.dtype([("qint8", np.int8, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:520:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint8 = np.dtype([("quint8", np.uint8, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:521:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint16 = np.dtype([("qint16", np.int16, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:522:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint16 = np.dtype([("quint16", np.uint16, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:523:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint32 = np.dtype([("qint32", np.int32, 1)])
/home/ubuntu/anaconda3/lib/python3.6/site-packages/tensorflow/python/framework/dtypes.py:528:
FutureWarning: Passing (type, 1) or '1type' as a synonym of type is deprecated; in a future
version of numpy, it will be understood as (type, (1,)) / '(1,)type'.
  np_resource = np.dtype([("resource", np.ubyte, 1)])
```

In [14]:

```
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='re
lu',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_uniform'))
    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)
    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 [15]:

```
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 = 'HAR_lstm_hyperparameter_tuning
',
                                     return_space = True)
```

```
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:58: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:74: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
```

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

try:
    import numpy as np
except:
    pass

try:
    import pandas as pd
except:
    pass

try:
    import itertools
except:
    pass

try:
    import numpy as np
except:
    pass

try:
    import matplotlib.pyplot as plt
except:
    pass
```

```
try:
    from sklearn.metrics import confusion_matrix
except:
    pass

try:
    from datetime import datetime
except:
    pass

try:
    import tensorflow as tf
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:
    from hyperas.utils import eval_hyperopt_space
except:
    pass

try:
    from keras.regularizers import l2
except:
    pass

try:
    import keras
except:
    pass

try:
    import tensorflow as tf
except:
    pass

try:
    from keras.models import load_model
except:
    pass

try:
    from sklearn.preprocessing import StandardScaler
except:
    pass

try:
```

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

try:
    from sklearn.preprocessing import StandardScaler
except:
    pass

try:
    from keras.models import Sequential
except:
    pass

try:
    from keras.layers import Dense
except:
    pass

try:
    from keras.layers import Flatten
except:
    pass

try:
    from keras.layers import Dropout
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 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:
    import tensorflow as tf
except:
    pass

try:
    from hyperas.utils import eval_hyperopt_space
except:
    pass

try:
    from prettytable import PrettyTable
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'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'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:     # Importing tensorflow
   4:     np.random.seed(36)
   5:     tf.set_random_seed(36)
   6:     # Initiliazing the sequential model
   7:     model = Sequential()
   8:
   9:     model.add(Conv1D(filters=space['filters'],
kernel_size=space['kernel_size'],activation='relu',kernel_initializer='he_uniform',
  10:                 kernel_regularizer=l2(space['l2']),input_shape=(128,9)))
  11:
  12:     model.add(Conv1D(filters=space['filters_1'], kernel_size=space['kernel_size_1'],
  13:
activation='relu',kernel_regularizer=l2(space['l2_1']),kernel_initializer='he_uniform'))
  14:     model.add(Dropout(space['Dropout']))
  15:     model.add(MaxPooling1D(pool_size=space['pool_size']))
  16:     model.add(Flatten())
  17:     model.add(Dense(space['Dense'], activation='relu'))
  18:     model.add(Dense(6, activation='softmax'))
  19:
  20:     adam = keras.optimizers.Adam(lr=space['lr'])
  21:     rmsprop = keras.optimizers.RMSprop(lr=space['lr_1'])
  22:
  23:     choiceval = space['choiceval']
  24:
  25:     if choiceval == 'adam':
  26:         optim = adam
  27:     else:
  28:         optim = rmsprop
  29:
  30:     print(model.summary())
  31:
  32:     model.compile(loss='categorical_crossentropy', metrics=['accuracy'],optimizer=optim)
  33:
  34:     result = model.fit(X_train, Y_train,
  35:               batch_size=space['batch_size'],
  36:               nb_epoch=space['nb_epoch'],
  37:               verbose=2,
  38:               validation_data=(X_val, Y_val))
  39:
  40:     score, acc = model.evaluate(X_val, Y_val, verbose=0)
  41:     score1, acc1 = model.evaluate(X_train, Y_train, verbose=0)
  42:     print('Train accuracy',acc1,'Test accuracy:', acc)
  43:     print('--------------------------------------------------------------------------------
')
  44:     return {'loss': -acc, 'status': STATUS_OK, 'model': model,'train_acc':acc1}
  45:
```

```
/home/ubuntu/Downloads/HumanActivityRecognition_assignment/HAR/temp_model.py:234: FutureWarning: M
ethod .as_matrix will be removed in a future version. Use .values instead.
  signals_data.append( _read_csv(filename).as_matrix())


  0%|          | 0/100 [00:00<?, ?it/s, best loss: ?]

/home/ubuntu/Downloads/HumanActivityRecognition_assignment/HAR/temp_model.py:250: FutureWarning: M
ethod .as_matrix will be removed in a future version. Use .values instead.
  return pd.get_dummies(y).as_matrix()

Model: "sequential_1"
_________________________________________________________________
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
  0%|          | 0/100 [00:00<?, ?it/s, best loss: ?]

/home/ubuntu/Downloads/HumanActivityRecognition_assignment/HAR/temp_model.py:299: UserWarning: The
`nb_epoch` argument in `fit` has been renamed `epochs`.
  validation_data=(X_val, Y_val))


Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 2s - loss: 45.6631 - acc: 0.7255 - val_loss: 3.6740 - val_acc: 0.7954

Epoch 2/30
 - 0s - loss: 1.2295 - acc: 0.8456 - val_loss: 0.7920 - val_acc: 0.8341

Epoch 3/30
 - 0s - loss: 0.5903 - acc: 0.8517 - val_loss: 0.8266 - val_acc: 0.7659

Epoch 4/30
 - 0s - loss: 0.5117 - acc: 0.8621 - val_loss: 0.6646 - val_acc: 0.8548

Epoch 5/30
 - 1s - loss: 0.4887 - acc: 0.8734 - val_loss: 0.6930 - val_acc: 0.8086

Epoch 6/30
 - 1s - loss: 0.4664 - acc: 0.8829 - val_loss: 0.6727 - val_acc: 0.8517

Epoch 7/30
 - 1s - loss: 0.4525 - acc: 0.8883 - val_loss: 0.5819 - val_acc: 0.8792

Epoch 8/30
 - 1s - loss: 0.4378 - acc: 0.8891 - val_loss: 0.6060 - val_acc: 0.8022

Epoch 9/30
 - 0s - loss: 0.4140 - acc: 0.8980 - val_loss: 0.5413 - val_acc: 0.8795

Epoch 10/30
 - 0s - loss: 0.4023 - acc: 0.8989 - val_loss: 0.5726 - val_acc: 0.8666

Epoch 11/30
 - 0s - loss: 0.3962 - acc: 0.9030 - val_loss: 0.4982 - val_acc: 0.8856
```

```
Epoch 12/30
 - 0s - loss: 0.4100 - acc: 0.8951 - val_loss: 0.5756 - val_acc: 0.8554

Epoch 13/30
 - 0s - loss: 0.3807 - acc: 0.9048 - val_loss: 0.5626 - val_acc: 0.8823

Epoch 14/30
 - 0s - loss: 0.3768 - acc: 0.9076 - val_loss: 0.5327 - val_acc: 0.8751

Epoch 15/30
 - 0s - loss: 0.3650 - acc: 0.9117 - val_loss: 0.4581 - val_acc: 0.8843

Epoch 16/30
 - 0s - loss: 0.3566 - acc: 0.9140 - val_loss: 0.4677 - val_acc: 0.8802

Epoch 17/30
 - 0s - loss: 0.3322 - acc: 0.9192 - val_loss: 0.5556 - val_acc: 0.8609

Epoch 18/30
 - 0s - loss: 0.3628 - acc: 0.9115 - val_loss: 0.4803 - val_acc: 0.8782

Epoch 19/30
 - 0s - loss: 0.3305 - acc: 0.9188 - val_loss: 0.5428 - val_acc: 0.8527

Epoch 20/30
 - 0s - loss: 0.4033 - acc: 0.9003 - val_loss: 0.4710 - val_acc: 0.8938

Epoch 21/30
 - 1s - loss: 0.3336 - acc: 0.9174 - val_loss: 0.5097 - val_acc: 0.8626

Epoch 22/30
 - 0s - loss: 0.3319 - acc: 0.9193 - val_loss: 0.5162 - val_acc: 0.8578

Epoch 23/30
 - 0s - loss: 0.3475 - acc: 0.9120 - val_loss: 0.5034 - val_acc: 0.8439

Epoch 24/30
 - 0s - loss: 0.3527 - acc: 0.9135 - val_loss: 0.4333 - val_acc: 0.9026

Epoch 25/30
 - 0s - loss: 0.3562 - acc: 0.9131 - val_loss: 0.4667 - val_acc: 0.8772

Epoch 26/30
 - 0s - loss: 0.3373 - acc: 0.9174 - val_loss: 0.4313 - val_acc: 0.8880

Epoch 27/30
 - 0s - loss: 0.3293 - acc: 0.9202 - val_loss: 0.4428 - val_acc: 0.8901

Epoch 28/30
 - 1s - loss: 0.3508 - acc: 0.9173 - val_loss: 0.4748 - val_acc: 0.8894

Epoch 29/30
 - 1s - loss: 0.3349 - acc: 0.9185 - val_loss: 0.5075 - val_acc: 0.8724

Epoch 30/30
 - 1s - loss: 0.3112 - acc: 0.9252 - val_loss: 0.4570 - val_acc: 0.8643

Train accuracy
0.9164853101196954
Test accuracy:
0.8642687478791992
_________________________________________________________________________________________
Model: "sequential_2"
_________________________________________________________________
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
 - 1s - loss: 4.8336 - acc: 0.7004 - val_loss: 0.7989 - val_acc: 0.7794

Epoch 2/35
 - 1s - loss: 0.5951 - acc: 0.8444 - val_loss: 0.9780 - val_acc: 0.6512

Epoch 3/35
 - 1s - loss: 0.4714 - acc: 0.8811 - val_loss: 0.6050 - val_acc: 0.8643

Epoch 4/35
 - 1s - loss: 0.4072 - acc: 0.8969 - val_loss: 0.5311 - val_acc: 0.8521

Epoch 5/35
 - 1s - loss: 0.3773 - acc: 0.9057 - val_loss: 0.4979 - val_acc: 0.8690

Epoch 6/35
 - 1s - loss: 0.3625 - acc: 0.9125 - val_loss: 1.1808 - val_acc: 0.6756

Epoch 7/35
 - 1s - loss: 0.3494 - acc: 0.9150 - val_loss: 0.4890 - val_acc: 0.8402

Epoch 8/35
 - 1s - loss: 0.3510 - acc: 0.9117 - val_loss: 0.4686 - val_acc: 0.8616

Epoch 9/35
 - 1s - loss: 0.3442 - acc: 0.9159 - val_loss: 0.4513 - val_acc: 0.8592

Epoch 10/35
 - 1s - loss: 0.3187 - acc: 0.9192 - val_loss: 0.4881 - val_acc: 0.8466

Epoch 11/35
 - 1s - loss: 0.3133 - acc: 0.9217 - val_loss: 0.6826 - val_acc: 0.7648

Epoch 12/35
 - 1s - loss: 0.3129 - acc: 0.9212 - val_loss: 0.7913 - val_acc: 0.7974

Epoch 13/35
 - 1s - loss: 0.3021 - acc: 0.9252 - val_loss: 0.5054 - val_acc: 0.8364

Epoch 14/35
 - 1s - loss: 0.3061 - acc: 0.9229 - val_loss: 0.4972 - val_acc: 0.8534

Epoch 15/35
 - 1s - loss: 0.3089 - acc: 0.9218 - val_loss: 0.5151 - val_acc: 0.8229

Epoch 16/35
 - 1s - loss: 0.2869 - acc: 0.9267 - val_loss: 0.5638 - val_acc: 0.8334

Epoch 17/35
 - 1s - loss: 0.2990 - acc: 0.9251 - val_loss: 0.5096 - val_acc: 0.8402

Epoch 18/35
 - 1s - loss: 0.2916 - acc: 0.9272 - val_loss: 0.4096 - val_acc: 0.8867

Epoch 19/35
 - 1s - loss: 0.2937 - acc: 0.9242 - val_loss: 0.4264 - val_acc: 0.8839

Epoch 20/35
 - 1s - loss: 0.2859 - acc: 0.9259 - val_loss: 0.5145 - val_acc: 0.8276

Epoch 21/35
 - 1s - loss: 0.2929 - acc: 0.9233 - val_loss: 0.4416 - val_acc: 0.8694

Epoch 22/35
 - 1s - loss: 0.2957 - acc: 0.9276 - val_loss: 0.4353 - val_acc: 0.8775

Epoch 23/35
```

```
 - 1s - loss: 0.2843 - acc: 0.9238 - val_loss: 0.4145 - val_acc: 0.8748

Epoch 24/35
 - 1s - loss: 0.2839 - acc: 0.9252 - val_loss: 0.4264 - val_acc: 0.8836

Epoch 25/35
 - 1s - loss: 0.2961 - acc: 0.9266 - val_loss: 0.4425 - val_acc: 0.8582

Epoch 26/35
 - 1s - loss: 0.2891 - acc: 0.9248 - val_loss: 0.4343 - val_acc: 0.8802

Epoch 27/35
 - 1s - loss: 0.2931 - acc: 0.9244 - val_loss: 0.5539 - val_acc: 0.8354

Epoch 28/35
 - 1s - loss: 0.2824 - acc: 0.9274 - val_loss: 0.6173 - val_acc: 0.8480

Epoch 29/35
 - 1s - loss: 0.2702 - acc: 0.9290 - val_loss: 0.4423 - val_acc: 0.8663

Epoch 30/35
 - 1s - loss: 0.3034 - acc: 0.9233 - val_loss: 0.4226 - val_acc: 0.8904

Epoch 31/35
 - 1s - loss: 0.2992 - acc: 0.9246 - val_loss: 0.4212 - val_acc: 0.8792

Epoch 32/35
 - 1s - loss: 0.2875 - acc: 0.9271 - val_loss: 0.5050 - val_acc: 0.8280

Epoch 33/35
 - 1s - loss: 0.2884 - acc: 0.9271 - val_loss: 0.6053 - val_acc: 0.8422

Epoch 34/35
 - 1s - loss: 0.2937 - acc: 0.9264 - val_loss: 0.4596 - val_acc: 0.8476

Epoch 35/35
 - 1s - loss: 0.2928 - acc: 0.9256 - val_loss: 0.4607 - val_acc: 0.8714

Train accuracy
0.9314472252448314
Test accuracy:
0.8713946386155412
_________________________________________________________________________________
Model: "sequential_3"
_________________________________________________________________
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
 - 1s - loss: 20.3575 - acc: 0.7484 - val_loss: 0.8393 - val_acc: 0.8320

Epoch 2/35
 - 1s - loss: 0.5896 - acc: 0.8475 - val_loss: 0.7320 - val_acc: 0.7777

Epoch 3/35
 - 1s - loss: 0.4849 - acc: 0.8787 - val_loss: 0.6157 - val_acc: 0.8507

Epoch 4/35
```

```
 - 1s - loss: 0.4231 - acc: 0.8968 - val_loss: 0.5331 - val_acc: 0.8639

Epoch 5/35
 - 1s - loss: 0.3926 - acc: 0.9021 - val_loss: 0.4819 - val_acc: 0.8982

Epoch 6/35
 - 1s - loss: 0.3753 - acc: 0.9116 - val_loss: 0.4705 - val_acc: 0.8860

Epoch 7/35
 - 1s - loss: 0.3602 - acc: 0.9100 - val_loss: 0.4583 - val_acc: 0.8924

Epoch 8/35
 - 1s - loss: 0.3565 - acc: 0.9124 - val_loss: 0.4521 - val_acc: 0.8880

Epoch 9/35
 - 1s - loss: 0.3427 - acc: 0.9139 - val_loss: 0.4466 - val_acc: 0.8870

Epoch 10/35
 - 1s - loss: 0.3335 - acc: 0.9139 - val_loss: 0.4788 - val_acc: 0.8649

Epoch 11/35
 - 1s - loss: 0.3275 - acc: 0.9154 - val_loss: 0.4465 - val_acc: 0.8792

Epoch 12/35
 - 1s - loss: 0.3243 - acc: 0.9196 - val_loss: 0.4438 - val_acc: 0.8941

Epoch 13/35
 - 1s - loss: 0.3141 - acc: 0.9192 - val_loss: 0.4029 - val_acc: 0.9009

Epoch 14/35
 - 1s - loss: 0.3063 - acc: 0.9217 - val_loss: 0.5977 - val_acc: 0.7791

Epoch 15/35
 - 1s - loss: 0.3119 - acc: 0.9169 - val_loss: 0.4128 - val_acc: 0.8911

Epoch 16/35
 - 1s - loss: 0.2997 - acc: 0.9218 - val_loss: 0.4116 - val_acc: 0.8819

Epoch 17/35
 - 1s - loss: 0.2961 - acc: 0.9211 - val_loss: 0.4109 - val_acc: 0.8721

Epoch 18/35
 - 1s - loss: 0.2994 - acc: 0.9188 - val_loss: 0.4516 - val_acc: 0.8707

Epoch 19/35
 - 1s - loss: 0.2884 - acc: 0.9230 - val_loss: 0.4432 - val_acc: 0.8646

Epoch 20/35
 - 1s - loss: 0.2899 - acc: 0.9217 - val_loss: 0.3947 - val_acc: 0.8826

Epoch 21/35
 - 1s - loss: 0.2831 - acc: 0.9211 - val_loss: 0.4397 - val_acc: 0.8639

Epoch 22/35
 - 1s - loss: 0.2839 - acc: 0.9195 - val_loss: 0.6397 - val_acc: 0.7828

Epoch 23/35
 - 1s - loss: 0.2960 - acc: 0.9246 - val_loss: 0.4225 - val_acc: 0.8873

Epoch 24/35
 - 1s - loss: 0.2874 - acc: 0.9245 - val_loss: 0.4410 - val_acc: 0.8812

Epoch 25/35
 - 1s - loss: 0.2945 - acc: 0.9222 - val_loss: 0.7334 - val_acc: 0.7564

Epoch 26/35
 - 1s - loss: 0.2828 - acc: 0.9225 - val_loss: 0.4711 - val_acc: 0.8449

Epoch 27/35
 - 1s - loss: 0.2776 - acc: 0.9240 - val_loss: 0.4905 - val_acc: 0.8388

Epoch 28/35
 - 1s - loss: 0.2871 - acc: 0.9238 - val_loss: 0.6996 - val_acc: 0.8049

Epoch 29/35
 - 1s - loss: 0.2800 - acc: 0.9244 - val_loss: 0.4017 - val_acc: 0.8894
```

```
Epoch 30/35
 - 1s - loss: 0.2838 - acc: 0.9237 - val_loss: 0.3783 - val_acc: 0.8999

Epoch 31/35
 - 1s - loss: 0.2789 - acc: 0.9227 - val_loss: 0.4857 - val_acc: 0.8578

Epoch 32/35
 - 1s - loss: 0.2814 - acc: 0.9241 - val_loss: 1.1569 - val_acc: 0.6953

Epoch 33/35
 - 1s - loss: 0.2879 - acc: 0.9244 - val_loss: 0.5874 - val_acc: 0.8144

Epoch 34/35
 - 1s - loss: 0.2753 - acc: 0.9257 - val_loss: 0.4505 - val_acc: 0.8449

Epoch 35/35
 - 1s - loss: 0.2767 - acc: 0.9238 - val_loss: 0.4754 - val_acc: 0.8500

Train accuracy
0.9132208922742111
Test accuracy:
0.8500169664065151
--------------------------------------------------------------------------------
Model: "sequential_4"
_________________________________________________________________
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
 - 1s - loss: 27.3683 - acc: 0.7028 - val_loss: 0.9492 - val_acc: 0.8358

Epoch 2/30
 - 1s - loss: 0.6951 - acc: 0.8085 - val_loss: 0.7878 - val_acc: 0.8039

Epoch 3/30
 - 1s - loss: 0.5964 - acc: 0.8463 - val_loss: 0.8159 - val_acc: 0.7801

Epoch 4/30
 - 1s - loss: 0.5402 - acc: 0.8644 - val_loss: 0.6643 - val_acc: 0.8602

Epoch 5/30
 - 1s - loss: 0.5127 - acc: 0.8730 - val_loss: 0.7862 - val_acc: 0.7808

Epoch 6/30
 - 1s - loss: 0.4925 - acc: 0.8746 - val_loss: 0.5902 - val_acc: 0.8619

Epoch 7/30
 - 1s - loss: 0.4796 - acc: 0.8803 - val_loss: 0.5985 - val_acc: 0.8602

Epoch 8/30
 - 1s - loss: 0.4632 - acc: 0.8792 - val_loss: 0.5726 - val_acc: 0.8697

Epoch 9/30
 - 1s - loss: 0.4518 - acc: 0.8878 - val_loss: 0.6740 - val_acc: 0.8269

Epoch 10/30
 - 1s - loss: 0.4509 - acc: 0.8856 - val_loss: 0.8493 - val_acc: 0.7581
```

```
Epoch 11/30
 - 1s - loss: 0.4363 - acc: 0.8902 - val_loss: 0.5907 - val_acc: 0.8521

Epoch 12/30
 - 1s - loss: 0.4328 - acc: 0.8898 - val_loss: 0.5946 - val_acc: 0.8283

Epoch 13/30
 - 1s - loss: 0.4394 - acc: 0.8916 - val_loss: 0.5715 - val_acc: 0.8137

Epoch 14/30
 - 1s - loss: 0.4251 - acc: 0.8932 - val_loss: 0.7697 - val_acc: 0.7204

Epoch 15/30
 - 1s - loss: 0.4190 - acc: 0.8931 - val_loss: 1.0278 - val_acc: 0.7306

Epoch 16/30
 - 1s - loss: 0.4143 - acc: 0.8916 - val_loss: 1.0401 - val_acc: 0.6362

Epoch 17/30
 - 1s - loss: 0.4173 - acc: 0.8949 - val_loss: 0.6918 - val_acc: 0.7828

Epoch 18/30
 - 1s - loss: 0.4010 - acc: 0.9008 - val_loss: 0.6574 - val_acc: 0.8107

Epoch 19/30
 - 1s - loss: 0.4084 - acc: 0.8949 - val_loss: 0.7804 - val_acc: 0.7893

Epoch 20/30
 - 1s - loss: 0.3998 - acc: 0.8976 - val_loss: 0.4701 - val_acc: 0.8680

Epoch 21/30
 - 1s - loss: 0.4030 - acc: 0.8981 - val_loss: 0.6874 - val_acc: 0.7886

Epoch 22/30
 - 1s - loss: 0.3929 - acc: 0.9008 - val_loss: 0.9044 - val_acc: 0.6970

Epoch 23/30
 - 1s - loss: 0.3900 - acc: 0.9014 - val_loss: 0.6372 - val_acc: 0.8191

Epoch 24/30
 - 1s - loss: 0.3989 - acc: 0.8993 - val_loss: 0.9071 - val_acc: 0.7180

Epoch 25/30
 - 1s - loss: 0.3940 - acc: 0.8995 - val_loss: 1.0882 - val_acc: 0.6685

Epoch 26/30
 - 1s - loss: 0.3962 - acc: 0.8938 - val_loss: 0.6639 - val_acc: 0.8005

Epoch 27/30
 - 1s - loss: 0.3918 - acc: 0.9006 - val_loss: 1.1005 - val_acc: 0.6176

Epoch 28/30
 - 1s - loss: 0.3945 - acc: 0.8980 - val_loss: 0.6645 - val_acc: 0.8266

Epoch 29/30
 - 1s - loss: 0.3840 - acc: 0.9000 - val_loss: 0.6993 - val_acc: 0.7550

Epoch 30/30
 - 1s - loss: 0.3885 - acc: 0.8988 - val_loss: 0.6044 - val_acc: 0.8059

Train accuracy
0.8788084874863983
Test accuracy:
0.8059043094672549
---------------------------------------------------------------------------------
Model: "sequential_5"
_________________________________________________________________
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
 - 1s - loss: 13.5035 - acc: 0.6541 - val_loss: 2.2046 - val_acc: 0.7513

Epoch 2/25
 - 0s - loss: 0.9648 - acc: 0.8060 - val_loss: 0.8084 - val_acc: 0.7655

Epoch 3/25
 - 0s - loss: 0.5329 - acc: 0.8704 - val_loss: 0.5970 - val_acc: 0.8968

Epoch 4/25
 - 0s - loss: 0.4619 - acc: 0.8881 - val_loss: 0.5605 - val_acc: 0.8907

Epoch 5/25
 - 0s - loss: 0.4152 - acc: 0.8973 - val_loss: 0.5077 - val_acc: 0.8965

Epoch 6/25
 - 0s - loss: 0.3799 - acc: 0.9063 - val_loss: 0.5755 - val_acc: 0.8185

Epoch 7/25
 - 0s - loss: 0.3690 - acc: 0.9053 - val_loss: 0.4988 - val_acc: 0.8663

Epoch 8/25
 - 0s - loss: 0.3609 - acc: 0.9068 - val_loss: 0.4662 - val_acc: 0.8867

Epoch 9/25
 - 0s - loss: 0.3464 - acc: 0.9131 - val_loss: 0.5541 - val_acc: 0.8242

Epoch 10/25
 - 1s - loss: 0.3338 - acc: 0.9135 - val_loss: 0.4902 - val_acc: 0.8385

Epoch 11/25
 - 1s - loss: 0.3343 - acc: 0.9158 - val_loss: 0.4508 - val_acc: 0.8758

Epoch 12/25
 - 1s - loss: 0.3291 - acc: 0.9151 - val_loss: 0.4358 - val_acc: 0.8795

Epoch 13/25
 - 1s - loss: 0.3267 - acc: 0.9195 - val_loss: 0.4176 - val_acc: 0.8850

Epoch 14/25
 - 1s - loss: 0.3143 - acc: 0.9210 - val_loss: 0.4115 - val_acc: 0.8880

Epoch 15/25
 - 1s - loss: 0.3251 - acc: 0.9180 - val_loss: 0.3941 - val_acc: 0.8985

Epoch 16/25
 - 1s - loss: 0.3181 - acc: 0.9212 - val_loss: 0.4736 - val_acc: 0.8490

Epoch 17/25
 - 1s - loss: 0.2977 - acc: 0.9227 - val_loss: 0.5509 - val_acc: 0.8219

Epoch 18/25
 - 1s - loss: 0.3087 - acc: 0.9188 - val_loss: 0.4254 - val_acc: 0.8789

Epoch 19/25
 - 1s - loss: 0.3049 - acc: 0.9227 - val_loss: 0.6111 - val_acc: 0.8025

Epoch 20/25
 - 1s - loss: 0.3079 - acc: 0.9217 - val_loss: 0.6777 - val_acc: 0.7625

Epoch 21/25
 - 1s - loss: 0.2940 - acc: 0.9244 - val_loss: 0.4225 - val_acc: 0.8707

Epoch 22/25
 - 1s - loss: 0.2961 - acc: 0.9225 - val loss: 0.4308 - val acc: 0.8619
```

```
Epoch 23/25
 - 1s - loss: 0.2984 - acc: 0.9193 - val_loss: 0.5307 - val_acc: 0.8473

Epoch 24/25
 - 1s - loss: 0.2844 - acc: 0.9279 - val_loss: 0.3633 - val_acc: 0.8924

Epoch 25/25
 - 1s - loss: 0.2955 - acc: 0.9237 - val_loss: 0.6739 - val_acc: 0.7940

Train accuracy
0.846980413428069
Test accuracy:
0.7940278249269103
--------------------------------------------------------------------------------
Model: "sequential_6"
_________________________________________________________________
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
 - 1s - loss: 24.1110 - acc: 0.6224 - val_loss: 1.1931 - val_acc: 0.7072

Epoch 2/35
 - 0s - loss: 0.8569 - acc: 0.7408 - val_loss: 0.8810 - val_acc: 0.7255

Epoch 3/35
 - 0s - loss: 0.6965 - acc: 0.7982 - val_loss: 0.7823 - val_acc: 0.7384

Epoch 4/35
 - 0s - loss: 0.6399 - acc: 0.8113 - val_loss: 0.8886 - val_acc: 0.7472

Epoch 5/35
 - 0s - loss: 0.5962 - acc: 0.8364 - val_loss: 0.6509 - val_acc: 0.8198

Epoch 6/35
 - 0s - loss: 0.5841 - acc: 0.8384 - val_loss: 0.7685 - val_acc: 0.7594

Epoch 7/35
 - 0s - loss: 0.5520 - acc: 0.8467 - val_loss: 0.6581 - val_acc: 0.8157

Epoch 8/35
 - 0s - loss: 0.5523 - acc: 0.8569 - val_loss: 0.6878 - val_acc: 0.7947

Epoch 9/35
 - 0s - loss: 0.5366 - acc: 0.8598 - val_loss: 0.5890 - val_acc: 0.8554

Epoch 10/35
 - 0s - loss: 0.5203 - acc: 0.8622 - val_loss: 1.0026 - val_acc: 0.6203

Epoch 11/35
 - 1s - loss: 0.5130 - acc: 0.8701 - val_loss: 0.5427 - val_acc: 0.8836

Epoch 12/35
 - 0s - loss: 0.4958 - acc: 0.8736 - val_loss: 0.5937 - val_acc: 0.8358

Epoch 13/35
 - 0s - loss: 0.4877 - acc: 0.8755 - val_loss: 0.6612 - val_acc: 0.8157
```

```
Epoch 14/35
 - 0s - loss: 0.4711 - acc: 0.8844 - val_loss: 0.5110 - val_acc: 0.8839

Epoch 15/35
 - 1s - loss: 0.4867 - acc: 0.8773 - val_loss: 0.4968 - val_acc: 0.8782

Epoch 16/35
 - 1s - loss: 0.4570 - acc: 0.8862 - val_loss: 0.5338 - val_acc: 0.8616

Epoch 17/35
 - 0s - loss: 0.4551 - acc: 0.8878 - val_loss: 0.5756 - val_acc: 0.8378

Epoch 18/35
 - 0s - loss: 0.4541 - acc: 0.8889 - val_loss: 0.6457 - val_acc: 0.8164

Epoch 19/35
 - 0s - loss: 0.4632 - acc: 0.8876 - val_loss: 0.5107 - val_acc: 0.8809

Epoch 20/35
 - 0s - loss: 0.4278 - acc: 0.8964 - val_loss: 0.5360 - val_acc: 0.8588

Epoch 21/35
 - 0s - loss: 0.4420 - acc: 0.8930 - val_loss: 0.5474 - val_acc: 0.8612

Epoch 22/35
 - 0s - loss: 0.4357 - acc: 0.8938 - val_loss: 0.4373 - val_acc: 0.8955

Epoch 23/35
 - 1s - loss: 0.4132 - acc: 0.9036 - val_loss: 0.4771 - val_acc: 0.8717

Epoch 24/35
 - 1s - loss: 0.4360 - acc: 0.8945 - val_loss: 0.4777 - val_acc: 0.8731

Epoch 25/35
 - 1s - loss: 0.4242 - acc: 0.8954 - val_loss: 0.9134 - val_acc: 0.7421

Epoch 26/35
 - 0s - loss: 0.4330 - acc: 0.8969 - val_loss: 0.6902 - val_acc: 0.7401

Epoch 27/35
 - 0s - loss: 0.4277 - acc: 0.8934 - val_loss: 0.7564 - val_acc: 0.7343

Epoch 28/35
 - 0s - loss: 0.4161 - acc: 0.9003 - val_loss: 0.5471 - val_acc: 0.8517

Epoch 29/35
 - 0s - loss: 0.4145 - acc: 0.9055 - val_loss: 0.6218 - val_acc: 0.7730

Epoch 30/35
 - 0s - loss: 0.4084 - acc: 0.9053 - val_loss: 0.4344 - val_acc: 0.8836

Epoch 31/35
 - 0s - loss: 0.4237 - acc: 0.8981 - val_loss: 0.5422 - val_acc: 0.8677

Epoch 32/35
 - 0s - loss: 0.4075 - acc: 0.9017 - val_loss: 0.4432 - val_acc: 0.8867

Epoch 33/35
 - 0s - loss: 0.4049 - acc: 0.9018 - val_loss: 0.5338 - val_acc: 0.8548

Epoch 34/35
 - 0s - loss: 0.4081 - acc: 0.8961 - val_loss: 0.4318 - val_acc: 0.8968

Epoch 35/35
 - 0s - loss: 0.3986 - acc: 0.9021 - val_loss: 0.4642 - val_acc: 0.8833

Train accuracy
0.9368879215891136
Test accuracy:
0.8832711231761113
_________________________________________________________________
Model: "sequential_7"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_13 (Conv1D)           (None, 122, 42)           2688
```

```
conv1d_13 (Conv1D)           (None, 122, 12)           2060
_________________________________________________________________
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
 - 1s - loss: 25.9344 - acc: 0.7753 - val_loss: 0.7848 - val_acc: 0.8582

Epoch 2/25
 - 1s - loss: 0.5604 - acc: 0.8679 - val_loss: 0.6968 - val_acc: 0.7815

Epoch 3/25
 - 1s - loss: 0.4504 - acc: 0.8887 - val_loss: 0.5210 - val_acc: 0.8979

Epoch 4/25
 - 1s - loss: 0.3879 - acc: 0.9059 - val_loss: 0.5356 - val_acc: 0.8602

Epoch 5/25
 - 1s - loss: 0.3709 - acc: 0.9086 - val_loss: 0.5228 - val_acc: 0.8649

Epoch 6/25
 - 1s - loss: 0.3639 - acc: 0.9071 - val_loss: 0.4590 - val_acc: 0.8792

Epoch 7/25
 - 1s - loss: 0.3458 - acc: 0.9105 - val_loss: 0.5052 - val_acc: 0.8731

Epoch 8/25
 - 1s - loss: 0.3470 - acc: 0.9110 - val_loss: 0.4379 - val_acc: 0.8924

Epoch 9/25
 - 1s - loss: 0.3371 - acc: 0.9146 - val_loss: 0.4367 - val_acc: 0.8887

Epoch 10/25
 - 1s - loss: 0.3331 - acc: 0.9142 - val_loss: 0.6910 - val_acc: 0.7577

Epoch 11/25
 - 1s - loss: 0.3321 - acc: 0.9169 - val_loss: 0.4465 - val_acc: 0.8975

Epoch 12/25
 - 1s - loss: 0.3214 - acc: 0.9159 - val_loss: 0.4553 - val_acc: 0.8775

Epoch 13/25
 - 1s - loss: 0.3288 - acc: 0.9184 - val_loss: 0.4089 - val_acc: 0.8931

Epoch 14/25
 - 1s - loss: 0.3290 - acc: 0.9168 - val_loss: 0.7026 - val_acc: 0.7594

Epoch 15/25
 - 1s - loss: 0.3216 - acc: 0.9192 - val_loss: 0.4462 - val_acc: 0.8694

Epoch 16/25
 - 1s - loss: 0.3140 - acc: 0.9181 - val_loss: 0.3985 - val_acc: 0.8877

Epoch 17/25
 - 1s - loss: 0.3151 - acc: 0.9177 - val_loss: 0.4173 - val_acc: 0.8829

Epoch 18/25
 - 1s - loss: 0.3118 - acc: 0.9184 - val_loss: 0.4128 - val_acc: 0.8789

Epoch 19/25
 - 1s - loss: 0.3140 - acc: 0.9204 - val_loss: 0.5263 - val_acc: 0.8314

Epoch 20/25
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```
Epoch 20/25
 - 1s - loss: 0.3103 - acc: 0.9195 - val_loss: 0.4356 - val_acc: 0.8554

Epoch 21/25
 - 1s - loss: 0.3070 - acc: 0.9230 - val_loss: 0.4348 - val_acc: 0.8775

Epoch 22/25
 - 1s - loss: 0.3040 - acc: 0.9203 - val_loss: 0.8331 - val_acc: 0.7214

Epoch 23/25
 - 1s - loss: 0.3143 - acc: 0.9196 - val_loss: 0.4298 - val_acc: 0.8941

Epoch 24/25
 - 1s - loss: 0.3092 - acc: 0.9202 - val_loss: 0.4254 - val_acc: 0.8697

Epoch 25/25
 - 1s - loss: 0.3158 - acc: 0.9181 - val_loss: 0.5199 - val_acc: 0.8548

Train accuracy
0.9163492927094669
Test accuracy:
0.8547675602307431
_________________________________________________________________
Model: "sequential_8"
_________________________________________________________________
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
 - 2s - loss: 11.7700 - acc: 0.7508 - val_loss: 0.9203 - val_acc: 0.7710

Epoch 2/30
 - 1s - loss: 0.6250 - acc: 0.8615 - val_loss: 0.8903 - val_acc: 0.7608

Epoch 3/30
 - 1s - loss: 0.5405 - acc: 0.8761 - val_loss: 0.6791 - val_acc: 0.8636

Epoch 4/30
 - 2s - loss: 0.4909 - acc: 0.8803 - val_loss: 0.7880 - val_acc: 0.8042

Epoch 5/30
 - 2s - loss: 0.4610 - acc: 0.8868 - val_loss: 0.6398 - val_acc: 0.8185

Epoch 6/30
 - 2s - loss: 0.4302 - acc: 0.8976 - val_loss: 0.7228 - val_acc: 0.7957

Epoch 7/30
 - 2s - loss: 0.4112 - acc: 0.8999 - val_loss: 0.5955 - val_acc: 0.8704

Epoch 8/30
 - 2s - loss: 0.3978 - acc: 0.8991 - val_loss: 0.5423 - val_acc: 0.8833

Epoch 9/30
 - 1s - loss: 0.3950 - acc: 0.8980 - val_loss: 0.5480 - val_acc: 0.8585

Epoch 10/30
 - 1s - loss: 0.3876 - acc: 0.9013 - val_loss: 0.7400 - val_acc: 0.7706

Epoch 11/30
```

```
Epoch 11/30
 - 2s - loss: 0.3673 - acc: 0.9068 - val_loss: 0.5064 - val_acc: 0.8768

Epoch 12/30
 - 1s - loss: 0.3708 - acc: 0.9051 - val_loss: 0.7500 - val_acc: 0.8015

Epoch 13/30
 - 2s - loss: 0.3519 - acc: 0.9097 - val_loss: 0.5641 - val_acc: 0.8412

Epoch 14/30
 - 2s - loss: 0.3573 - acc: 0.9082 - val_loss: 0.6434 - val_acc: 0.8103

Epoch 15/30
 - 1s - loss: 0.3667 - acc: 0.9075 - val_loss: 0.5404 - val_acc: 0.8775

Epoch 16/30
 - 1s - loss: 0.3423 - acc: 0.9120 - val_loss: 0.4586 - val_acc: 0.8894

Epoch 17/30
 - 1s - loss: 0.3395 - acc: 0.9079 - val_loss: 0.5622 - val_acc: 0.8765

Epoch 18/30
 - 1s - loss: 0.3352 - acc: 0.9165 - val_loss: 0.7138 - val_acc: 0.7822

Epoch 19/30
 - 2s - loss: 0.3467 - acc: 0.9074 - val_loss: 0.5330 - val_acc: 0.8826

Epoch 20/30
 - 2s - loss: 0.3288 - acc: 0.9157 - val_loss: 0.4902 - val_acc: 0.8707

Epoch 21/30
 - 2s - loss: 0.3220 - acc: 0.9153 - val_loss: 0.6368 - val_acc: 0.8269

Epoch 22/30
 - 2s - loss: 0.3311 - acc: 0.9101 - val_loss: 0.6017 - val_acc: 0.7879

Epoch 23/30
 - 1s - loss: 0.3349 - acc: 0.9110 - val_loss: 0.5293 - val_acc: 0.8694

Epoch 24/30
 - 1s - loss: 0.3417 - acc: 0.9125 - val_loss: 0.5296 - val_acc: 0.8731

Epoch 25/30
 - 2s - loss: 0.3206 - acc: 0.9154 - val_loss: 0.4973 - val_acc: 0.8955

Epoch 26/30
 - 2s - loss: 0.3357 - acc: 0.9138 - val_loss: 0.5744 - val_acc: 0.8609

Epoch 27/30
 - 2s - loss: 0.3224 - acc: 0.9153 - val_loss: 0.5728 - val_acc: 0.8198

Epoch 28/30
 - 2s - loss: 0.3042 - acc: 0.9223 - val_loss: 0.4206 - val_acc: 0.8884

Epoch 29/30
 - 2s - loss: 0.3312 - acc: 0.9155 - val_loss: 0.5798 - val_acc: 0.8449

Epoch 30/30
 - 2s - loss: 0.3006 - acc: 0.9237 - val_loss: 0.6267 - val_acc: 0.8008

Train accuracy
0.8729597388465724
Test accuracy:
0.8008143875127248
_________________________________________________________________________________
Model: "sequential_9"
_________________________________________________________________
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
```

```
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
 - 2s - loss: 14.6859 - acc: 0.6493 - val_loss: 0.9420 - val_acc: 0.6966

Epoch 2/35
 - 1s - loss: 0.7678 - acc: 0.7427 - val_loss: 1.4282 - val_acc: 0.4265

Epoch 3/35
 - 1s - loss: 0.7142 - acc: 0.7618 - val_loss: 0.9136 - val_acc: 0.7055

Epoch 4/35
 - 1s - loss: 0.6724 - acc: 0.7814 - val_loss: 0.9682 - val_acc: 0.6481

Epoch 5/35
 - 1s - loss: 0.6481 - acc: 0.7960 - val_loss: 0.7854 - val_acc: 0.7319

Epoch 6/35
 - 1s - loss: 0.6340 - acc: 0.8032 - val_loss: 1.1660 - val_acc: 0.6105

Epoch 7/35
 - 1s - loss: 0.6087 - acc: 0.8184 - val_loss: 0.7263 - val_acc: 0.7526

Epoch 8/35
 - 1s - loss: 0.5765 - acc: 0.8322 - val_loss: 0.6826 - val_acc: 0.7818

Epoch 9/35
 - 1s - loss: 0.5633 - acc: 0.8380 - val_loss: 0.7131 - val_acc: 0.7903

Epoch 10/35
 - 1s - loss: 0.5500 - acc: 0.8441 - val_loss: 1.2027 - val_acc: 0.5952

Epoch 11/35
 - 1s - loss: 0.5362 - acc: 0.8493 - val_loss: 1.0143 - val_acc: 0.6834

Epoch 12/35
 - 1s - loss: 0.5140 - acc: 0.8515 - val_loss: 0.7167 - val_acc: 0.7981

Epoch 13/35
 - 1s - loss: 0.5045 - acc: 0.8558 - val_loss: 0.8289 - val_acc: 0.7190

Epoch 14/35
 - 1s - loss: 0.4934 - acc: 0.8659 - val_loss: 0.6415 - val_acc: 0.8324

Epoch 15/35
 - 1s - loss: 0.4807 - acc: 0.8762 - val_loss: 0.8345 - val_acc: 0.7353

Epoch 16/35
 - 1s - loss: 0.4694 - acc: 0.8712 - val_loss: 0.6157 - val_acc: 0.8103

Epoch 17/35
 - 1s - loss: 0.4699 - acc: 0.8727 - val_loss: 0.7784 - val_acc: 0.7621

Epoch 18/35
 - 1s - loss: 0.4603 - acc: 0.8777 - val_loss: 0.6007 - val_acc: 0.8551

Epoch 19/35
 - 1s - loss: 0.4546 - acc: 0.8728 - val_loss: 0.9879 - val_acc: 0.6797

Epoch 20/35
 - 1s - loss: 0.4460 - acc: 0.8769 - val_loss: 0.6935 - val_acc: 0.8473

Epoch 21/35
 - 1s - loss: 0.4457 - acc: 0.8794 - val_loss: 0.5801 - val_acc: 0.8107

Epoch 22/35
 - 1s - loss: 0.4408 - acc: 0.8808 - val_loss: 0.9661 - val_acc: 0.6709
```

```
Epoch 23/35
 - 1s - loss: 0.4323 - acc: 0.8814 - val_loss: 0.5140 - val_acc: 0.8517

Epoch 24/35
 - 1s - loss: 0.4391 - acc: 0.8823 - val_loss: 0.7814 - val_acc: 0.7452

Epoch 25/35
 - 1s - loss: 0.4375 - acc: 0.8787 - val_loss: 0.6359 - val_acc: 0.8025

Epoch 26/35
 - 1s - loss: 0.4352 - acc: 0.8783 - val_loss: 0.6166 - val_acc: 0.7978

Epoch 27/35
 - 1s - loss: 0.4345 - acc: 0.8799 - val_loss: 1.2237 - val_acc: 0.6678

Epoch 28/35
 - 1s - loss: 0.4312 - acc: 0.8770 - val_loss: 0.5257 - val_acc: 0.8398

Epoch 29/35
 - 1s - loss: 0.4304 - acc: 0.8844 - val_loss: 0.6051 - val_acc: 0.8327

Epoch 30/35
 - 1s - loss: 0.4289 - acc: 0.8821 - val_loss: 0.5501 - val_acc: 0.8208

Epoch 31/35
 - 1s - loss: 0.4316 - acc: 0.8821 - val_loss: 0.6763 - val_acc: 0.8096

Epoch 32/35
 - 1s - loss: 0.4267 - acc: 0.8875 - val_loss: 0.6943 - val_acc: 0.7645

Epoch 33/35
 - 1s - loss: 0.4251 - acc: 0.8844 - val_loss: 0.7525 - val_acc: 0.7102

Epoch 34/35
 - 1s - loss: 0.4138 - acc: 0.8833 - val_loss: 0.6279 - val_acc: 0.8331

Epoch 35/35
 - 1s - loss: 0.4279 - acc: 0.8893 - val_loss: 1.3679 - val_acc: 0.5799

Train accuracy
0.6488030468062037
Test accuracy:
0.5799117746861214
--------------------------------------------------------------------------------
Model: "sequential_10"
_________________________________________________________________
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
 - 1s - loss: 32.2898 - acc: 0.7076 - val_loss: 9.0197 - val_acc: 0.8066

Epoch 2/25
 - 1s - loss: 3.7370 - acc: 0.8554 - val_loss: 1.5624 - val_acc: 0.7991

Epoch 3/25
 - 1s - loss: 0.7893 - acc: 0.8946 - val_loss: 0.8549 - val_acc: 0.8605
```

```
Epoch 4/25
 - 1s - loss: 0.5178 - acc: 0.8984 - val_loss: 0.7483 - val_acc: 0.8436

Epoch 5/25
 - 1s - loss: 0.4655 - acc: 0.9032 - val_loss: 0.6611 - val_acc: 0.8680

Epoch 6/25
 - 1s - loss: 0.4307 - acc: 0.9049 - val_loss: 0.6432 - val_acc: 0.8500

Epoch 7/25
 - 1s - loss: 0.4102 - acc: 0.9085 - val_loss: 0.6366 - val_acc: 0.8466

Epoch 8/25
 - 1s - loss: 0.3845 - acc: 0.9162 - val_loss: 0.6391 - val_acc: 0.8517

Epoch 9/25
 - 1s - loss: 0.3706 - acc: 0.9172 - val_loss: 0.5516 - val_acc: 0.8663

Epoch 10/25
 - 1s - loss: 0.3658 - acc: 0.9116 - val_loss: 0.5739 - val_acc: 0.8680

Epoch 11/25
 - 1s - loss: 0.3475 - acc: 0.9174 - val_loss: 0.5446 - val_acc: 0.8680

Epoch 12/25
 - 1s - loss: 0.3382 - acc: 0.9187 - val_loss: 0.5750 - val_acc: 0.8633

Epoch 13/25
 - 1s - loss: 0.3254 - acc: 0.9212 - val_loss: 0.5101 - val_acc: 0.8833

Epoch 14/25
 - 1s - loss: 0.3138 - acc: 0.9251 - val_loss: 0.5219 - val_acc: 0.8880

Epoch 15/25
 - 1s - loss: 0.3159 - acc: 0.9286 - val_loss: 0.5016 - val_acc: 0.8816

Epoch 16/25
 - 1s - loss: 0.3069 - acc: 0.9276 - val_loss: 0.4594 - val_acc: 0.8833

Epoch 17/25
 - 1s - loss: 0.2849 - acc: 0.9331 - val_loss: 0.4880 - val_acc: 0.8734

Epoch 18/25
 - 1s - loss: 0.2826 - acc: 0.9336 - val_loss: 0.4330 - val_acc: 0.8880

Epoch 19/25
 - 1s - loss: 0.2937 - acc: 0.9279 - val_loss: 0.4914 - val_acc: 0.8799

Epoch 20/25
 - 1s - loss: 0.2820 - acc: 0.9306 - val_loss: 0.4311 - val_acc: 0.8918

Epoch 21/25
 - 1s - loss: 0.2742 - acc: 0.9320 - val_loss: 0.4996 - val_acc: 0.8609

Epoch 22/25
 - 1s - loss: 0.2740 - acc: 0.9350 - val_loss: 0.4487 - val_acc: 0.8809

Epoch 23/25
 - 1s - loss: 0.2600 - acc: 0.9346 - val_loss: 0.4819 - val_acc: 0.8819

Epoch 24/25
 - 1s - loss: 0.2705 - acc: 0.9369 - val_loss: 0.4017 - val_acc: 0.8887

Epoch 25/25
 - 1s - loss: 0.2713 - acc: 0.9300 - val_loss: 0.4716 - val_acc: 0.8704

Train accuracy
0.926006528835691
Test accuracy:
0.8703766542246352
_________________________________________________________________
Model: "sequential_11"
_________________________________________________________________
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
 - 1s - loss: 20.9648 - acc: 0.7605 - val_loss: 1.0032 - val_acc: 0.8571

Epoch 2/30
 - 1s - loss: 0.5809 - acc: 0.8523 - val_loss: 0.8805 - val_acc: 0.7014

Epoch 3/30
 - 1s - loss: 0.4622 - acc: 0.8830 - val_loss: 0.6298 - val_acc: 0.8378

Epoch 4/30
 - 1s - loss: 0.4116 - acc: 0.8970 - val_loss: 0.6719 - val_acc: 0.7743

Epoch 5/30
 - 1s - loss: 0.3941 - acc: 0.9013 - val_loss: 0.5305 - val_acc: 0.8836

Epoch 6/30
 - 1s - loss: 0.3648 - acc: 0.9041 - val_loss: 0.5254 - val_acc: 0.8588

Epoch 7/30
 - 1s - loss: 0.3580 - acc: 0.9052 - val_loss: 0.4693 - val_acc: 0.8806

Epoch 8/30
 - 1s - loss: 0.3542 - acc: 0.9083 - val_loss: 0.4809 - val_acc: 0.8877

Epoch 9/30
 - 1s - loss: 0.3358 - acc: 0.9139 - val_loss: 0.4757 - val_acc: 0.8717

Epoch 10/30
 - 1s - loss: 0.3305 - acc: 0.9098 - val_loss: 0.7603 - val_acc: 0.7414

Epoch 11/30
 - 1s - loss: 0.3318 - acc: 0.9151 - val_loss: 0.4851 - val_acc: 0.8758

Epoch 12/30
 - 1s - loss: 0.3270 - acc: 0.9174 - val_loss: 0.4694 - val_acc: 0.8666

Epoch 13/30
 - 1s - loss: 0.3138 - acc: 0.9174 - val_loss: 0.5188 - val_acc: 0.8276

Epoch 14/30
 - 1s - loss: 0.3043 - acc: 0.9248 - val_loss: 0.5496 - val_acc: 0.8283

Epoch 15/30
 - 1s - loss: 0.3096 - acc: 0.9187 - val_loss: 0.4543 - val_acc: 0.8605

Epoch 16/30
 - 1s - loss: 0.3058 - acc: 0.9229 - val_loss: 0.5462 - val_acc: 0.8001

Epoch 17/30
 - 1s - loss: 0.3047 - acc: 0.9195 - val_loss: 0.3970 - val_acc: 0.8938

Epoch 18/30
 - 1s - loss: 0.2966 - acc: 0.9192 - val_loss: 0.3898 - val_acc: 0.8894

Epoch 19/30
 - 1s - loss: 0.2933 - acc: 0.9219 - val_loss: 0.4122 - val_acc: 0.8816

Epoch 20/30
```

```
 - 1s - loss: 0.2985 - acc: 0.9237 - val_loss: 0.4142 - val_acc: 0.8524

Epoch 21/30
 - 1s - loss: 0.2902 - acc: 0.9226 - val_loss: 0.3949 - val_acc: 0.8829

Epoch 22/30
 - 1s - loss: 0.2934 - acc: 0.9222 - val_loss: 0.3922 - val_acc: 0.8721

Epoch 23/30
 - 1s - loss: 0.2924 - acc: 0.9227 - val_loss: 0.4097 - val_acc: 0.8687

Epoch 24/30
 - 1s - loss: 0.2858 - acc: 0.9233 - val_loss: 0.4434 - val_acc: 0.8755

Epoch 25/30
 - 1s - loss: 0.2970 - acc: 0.9215 - val_loss: 0.7700 - val_acc: 0.7011

Epoch 26/30
 - 1s - loss: 0.2911 - acc: 0.9219 - val_loss: 0.4405 - val_acc: 0.8731

Epoch 27/30
 - 1s - loss: 0.2895 - acc: 0.9217 - val_loss: 0.3742 - val_acc: 0.8768

Epoch 28/30
 - 1s - loss: 0.2872 - acc: 0.9240 - val_loss: 0.5200 - val_acc: 0.8409

Epoch 29/30
 - 1s - loss: 0.2837 - acc: 0.9234 - val_loss: 0.5465 - val_acc: 0.8107

Epoch 30/30
 - 1s - loss: 0.2822 - acc: 0.9252 - val_loss: 0.3945 - val_acc: 0.8531

Train accuracy
0.9039717083786725
Test accuracy:
0.8530709195792331
_________________________________________________________________________________
Model: "sequential_12"
_________________________________________________________________
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
 - 2s - loss: 4.3727 - acc: 0.7879 - val_loss: 0.5498 - val_acc: 0.8697

Epoch 2/25
 - 1s - loss: 0.4594 - acc: 0.8845 - val_loss: 0.6519 - val_acc: 0.7794

Epoch 3/25
 - 1s - loss: 0.4358 - acc: 0.8906 - val_loss: 0.5077 - val_acc: 0.8666

Epoch 4/25
 - 1s - loss: 0.4183 - acc: 0.8973 - val_loss: 0.5936 - val_acc: 0.8076

Epoch 5/25
 - 1s - loss: 0.3931 - acc: 0.8998 - val_loss: 0.6822 - val_acc: 0.7852

Epoch 6/25
```

```
 - 1s - loss: 0.4002 - acc: 0.8987 - val_loss: 0.6620 - val_acc: 0.7991

Epoch 7/25
 - 1s - loss: 0.3777 - acc: 0.9076 - val_loss: 0.4550 - val_acc: 0.8717

Epoch 8/25
 - 1s - loss: 0.4031 - acc: 0.9057 - val_loss: 0.5037 - val_acc: 0.8314

Epoch 9/25
 - 1s - loss: 0.3970 - acc: 0.9051 - val_loss: 0.3822 - val_acc: 0.8938

Epoch 10/25
 - 1s - loss: 0.3775 - acc: 0.9123 - val_loss: 0.5359 - val_acc: 0.8239

Epoch 11/25
 - 1s - loss: 0.3941 - acc: 0.9057 - val_loss: 0.4317 - val_acc: 0.8626

Epoch 12/25
 - 1s - loss: 0.3753 - acc: 0.9074 - val_loss: 0.4547 - val_acc: 0.8823

Epoch 13/25
 - 1s - loss: 0.3531 - acc: 0.9100 - val_loss: 0.5341 - val_acc: 0.8378

Epoch 14/25
 - 1s - loss: 0.3442 - acc: 0.9162 - val_loss: 0.5557 - val_acc: 0.8229

Epoch 15/25
 - 1s - loss: 0.3401 - acc: 0.9174 - val_loss: 0.5663 - val_acc: 0.8229

Epoch 16/25
 - 1s - loss: 0.3524 - acc: 0.9121 - val_loss: 0.5410 - val_acc: 0.8388

Epoch 17/25
 - 1s - loss: 0.3429 - acc: 0.9123 - val_loss: 0.5023 - val_acc: 0.8083

Epoch 18/25
 - 1s - loss: 0.3532 - acc: 0.9119 - val_loss: 0.5125 - val_acc: 0.8341

Epoch 19/25
 - 1s - loss: 0.3397 - acc: 0.9089 - val_loss: 0.8620 - val_acc: 0.7221

Epoch 20/25
 - 1s - loss: 0.3357 - acc: 0.9153 - val_loss: 0.5290 - val_acc: 0.8086

Epoch 21/25
 - 1s - loss: 0.3325 - acc: 0.9177 - val_loss: 0.4726 - val_acc: 0.8490

Epoch 22/25
 - 1s - loss: 0.3457 - acc: 0.9120 - val_loss: 0.4696 - val_acc: 0.8324

Epoch 23/25
 - 1s - loss: 0.3292 - acc: 0.9154 - val_loss: 0.5750 - val_acc: 0.8039

Epoch 24/25
 - 1s - loss: 0.3401 - acc: 0.9147 - val_loss: 0.7511 - val_acc: 0.7957

Epoch 25/25
 - 1s - loss: 0.3292 - acc: 0.9170 - val_loss: 1.1773 - val_acc: 0.6379

Train accuracy
0.7125952121871599
Test accuracy:
0.6379368849677638
_________________________________________________________________
Model: "sequential_13"
_________________________________________________________________
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
 - 1s - loss: 89.6498 - acc: 0.7224 - val_loss: 19.9485 - val_acc: 0.7448

Epoch 2/30
 - 0s - loss: 7.6944 - acc: 0.8186 - val_loss: 2.3868 - val_acc: 0.7631

Epoch 3/30
 - 1s - loss: 1.1170 - acc: 0.8546 - val_loss: 1.0868 - val_acc: 0.7862

Epoch 4/30
 - 1s - loss: 0.6317 - acc: 0.8624 - val_loss: 0.8694 - val_acc: 0.8280

Epoch 5/30
 - 0s - loss: 0.5809 - acc: 0.8652 - val_loss: 0.7927 - val_acc: 0.8466

Epoch 6/30
 - 0s - loss: 0.5419 - acc: 0.8762 - val_loss: 0.7837 - val_acc: 0.8463

Epoch 7/30
 - 0s - loss: 0.5666 - acc: 0.8636 - val_loss: 0.7665 - val_acc: 0.8286

Epoch 8/30
 - 1s - loss: 0.4740 - acc: 0.8911 - val_loss: 0.6898 - val_acc: 0.8571

Epoch 9/30
 - 1s - loss: 0.4642 - acc: 0.8867 - val_loss: 0.6836 - val_acc: 0.8616

Epoch 10/30
 - 1s - loss: 0.4466 - acc: 0.8931 - val_loss: 0.7112 - val_acc: 0.8473

Epoch 11/30
 - 1s - loss: 0.4432 - acc: 0.8939 - val_loss: 0.6376 - val_acc: 0.8636

Epoch 12/30
 - 1s - loss: 0.4173 - acc: 0.8964 - val_loss: 0.7782 - val_acc: 0.7737

Epoch 13/30
 - 1s - loss: 0.4381 - acc: 0.8912 - val_loss: 0.6327 - val_acc: 0.8585

Epoch 14/30
 - 1s - loss: 0.3959 - acc: 0.9029 - val_loss: 0.6055 - val_acc: 0.8772

Epoch 15/30
 - 1s - loss: 0.4136 - acc: 0.8949 - val_loss: 0.6031 - val_acc: 0.8677

Epoch 16/30
 - 1s - loss: 0.4019 - acc: 0.9007 - val_loss: 0.5929 - val_acc: 0.8422

Epoch 17/30
 - 1s - loss: 0.3818 - acc: 0.9053 - val_loss: 0.6282 - val_acc: 0.8239

Epoch 18/30
 - 1s - loss: 0.3880 - acc: 0.9053 - val_loss: 0.6133 - val_acc: 0.8375

Epoch 19/30
 - 1s - loss: 0.4003 - acc: 0.8984 - val_loss: 0.5992 - val_acc: 0.8337

Epoch 20/30
 - 1s - loss: 0.3880 - acc: 0.8989 - val_loss: 0.5717 - val_acc: 0.8731

Epoch 21/30
 - 1s - loss: 0.3806 - acc: 0.9034 - val_loss: 0.6176 - val_acc: 0.8341

Epoch 22/30
 - 1s - loss: 0.3601 - acc: 0.9113 - val_loss: 0.5389 - val_acc: 0.8673
```

```
Epoch 23/30
 - 1s - loss: 0.3814 - acc: 0.8992 - val_loss: 0.5891 - val_acc: 0.8588

Epoch 24/30
 - 1s - loss: 0.3648 - acc: 0.9112 - val_loss: 0.5539 - val_acc: 0.8541

Epoch 25/30
 - 1s - loss: 0.3709 - acc: 0.9051 - val_loss: 0.5739 - val_acc: 0.8578

Epoch 26/30
 - 1s - loss: 0.3481 - acc: 0.9154 - val_loss: 0.5529 - val_acc: 0.8415

Epoch 27/30
 - 0s - loss: 0.3507 - acc: 0.9105 - val_loss: 0.5710 - val_acc: 0.8666

Epoch 28/30
 - 0s - loss: 0.3465 - acc: 0.9142 - val_loss: 0.6234 - val_acc: 0.7978

Epoch 29/30
 - 0s - loss: 0.3819 - acc: 0.9033 - val_loss: 0.6256 - val_acc: 0.8364

Epoch 30/30
 - 0s - loss: 0.3530 - acc: 0.9135 - val_loss: 0.5547 - val_acc: 0.8483

Train accuracy
0.9114526659412405
Test accuracy:
0.848320325755005
--------------------------------------------------------------------------------
Model: "sequential_14"
_________________________________________________________________
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
 - 1s - loss: 35.4897 - acc: 0.7433 - val_loss: 1.2871 - val_acc: 0.7550

Epoch 2/30
 - 1s - loss: 0.7594 - acc: 0.8179 - val_loss: 0.8526 - val_acc: 0.7781

Epoch 3/30
 - 1s - loss: 0.6098 - acc: 0.8479 - val_loss: 0.7639 - val_acc: 0.8249

Epoch 4/30
 - 1s - loss: 0.5718 - acc: 0.8572 - val_loss: 0.7489 - val_acc: 0.8347

Epoch 5/30
 - 1s - loss: 0.5284 - acc: 0.8617 - val_loss: 0.6475 - val_acc: 0.8252

Epoch 6/30
 - 1s - loss: 0.5021 - acc: 0.8686 - val_loss: 0.7006 - val_acc: 0.7740

Epoch 7/30
 - 1s - loss: 0.4982 - acc: 0.8735 - val_loss: 0.6134 - val_acc: 0.8398

Epoch 8/30
 - 1s - loss: 0.4664 - acc: 0.8795 - val_loss: 0.6576 - val_acc: 0.8130
```

```
Epoch 9/30
 - 1s - loss: 0.4735 - acc: 0.8779 - val_loss: 0.6451 - val_acc: 0.8419

Epoch 10/30
 - 1s - loss: 0.4771 - acc: 0.8727 - val_loss: 0.6418 - val_acc: 0.8341

Epoch 11/30
 - 1s - loss: 0.4488 - acc: 0.8871 - val_loss: 0.5259 - val_acc: 0.8731

Epoch 12/30
 - 1s - loss: 0.4102 - acc: 0.8974 - val_loss: 0.5612 - val_acc: 0.8432

Epoch 13/30
 - 1s - loss: 0.4220 - acc: 0.8924 - val_loss: 0.5593 - val_acc: 0.8731

Epoch 14/30
 - 1s - loss: 0.4100 - acc: 0.8962 - val_loss: 0.5432 - val_acc: 0.8575

Epoch 15/30
 - 1s - loss: 0.3916 - acc: 0.9014 - val_loss: 0.6941 - val_acc: 0.7771

Epoch 16/30
 - 1s - loss: 0.4146 - acc: 0.8966 - val_loss: 0.5165 - val_acc: 0.8670

Epoch 17/30
 - 1s - loss: 0.3688 - acc: 0.9061 - val_loss: 0.5152 - val_acc: 0.8588

Epoch 18/30
 - 1s - loss: 0.3874 - acc: 0.9023 - val_loss: 0.4512 - val_acc: 0.8700

Epoch 19/30
 - 1s - loss: 0.4104 - acc: 0.9008 - val_loss: 0.4804 - val_acc: 0.8646

Epoch 20/30
 - 1s - loss: 0.3690 - acc: 0.9087 - val_loss: 0.4515 - val_acc: 0.8843

Epoch 21/30
 - 1s - loss: 0.3720 - acc: 0.9026 - val_loss: 0.5274 - val_acc: 0.8619

Epoch 22/30
 - 1s - loss: 0.3475 - acc: 0.9119 - val_loss: 0.4526 - val_acc: 0.8622

Epoch 23/30
 - 1s - loss: 0.3616 - acc: 0.9072 - val_loss: 0.6125 - val_acc: 0.8449

Epoch 24/30
 - 1s - loss: 0.3703 - acc: 0.9049 - val_loss: 0.4497 - val_acc: 0.8748

Epoch 25/30
 - 1s - loss: 0.3594 - acc: 0.9082 - val_loss: 0.5127 - val_acc: 0.8602

Epoch 26/30
 - 1s - loss: 0.3451 - acc: 0.9136 - val_loss: 0.4155 - val_acc: 0.8877

Epoch 27/30
 - 1s - loss: 0.3978 - acc: 0.8984 - val_loss: 0.4815 - val_acc: 0.8758

Epoch 28/30
 - 1s - loss: 0.3381 - acc: 0.9161 - val_loss: 0.4378 - val_acc: 0.8758

Epoch 29/30
 - 1s - loss: 0.3500 - acc: 0.9098 - val_loss: 0.5077 - val_acc: 0.8578

Epoch 30/30
 - 1s - loss: 0.3255 - acc: 0.9197 - val_loss: 0.5396 - val_acc: 0.8361

Train accuracy
0.8909140369967355
Test accuracy:
0.836104513064133
_________________________________________________________________________________
Model: "sequential_15"
_________________________________________________________________
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
 - 1s - loss: 20.6649 - acc: 0.7228 - val_loss: 2.9764 - val_acc: 0.8266

Epoch 2/25
 - 1s - loss: 1.0891 - acc: 0.8777 - val_loss: 0.8964 - val_acc: 0.8276

Epoch 3/25
 - 1s - loss: 0.4922 - acc: 0.8988 - val_loss: 0.8108 - val_acc: 0.8334

Epoch 4/25
 - 1s - loss: 0.4548 - acc: 0.8969 - val_loss: 0.6837 - val_acc: 0.8680

Epoch 5/25
 - 1s - loss: 0.4037 - acc: 0.9063 - val_loss: 0.6327 - val_acc: 0.8843

Epoch 6/25
 - 1s - loss: 0.3806 - acc: 0.9109 - val_loss: 0.6458 - val_acc: 0.8459

Epoch 7/25
 - 1s - loss: 0.3789 - acc: 0.9169 - val_loss: 0.6155 - val_acc: 0.8585

Epoch 8/25
 - 1s - loss: 0.3383 - acc: 0.9218 - val_loss: 0.6573 - val_acc: 0.8507

Epoch 9/25
 - 1s - loss: 0.3237 - acc: 0.9275 - val_loss: 0.5398 - val_acc: 0.8721

Epoch 10/25
 - 1s - loss: 0.3176 - acc: 0.9266 - val_loss: 0.7252 - val_acc: 0.7547

Epoch 11/25
 - 1s - loss: 0.3307 - acc: 0.9226 - val_loss: 0.5169 - val_acc: 0.8948

Epoch 12/25
 - 1s - loss: 0.2851 - acc: 0.9350 - val_loss: 0.5095 - val_acc: 0.8846

Epoch 13/25
 - 1s - loss: 0.2848 - acc: 0.9334 - val_loss: 0.4938 - val_acc: 0.8789

Epoch 14/25
 - 1s - loss: 0.2847 - acc: 0.9325 - val_loss: 0.5313 - val_acc: 0.8731

Epoch 15/25
 - 1s - loss: 0.2819 - acc: 0.9274 - val_loss: 0.4841 - val_acc: 0.9050

Epoch 16/25
 - 1s - loss: 0.2728 - acc: 0.9334 - val_loss: 0.5026 - val_acc: 0.8514

Epoch 17/25
 - 1s - loss: 0.2702 - acc: 0.9334 - val_loss: 0.5057 - val_acc: 0.8823

Epoch 18/25
 - 1s - loss: 0.2776 - acc: 0.9301 - val_loss: 0.4568 - val_acc: 0.8775

Epoch 19/25
 - 1s - loss: 0.3202 - acc: 0.9249 - val_loss: 0.4753 - val_acc: 0.8853

Epoch 20/25
 - 1s - loss: 0.2625 - acc: 0.9374 - val loss: 0.4299 - val acc: 0.8829
```

```
Epoch 21/25
 - 1s - loss: 0.2625 - acc: 0.9348 - val_loss: 0.4650 - val_acc: 0.8897

Epoch 22/25
 - 1s - loss: 0.2729 - acc: 0.9329 - val_loss: 0.4781 - val_acc: 0.8816

Epoch 23/25
 - 1s - loss: 0.2468 - acc: 0.9385 - val_loss: 0.4119 - val_acc: 0.8867

Epoch 24/25
 - 1s - loss: 0.2652 - acc: 0.9357 - val_loss: 0.4049 - val_acc: 0.8904

Epoch 25/25
 - 1s - loss: 0.2604 - acc: 0.9355 - val_loss: 0.4585 - val_acc: 0.8918

Train accuracy
0.9529379760609358
Test accuracy:
0.8917543264336614
--------------------------------------------------------------------------------
Model: "sequential_16"
_________________________________________________________________
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
 - 1s - loss: 14.9757 - acc: 0.7220 - val_loss: 1.3175 - val_acc: 0.7465

Epoch 2/30
 - 0s - loss: 0.6847 - acc: 0.8192 - val_loss: 0.8175 - val_acc: 0.7896

Epoch 3/30
 - 1s - loss: 0.4988 - acc: 0.8788 - val_loss: 0.6972 - val_acc: 0.8612

Epoch 4/30
 - 1s - loss: 0.4709 - acc: 0.8840 - val_loss: 0.6941 - val_acc: 0.8541

Epoch 5/30
 - 1s - loss: 0.4316 - acc: 0.8893 - val_loss: 0.6084 - val_acc: 0.8605

Epoch 6/30
 - 1s - loss: 0.4296 - acc: 0.8863 - val_loss: 0.6387 - val_acc: 0.8154

Epoch 7/30
 - 1s - loss: 0.4332 - acc: 0.8893 - val_loss: 0.5880 - val_acc: 0.8565

Epoch 8/30
 - 1s - loss: 0.4131 - acc: 0.8867 - val_loss: 0.6423 - val_acc: 0.8375

Epoch 9/30
 - 1s - loss: 0.4096 - acc: 0.8911 - val_loss: 0.5675 - val_acc: 0.8473

Epoch 10/30
 - 1s - loss: 0.3697 - acc: 0.9033 - val_loss: 0.4898 - val_acc: 0.8904

Epoch 11/30
 - 1s - loss: 0.3441 - acc: 0.9102 - val_loss: 0.5020 - val_acc: 0.8951
```

```
Epoch 12/30
 - 1s - loss: 0.3399 - acc: 0.9115 - val_loss: 0.5830 - val_acc: 0.8415

Epoch 13/30
 - 1s - loss: 0.3757 - acc: 0.9055 - val_loss: 0.4728 - val_acc: 0.8846

Epoch 14/30
 - 1s - loss: 0.3286 - acc: 0.9202 - val_loss: 0.6043 - val_acc: 0.8341

Epoch 15/30
 - 1s - loss: 0.3366 - acc: 0.9112 - val_loss: 0.4632 - val_acc: 0.8823

Epoch 16/30
 - 1s - loss: 0.3011 - acc: 0.9223 - val_loss: 0.4498 - val_acc: 0.8768

Epoch 17/30
 - 1s - loss: 0.3089 - acc: 0.9188 - val_loss: 0.4620 - val_acc: 0.8734

Epoch 18/30
 - 1s - loss: 0.3119 - acc: 0.9192 - val_loss: 0.4502 - val_acc: 0.8907

Epoch 19/30
 - 1s - loss: 0.3040 - acc: 0.9238 - val_loss: 0.4642 - val_acc: 0.8599

Epoch 20/30
 - 1s - loss: 0.3219 - acc: 0.9165 - val_loss: 0.4259 - val_acc: 0.9023

Epoch 21/30
 - 1s - loss: 0.3324 - acc: 0.9172 - val_loss: 0.6198 - val_acc: 0.8120

Epoch 22/30
 - 1s - loss: 0.3071 - acc: 0.9234 - val_loss: 0.4139 - val_acc: 0.8907

Epoch 23/30
 - 1s - loss: 0.3090 - acc: 0.9180 - val_loss: 0.4587 - val_acc: 0.8663

Epoch 24/30
 - 1s - loss: 0.3332 - acc: 0.9163 - val_loss: 0.4301 - val_acc: 0.8775

Epoch 25/30
 - 1s - loss: 0.3066 - acc: 0.9244 - val_loss: 0.4730 - val_acc: 0.8714

Epoch 26/30
 - 1s - loss: 0.2782 - acc: 0.9264 - val_loss: 0.4588 - val_acc: 0.8649

Epoch 27/30
 - 1s - loss: 0.2633 - acc: 0.9304 - val_loss: 0.3943 - val_acc: 0.8873

Epoch 28/30
 - 1s - loss: 0.2783 - acc: 0.9261 - val_loss: 0.5358 - val_acc: 0.8795

Epoch 29/30
 - 1s - loss: 0.2809 - acc: 0.9272 - val_loss: 0.3677 - val_acc: 0.9077

Epoch 30/30
 - 1s - loss: 0.2587 - acc: 0.9324 - val_loss: 0.4711 - val_acc: 0.8561

Train accuracy
0.9230141458106638
Test accuracy:
0.8561248727519511
_________________________________________________________________
Model: "sequential_17"
_________________________________________________________________
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
 - 1s - loss: 65.1230 - acc: 0.6164 - val_loss: 47.3758 - val_acc: 0.7139

Epoch 2/30
 - 0s - loss: 35.5025 - acc: 0.7794 - val_loss: 26.0587 - val_acc: 0.7713

Epoch 3/30
 - 1s - loss: 19.4123 - acc: 0.8388 - val_loss: 14.3826 - val_acc: 0.8252

Epoch 4/30
 - 1s - loss: 10.5965 - acc: 0.8679 - val_loss: 7.9851 - val_acc: 0.7910

Epoch 5/30
 - 1s - loss: 5.7715 - acc: 0.8817 - val_loss: 4.5437 - val_acc: 0.7173

Epoch 6/30
 - 1s - loss: 3.1694 - acc: 0.8879 - val_loss: 2.6604 - val_acc: 0.7852

Epoch 7/30
 - 1s - loss: 1.8104 - acc: 0.8908 - val_loss: 1.6913 - val_acc: 0.8144

Epoch 8/30
 - 1s - loss: 1.1123 - acc: 0.8979 - val_loss: 1.2272 - val_acc: 0.8059

Epoch 9/30
 - 1s - loss: 0.7873 - acc: 0.8961 - val_loss: 0.9855 - val_acc: 0.8449

Epoch 10/30
 - 1s - loss: 0.6191 - acc: 0.8995 - val_loss: 0.8645 - val_acc: 0.8405

Epoch 11/30
 - 1s - loss: 0.5352 - acc: 0.9017 - val_loss: 0.7842 - val_acc: 0.8470

Epoch 12/30
 - 1s - loss: 0.4964 - acc: 0.9017 - val_loss: 0.7484 - val_acc: 0.8534

Epoch 13/30
 - 1s - loss: 0.4681 - acc: 0.9033 - val_loss: 0.7376 - val_acc: 0.8283

Epoch 14/30
 - 1s - loss: 0.4435 - acc: 0.9101 - val_loss: 0.7146 - val_acc: 0.8439

Epoch 15/30
 - 1s - loss: 0.4273 - acc: 0.9109 - val_loss: 0.6868 - val_acc: 0.8544

Epoch 16/30
 - 1s - loss: 0.4162 - acc: 0.9116 - val_loss: 0.6653 - val_acc: 0.8195

Epoch 17/30
 - 1s - loss: 0.4006 - acc: 0.9135 - val_loss: 0.6531 - val_acc: 0.8483

Epoch 18/30
 - 1s - loss: 0.3993 - acc: 0.9134 - val_loss: 0.6333 - val_acc: 0.8592

Epoch 19/30
 - 0s - loss: 0.3919 - acc: 0.9149 - val_loss: 0.6501 - val_acc: 0.8497

Epoch 20/30
 - 1s - loss: 0.3884 - acc: 0.9116 - val_loss: 0.6260 - val_acc: 0.8646

Epoch 21/30
 - 1s - loss: 0.3665 - acc: 0.9188 - val_loss: 0.7164 - val_acc: 0.8202

Epoch 22/30
 - 1s - loss: 0.3715 - acc: 0.9162 - val_loss: 0.5869 - val_acc: 0.8490

Epoch 23/30
```

```
Epoch 23/30
 - 1s - loss: 0.3637 - acc: 0.9157 - val_loss: 0.5930 - val_acc: 0.8602

Epoch 24/30
 - 1s - loss: 0.3426 - acc: 0.9245 - val_loss: 0.5578 - val_acc: 0.8694

Epoch 25/30
 - 1s - loss: 0.3361 - acc: 0.9238 - val_loss: 0.5709 - val_acc: 0.8714

Epoch 26/30
 - 1s - loss: 0.3323 - acc: 0.9268 - val_loss: 0.5865 - val_acc: 0.8694

Epoch 27/30
 - 1s - loss: 0.3248 - acc: 0.9242 - val_loss: 0.5351 - val_acc: 0.8755

Epoch 28/30
 - 1s - loss: 0.3173 - acc: 0.9276 - val_loss: 0.5482 - val_acc: 0.8816

Epoch 29/30
 - 1s - loss: 0.3217 - acc: 0.9252 - val_loss: 0.5434 - val_acc: 0.8704

Epoch 30/30
 - 1s - loss: 0.3100 - acc: 0.9287 - val_loss: 0.5221 - val_acc: 0.8663

Train accuracy
0.9336235038084875
Test accuracy:
0.8663047166610112
--------------------------------------------------------------------------------
Model: "sequential_18"
_________________________________________________________________
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
 - 2s - loss: 11.9240 - acc: 0.7198 - val_loss: 0.9026 - val_acc: 0.7333

Epoch 2/25
 - 2s - loss: 0.6561 - acc: 0.8100 - val_loss: 0.8119 - val_acc: 0.7716

Epoch 3/25
 - 2s - loss: 0.5825 - acc: 0.8395 - val_loss: 0.7011 - val_acc: 0.8341

Epoch 4/25
 - 2s - loss: 0.5534 - acc: 0.8520 - val_loss: 0.7116 - val_acc: 0.8402

Epoch 5/25
 - 3s - loss: 0.5358 - acc: 0.8617 - val_loss: 0.6522 - val_acc: 0.8554

Epoch 6/25
 - 2s - loss: 0.4916 - acc: 0.8740 - val_loss: 0.6569 - val_acc: 0.8521

Epoch 7/25
 - 2s - loss: 0.4699 - acc: 0.8754 - val_loss: 0.6293 - val_acc: 0.8782

Epoch 8/25
 - 2s - loss: 0.4921 - acc: 0.8742 - val_loss: 0.7352 - val_acc: 0.7964

Epoch 9/25
```

```
Epoch 9/25
 - 2s - loss: 0.4646 - acc: 0.8826 - val_loss: 0.5709 - val_acc: 0.8599

Epoch 10/25
 - 2s - loss: 0.4507 - acc: 0.8875 - val_loss: 0.8427 - val_acc: 0.7173

Epoch 11/25
 - 3s - loss: 0.4148 - acc: 0.8996 - val_loss: 0.6981 - val_acc: 0.8307

Epoch 12/25
 - 3s - loss: 0.4547 - acc: 0.8849 - val_loss: 0.6476 - val_acc: 0.8290

Epoch 13/25
 - 3s - loss: 0.4413 - acc: 0.8881 - val_loss: 0.7384 - val_acc: 0.7391

Epoch 14/25
 - 3s - loss: 0.4263 - acc: 0.8964 - val_loss: 0.5896 - val_acc: 0.8331

Epoch 15/25
 - 2s - loss: 0.4266 - acc: 0.8954 - val_loss: 0.6103 - val_acc: 0.8649

Epoch 16/25
 - 2s - loss: 0.4155 - acc: 0.8957 - val_loss: 1.0522 - val_acc: 0.7248

Epoch 17/25
 - 2s - loss: 0.4521 - acc: 0.8815 - val_loss: 0.6671 - val_acc: 0.7699

Epoch 18/25
 - 2s - loss: 0.3912 - acc: 0.9025 - val_loss: 0.5509 - val_acc: 0.8286

Epoch 19/25
 - 2s - loss: 0.4207 - acc: 0.8894 - val_loss: 0.5907 - val_acc: 0.8497

Epoch 20/25
 - 2s - loss: 0.4315 - acc: 0.8898 - val_loss: 0.6271 - val_acc: 0.8025

Epoch 21/25
 - 2s - loss: 0.4015 - acc: 0.8974 - val_loss: 0.8246 - val_acc: 0.7523

Epoch 22/25
 - 2s - loss: 0.4121 - acc: 0.8909 - val_loss: 0.5494 - val_acc: 0.8490

Epoch 23/25
 - 2s - loss: 0.3844 - acc: 0.8985 - val_loss: 0.6337 - val_acc: 0.8354

Epoch 24/25
 - 2s - loss: 0.4004 - acc: 0.8920 - val_loss: 0.7062 - val_acc: 0.8096

Epoch 25/25
 - 2s - loss: 0.3958 - acc: 0.8964 - val_loss: 0.6863 - val_acc: 0.7553

Train accuracy
0.7717627856365615
Test accuracy:
0.7553444180522565
--------------------------------------------------------------------------------
Model: "sequential_19"
_________________________________________________________________
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
 - 1s - loss: 4.3355 - acc: 0.7131 - val_loss: 0.8315 - val_acc: 0.8137

Epoch 2/25
 - 0s - loss: 0.5858 - acc: 0.8591 - val_loss: 0.6856 - val_acc: 0.8524

Epoch 3/25
 - 0s - loss: 0.4352 - acc: 0.9007 - val_loss: 0.4539 - val_acc: 0.8999

Epoch 4/25
 - 0s - loss: 0.3613 - acc: 0.9113 - val_loss: 0.5771 - val_acc: 0.8337

Epoch 5/25
 - 0s - loss: 0.3329 - acc: 0.9158 - val_loss: 0.4704 - val_acc: 0.8829

Epoch 6/25
 - 0s - loss: 0.3183 - acc: 0.9207 - val_loss: 0.4273 - val_acc: 0.8860

Epoch 7/25
 - 0s - loss: 0.3087 - acc: 0.9252 - val_loss: 0.4198 - val_acc: 0.8928

Epoch 8/25
 - 0s - loss: 0.2928 - acc: 0.9225 - val_loss: 0.4145 - val_acc: 0.8846

Epoch 9/25
 - 1s - loss: 0.2828 - acc: 0.9237 - val_loss: 0.4001 - val_acc: 0.8999

Epoch 10/25
 - 1s - loss: 0.2927 - acc: 0.9204 - val_loss: 0.6243 - val_acc: 0.7944

Epoch 11/25
 - 1s - loss: 0.2903 - acc: 0.9248 - val_loss: 0.4447 - val_acc: 0.8626

Epoch 12/25
 - 1s - loss: 0.2937 - acc: 0.9206 - val_loss: 0.4220 - val_acc: 0.8928

Epoch 13/25
 - 1s - loss: 0.2801 - acc: 0.9233 - val_loss: 0.4380 - val_acc: 0.8731

Epoch 14/25
 - 1s - loss: 0.2782 - acc: 0.9251 - val_loss: 0.4099 - val_acc: 0.8806

Epoch 15/25
 - 1s - loss: 0.2905 - acc: 0.9234 - val_loss: 0.3936 - val_acc: 0.8948

Epoch 16/25
 - 1s - loss: 0.2858 - acc: 0.9251 - val_loss: 0.4116 - val_acc: 0.8887

Epoch 17/25
 - 1s - loss: 0.2717 - acc: 0.9287 - val_loss: 0.5960 - val_acc: 0.8273

Epoch 18/25
 - 1s - loss: 0.2760 - acc: 0.9257 - val_loss: 0.4060 - val_acc: 0.8833

Epoch 19/25
 - 1s - loss: 0.2700 - acc: 0.9253 - val_loss: 0.4255 - val_acc: 0.8795

Epoch 20/25
 - 1s - loss: 0.2705 - acc: 0.9242 - val_loss: 0.4936 - val_acc: 0.8527

Epoch 21/25
 - 1s - loss: 0.2895 - acc: 0.9259 - val_loss: 0.5296 - val_acc: 0.8629

Epoch 22/25
 - 1s - loss: 0.2600 - acc: 0.9313 - val_loss: 0.4023 - val_acc: 0.8806

Epoch 23/25
 - 1s - loss: 0.2827 - acc: 0.9280 - val_loss: 0.4478 - val_acc: 0.8537

Epoch 24/25
 - 1s - loss: 0.2687 - acc: 0.9280 - val_loss: 0.4729 - val_acc: 0.8524

Epoch 25/25
 - 1s - loss: 0.2697 - acc: 0.9271 - val_loss: 0.6130 - val_acc: 0.8083
```

```
Train accuracy
0.831474428726877
Test accuracy:
0.8082796063793688
_________________________________________________________________________________
Model: "sequential_20"
_________________________________________________________________
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
 - 1s - loss: 22.2379 - acc: 0.7931 - val_loss: 4.2760 - val_acc: 0.8320

Epoch 2/35
 - 0s - loss: 1.5085 - acc: 0.8966 - val_loss: 0.7683 - val_acc: 0.8588

Epoch 3/35
 - 0s - loss: 0.4646 - acc: 0.9125 - val_loss: 0.6108 - val_acc: 0.8921

Epoch 4/35
 - 1s - loss: 0.3579 - acc: 0.9286 - val_loss: 0.4960 - val_acc: 0.9040

Epoch 5/35
 - 1s - loss: 0.3236 - acc: 0.9301 - val_loss: 0.4665 - val_acc: 0.8928

Epoch 6/35
 - 1s - loss: 0.3036 - acc: 0.9305 - val_loss: 0.4805 - val_acc: 0.8860

Epoch 7/35
 - 1s - loss: 0.3262 - acc: 0.9227 - val_loss: 0.4121 - val_acc: 0.9033

Epoch 8/35
 - 1s - loss: 0.3012 - acc: 0.9320 - val_loss: 0.4068 - val_acc: 0.8941

Epoch 9/35
 - 1s - loss: 0.2780 - acc: 0.9327 - val_loss: 0.4220 - val_acc: 0.8955

Epoch 10/35
 - 1s - loss: 0.2734 - acc: 0.9339 - val_loss: 0.3795 - val_acc: 0.8972

Epoch 11/35
 - 1s - loss: 0.2633 - acc: 0.9350 - val_loss: 0.4048 - val_acc: 0.8945

Epoch 12/35
 - 1s - loss: 0.3093 - acc: 0.9279 - val_loss: 0.3912 - val_acc: 0.8870

Epoch 13/35
 - 1s - loss: 0.2636 - acc: 0.9321 - val_loss: 0.3971 - val_acc: 0.8890

Epoch 14/35
 - 1s - loss: 0.2475 - acc: 0.9393 - val_loss: 0.4173 - val_acc: 0.8806

Epoch 15/35
 - 1s - loss: 0.2561 - acc: 0.9354 - val_loss: 0.3768 - val_acc: 0.9046

Epoch 16/35
 - 1s - loss: 0.2874 - acc: 0.9287 - val_loss: 0.4000 - val_acc: 0.8985
```

```
Epoch 17/35
 - 1s - loss: 0.2509 - acc: 0.9363 - val_loss: 0.4263 - val_acc: 0.8772

Epoch 18/35
 - 1s - loss: 0.2365 - acc: 0.9395 - val_loss: 0.3513 - val_acc: 0.9016

Epoch 19/35
 - 1s - loss: 0.2642 - acc: 0.9324 - val_loss: 0.3389 - val_acc: 0.9013

Epoch 20/35
 - 1s - loss: 0.2624 - acc: 0.9309 - val_loss: 0.3560 - val_acc: 0.9019

Epoch 21/35
 - 1s - loss: 0.2377 - acc: 0.9366 - val_loss: 0.5165 - val_acc: 0.8351

Epoch 22/35
 - 1s - loss: 0.2724 - acc: 0.9332 - val_loss: 0.3473 - val_acc: 0.9002

Epoch 23/35
 - 1s - loss: 0.2603 - acc: 0.9336 - val_loss: 0.3746 - val_acc: 0.8928

Epoch 24/35
 - 1s - loss: 0.2353 - acc: 0.9412 - val_loss: 0.3156 - val_acc: 0.9094

Epoch 25/35
 - 1s - loss: 0.2340 - acc: 0.9415 - val_loss: 0.4412 - val_acc: 0.8711

Epoch 26/35
 - 1s - loss: 0.2431 - acc: 0.9374 - val_loss: 0.4143 - val_acc: 0.8778

Epoch 27/35
 - 0s - loss: 0.2344 - acc: 0.9372 - val_loss: 0.3915 - val_acc: 0.8938

Epoch 28/35
 - 1s - loss: 0.2537 - acc: 0.9359 - val_loss: 0.3890 - val_acc: 0.8948

Epoch 29/35
 - 1s - loss: 0.2533 - acc: 0.9348 - val_loss: 0.4068 - val_acc: 0.9128

Epoch 30/35
 - 1s - loss: 0.2134 - acc: 0.9470 - val_loss: 0.3260 - val_acc: 0.8873

Epoch 31/35
 - 1s - loss: 0.2252 - acc: 0.9412 - val_loss: 0.3577 - val_acc: 0.8938

Epoch 32/35
 - 1s - loss: 0.2625 - acc: 0.9319 - val_loss: 0.4013 - val_acc: 0.8935

Epoch 33/35
 - 1s - loss: 0.2287 - acc: 0.9404 - val_loss: 0.3360 - val_acc: 0.8968

Epoch 34/35
 - 1s - loss: 0.2453 - acc: 0.9377 - val_loss: 0.3912 - val_acc: 0.8694

Epoch 35/35
 - 1s - loss: 0.2176 - acc: 0.9437 - val_loss: 0.3651 - val_acc: 0.8836

Train accuracy
0.9341675734494015
Test accuracy:
0.8836104513064132
_________________________________________________________________
Model: "sequential_21"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_41 (Conv1D)           (None, 124, 32)           1472
_________________________________________________________________
conv1d_42 (Conv1D)           (None, 122, 32)           3104
_________________________________________________________________
dropout_21 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_21 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_21 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_41 (Dense)             (None, 64)                81984
```

```
dense_41 (Dense)             (None, 64)                81984
_________________________________________________________________
dense_42 (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
 - 1s - loss: 33.6068 - acc: 0.7138 - val_loss: 16.7369 - val_acc: 0.7747

Epoch 2/35
 - 0s - loss: 9.3305 - acc: 0.8802 - val_loss: 4.8747 - val_acc: 0.7876

Epoch 3/35
 - 1s - loss: 2.6598 - acc: 0.9083 - val_loss: 1.7121 - val_acc: 0.8683

Epoch 4/35
 - 1s - loss: 0.9494 - acc: 0.9085 - val_loss: 0.9197 - val_acc: 0.8548

Epoch 5/35
 - 1s - loss: 0.5231 - acc: 0.9144 - val_loss: 0.7404 - val_acc: 0.8127

Epoch 6/35
 - 1s - loss: 0.4156 - acc: 0.9232 - val_loss: 0.6547 - val_acc: 0.8514

Epoch 7/35
 - 1s - loss: 0.3686 - acc: 0.9278 - val_loss: 0.5938 - val_acc: 0.8633

Epoch 8/35
 - 1s - loss: 0.3454 - acc: 0.9286 - val_loss: 0.5892 - val_acc: 0.8792

Epoch 9/35
 - 1s - loss: 0.3215 - acc: 0.9340 - val_loss: 0.5637 - val_acc: 0.8724

Epoch 10/35
 - 1s - loss: 0.3176 - acc: 0.9283 - val_loss: 0.5684 - val_acc: 0.8758

Epoch 11/35
 - 1s - loss: 0.2987 - acc: 0.9354 - val_loss: 0.5235 - val_acc: 0.8918

Epoch 12/35
 - 1s - loss: 0.2773 - acc: 0.9408 - val_loss: 0.5231 - val_acc: 0.8816

Epoch 13/35
 - 1s - loss: 0.2895 - acc: 0.9343 - val_loss: 0.5158 - val_acc: 0.8609

Epoch 14/35
 - 1s - loss: 0.2724 - acc: 0.9393 - val_loss: 0.5055 - val_acc: 0.8935

Epoch 15/35
 - 1s - loss: 0.2695 - acc: 0.9339 - val_loss: 0.5539 - val_acc: 0.8388

Epoch 16/35
 - 1s - loss: 0.2695 - acc: 0.9362 - val_loss: 0.4808 - val_acc: 0.8588

Epoch 17/35
 - 1s - loss: 0.2548 - acc: 0.9418 - val_loss: 0.4877 - val_acc: 0.8775

Epoch 18/35
 - 1s - loss: 0.2536 - acc: 0.9415 - val_loss: 0.4320 - val_acc: 0.8894

Epoch 19/35
 - 1s - loss: 0.2471 - acc: 0.9406 - val_loss: 0.4614 - val_acc: 0.8975

Epoch 20/35
 - 1s - loss: 0.2616 - acc: 0.9346 - val_loss: 0.4291 - val_acc: 0.9101

Epoch 21/35
 - 1s - loss: 0.2349 - acc: 0.9455 - val_loss: 0.5125 - val_acc: 0.8616

Epoch 22/35
 - 1s - loss: 0.2480 - acc: 0.9372 - val_loss: 0.3963 - val_acc: 0.9172

Epoch 23/35
```

```
 - 1s - loss: 0.2266 - acc: 0.9422 - val_loss: 0.4383 - val_acc: 0.8972

Epoch 24/35
 - 1s - loss: 0.2214 - acc: 0.9453 - val_loss: 0.4147 - val_acc: 0.8778

Epoch 25/35
 - 1s - loss: 0.2456 - acc: 0.9382 - val_loss: 0.4685 - val_acc: 0.8799

Epoch 26/35
 - 1s - loss: 0.2307 - acc: 0.9397 - val_loss: 0.4518 - val_acc: 0.8850

Epoch 27/35
 - 1s - loss: 0.2231 - acc: 0.9396 - val_loss: 0.4099 - val_acc: 0.8924

Epoch 28/35
 - 1s - loss: 0.2320 - acc: 0.9422 - val_loss: 0.4446 - val_acc: 0.8904

Epoch 29/35
 - 1s - loss: 0.2224 - acc: 0.9425 - val_loss: 0.4220 - val_acc: 0.8918

Epoch 30/35
 - 1s - loss: 0.2076 - acc: 0.9468 - val_loss: 0.4020 - val_acc: 0.8850

Epoch 31/35
 - 1s - loss: 0.2297 - acc: 0.9391 - val_loss: 0.4052 - val_acc: 0.8948

Epoch 32/35
 - 1s - loss: 0.2647 - acc: 0.9332 - val_loss: 0.4110 - val_acc: 0.9050

Epoch 33/35
 - 1s - loss: 0.2375 - acc: 0.9380 - val_loss: 0.4497 - val_acc: 0.8833

Epoch 34/35
 - 1s - loss: 0.2131 - acc: 0.9460 - val_loss: 0.4044 - val_acc: 0.8785

Epoch 35/35
 - 1s - loss: 0.2073 - acc: 0.9483 - val_loss: 0.4375 - val_acc: 0.8677

Train accuracy
0.9322633297062024
Test accuracy:
0.8676620291822192
_________________________________________________________________________________
Model: "sequential_22"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_43 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_44 (Conv1D)           (None, 122, 32)           2720
_________________________________________________________________
dropout_22 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_22 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_22 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_43 (Dense)             (None, 64)                81984
_________________________________________________________________
dense_44 (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
 - 2s - loss: 7.9108 - acc: 0.8074 - val_loss: 0.7333 - val_acc: 0.8446

Epoch 2/35
 - 1s - loss: 0.4883 - acc: 0.8855 - val_loss: 0.6385 - val_acc: 0.8514

Epoch 3/35
 - 1s - loss: 0.4217 - acc: 0.8996 - val_loss: 0.5877 - val_acc: 0.8789

Epoch 4/35
```

```
 - 1s - loss: 0.3964 - acc: 0.9036 - val_loss: 0.5773 - val_acc: 0.8646

Epoch 5/35
 - 1s - loss: 0.3667 - acc: 0.9143 - val_loss: 0.5007 - val_acc: 0.8887

Epoch 6/35
 - 1s - loss: 0.3277 - acc: 0.9208 - val_loss: 0.5323 - val_acc: 0.8463

Epoch 7/35
 - 1s - loss: 0.3331 - acc: 0.9206 - val_loss: 0.5746 - val_acc: 0.8504

Epoch 8/35
 - 1s - loss: 0.3252 - acc: 0.9248 - val_loss: 0.4645 - val_acc: 0.8738

Epoch 9/35
 - 1s - loss: 0.3054 - acc: 0.9260 - val_loss: 0.4612 - val_acc: 0.8633

Epoch 10/35
 - 1s - loss: 0.3221 - acc: 0.9232 - val_loss: 0.4472 - val_acc: 0.8921

Epoch 11/35
 - 1s - loss: 0.2853 - acc: 0.9302 - val_loss: 0.4284 - val_acc: 0.8768

Epoch 12/35
 - 1s - loss: 0.3187 - acc: 0.9217 - val_loss: 0.4800 - val_acc: 0.8616

Epoch 13/35
 - 1s - loss: 0.3041 - acc: 0.9233 - val_loss: 0.5139 - val_acc: 0.8660

Epoch 14/35
 - 1s - loss: 0.2914 - acc: 0.9246 - val_loss: 0.4735 - val_acc: 0.8778

Epoch 15/35
 - 1s - loss: 0.2987 - acc: 0.9268 - val_loss: 0.5673 - val_acc: 0.8317

Epoch 16/35
 - 1s - loss: 0.2751 - acc: 0.9283 - val_loss: 0.4080 - val_acc: 0.8758

Epoch 17/35
 - 1s - loss: 0.2584 - acc: 0.9347 - val_loss: 0.3861 - val_acc: 0.9057

Epoch 18/35
 - 1s - loss: 0.2733 - acc: 0.9280 - val_loss: 0.3922 - val_acc: 0.8951

Epoch 19/35
 - 1s - loss: 0.2549 - acc: 0.9306 - val_loss: 0.4816 - val_acc: 0.8812

Epoch 20/35
 - 1s - loss: 0.2425 - acc: 0.9328 - val_loss: 0.3716 - val_acc: 0.8989

Epoch 21/35
 - 1s - loss: 0.2705 - acc: 0.9272 - val_loss: 0.3875 - val_acc: 0.8829

Epoch 22/35
 - 1s - loss: 0.2453 - acc: 0.9336 - val_loss: 0.3580 - val_acc: 0.8870

Epoch 23/35
 - 1s - loss: 0.2460 - acc: 0.9346 - val_loss: 0.4272 - val_acc: 0.8843

Epoch 24/35
 - 1s - loss: 0.2567 - acc: 0.9314 - val_loss: 0.4500 - val_acc: 0.8636

Epoch 25/35
 - 1s - loss: 0.2713 - acc: 0.9310 - val_loss: 0.4296 - val_acc: 0.8880

Epoch 26/35
 - 1s - loss: 0.2427 - acc: 0.9350 - val_loss: 0.3721 - val_acc: 0.8928

Epoch 27/35
 - 1s - loss: 0.2691 - acc: 0.9321 - val_loss: 0.3979 - val_acc: 0.8938

Epoch 28/35
 - 1s - loss: 0.2474 - acc: 0.9382 - val_loss: 0.3207 - val_acc: 0.9094

Epoch 29/35
 - 1s - loss: 0.2750 - acc: 0.9305 - val_loss: 0.5597 - val_acc: 0.8459
```

```
Epoch 30/35
 - 1s - loss: 0.2521 - acc: 0.9332 - val_loss: 0.3531 - val_acc: 0.9141

Epoch 31/35
 - 1s - loss: 0.2229 - acc: 0.9425 - val_loss: 0.4312 - val_acc: 0.8700

Epoch 32/35
 - 1s - loss: 0.2602 - acc: 0.9321 - val_loss: 0.3886 - val_acc: 0.8717

Epoch 33/35
 - 1s - loss: 0.2216 - acc: 0.9366 - val_loss: 0.4442 - val_acc: 0.8853

Epoch 34/35
 - 1s - loss: 0.2504 - acc: 0.9331 - val_loss: 0.3848 - val_acc: 0.8951

Epoch 35/35
 - 1s - loss: 0.2387 - acc: 0.9395 - val_loss: 0.3892 - val_acc: 0.8897

Train accuracy
0.9390642002176278
Test accuracy:
0.8897183576518494
_________________________________________________________________________________________
Model: "sequential_23"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_45 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_46 (Conv1D)           (None, 122, 32)           2720
_________________________________________________________________
dropout_23 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_23 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_23 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_45 (Dense)             (None, 32)                40992
_________________________________________________________________
dense_46 (Dense)             (None, 6)                 198
=================================================================
Total params: 45,198
Trainable params: 45,198
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 2s - loss: 11.3744 - acc: 0.7394 - val_loss: 0.8666 - val_acc: 0.8381

Epoch 2/25
 - 1s - loss: 0.5888 - acc: 0.8617 - val_loss: 0.7515 - val_acc: 0.8405

Epoch 3/25
 - 1s - loss: 0.4943 - acc: 0.8811 - val_loss: 0.6910 - val_acc: 0.8602

Epoch 4/25
 - 1s - loss: 0.5028 - acc: 0.8711 - val_loss: 0.6938 - val_acc: 0.8361

Epoch 5/25
 - 1s - loss: 0.4543 - acc: 0.8833 - val_loss: 0.6105 - val_acc: 0.8687

Epoch 6/25
 - 1s - loss: 0.4083 - acc: 0.8947 - val_loss: 0.6098 - val_acc: 0.8429

Epoch 7/25
 - 1s - loss: 0.4284 - acc: 0.8881 - val_loss: 0.5768 - val_acc: 0.8633

Epoch 8/25
 - 1s - loss: 0.4092 - acc: 0.8981 - val_loss: 0.5916 - val_acc: 0.8673

Epoch 9/25
 - 1s - loss: 0.3907 - acc: 0.8981 - val_loss: 0.5895 - val_acc: 0.8453

Epoch 10/25
 - 1s - loss: 0.3823 - acc: 0.9033 - val_loss: 0.5275 - val_acc: 0.8656
```

```
Epoch 11/25
 - 2s - loss: 0.3659 - acc: 0.9061 - val_loss: 0.4985 - val_acc: 0.8812

Epoch 12/25
 - 2s - loss: 0.3366 - acc: 0.9138 - val_loss: 0.5697 - val_acc: 0.8466

Epoch 13/25
 - 2s - loss: 0.3425 - acc: 0.9143 - val_loss: 0.5522 - val_acc: 0.8534

Epoch 14/25
 - 2s - loss: 0.3340 - acc: 0.9181 - val_loss: 0.5121 - val_acc: 0.8806

Epoch 15/25
 - 2s - loss: 0.3514 - acc: 0.9082 - val_loss: 0.5638 - val_acc: 0.8517

Epoch 16/25
 - 2s - loss: 0.3389 - acc: 0.9136 - val_loss: 0.4846 - val_acc: 0.8459

Epoch 17/25
 - 2s - loss: 0.3200 - acc: 0.9199 - val_loss: 0.5141 - val_acc: 0.8660

Epoch 18/25
 - 2s - loss: 0.3123 - acc: 0.9242 - val_loss: 0.4294 - val_acc: 0.8789

Epoch 19/25
 - 2s - loss: 0.3301 - acc: 0.9200 - val_loss: 0.5005 - val_acc: 0.8782

Epoch 20/25
 - 2s - loss: 0.2958 - acc: 0.9280 - val_loss: 0.4327 - val_acc: 0.8975

Epoch 21/25
 - 2s - loss: 0.2907 - acc: 0.9257 - val_loss: 0.5165 - val_acc: 0.8385

Epoch 22/25
 - 1s - loss: 0.2799 - acc: 0.9313 - val_loss: 0.4023 - val_acc: 0.8968

Epoch 23/25
 - 1s - loss: 0.2797 - acc: 0.9285 - val_loss: 0.4759 - val_acc: 0.8426

Epoch 24/25
 - 1s - loss: 0.3033 - acc: 0.9255 - val_loss: 0.4150 - val_acc: 0.8850

Epoch 25/25
 - 1s - loss: 0.2855 - acc: 0.9306 - val_loss: 0.4448 - val_acc: 0.8700

Train accuracy
0.9215179542981502
Test accuracy:
0.8700373260943333
_________________________________________________________________
Model: "sequential_24"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_47 (Conv1D)           (None, 124, 32)           1472
_________________________________________________________________
conv1d_48 (Conv1D)           (None, 118, 32)           7200
_________________________________________________________________
dropout_24 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_24 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_24 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_47 (Dense)             (None, 64)                79936
_________________________________________________________________
dense_48 (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 1/35
 - 2s - loss: 12.1664 - acc: 0.7958 - val_loss: 2.1844 - val_acc: 0.8157
```

```
Epoch 2/35
 - 1s - loss: 0.9176 - acc: 0.9102 - val_loss: 0.7288 - val_acc: 0.8633

Epoch 3/35
 - 1s - loss: 0.4021 - acc: 0.9270 - val_loss: 0.5741 - val_acc: 0.8918

Epoch 4/35
 - 1s - loss: 0.3559 - acc: 0.9263 - val_loss: 0.5036 - val_acc: 0.9067

Epoch 5/35
 - 2s - loss: 0.3210 - acc: 0.9308 - val_loss: 0.4658 - val_acc: 0.9077

Epoch 6/35
 - 2s - loss: 0.2848 - acc: 0.9343 - val_loss: 0.4768 - val_acc: 0.8867

Epoch 7/35
 - 2s - loss: 0.2831 - acc: 0.9363 - val_loss: 0.4230 - val_acc: 0.8985

Epoch 8/35
 - 2s - loss: 0.2572 - acc: 0.9380 - val_loss: 0.4327 - val_acc: 0.8965

Epoch 9/35
 - 2s - loss: 0.2576 - acc: 0.9404 - val_loss: 0.4019 - val_acc: 0.8884

Epoch 10/35
 - 2s - loss: 0.2359 - acc: 0.9402 - val_loss: 0.3837 - val_acc: 0.8985

Epoch 11/35
 - 2s - loss: 0.2554 - acc: 0.9368 - val_loss: 0.3982 - val_acc: 0.8921

Epoch 12/35
 - 2s - loss: 0.2314 - acc: 0.9404 - val_loss: 0.3733 - val_acc: 0.9158

Epoch 13/35
 - 2s - loss: 0.2146 - acc: 0.9452 - val_loss: 0.4248 - val_acc: 0.8633

Epoch 14/35
 - 2s - loss: 0.2336 - acc: 0.9396 - val_loss: 0.3564 - val_acc: 0.9104

Epoch 15/35
 - 2s - loss: 0.2156 - acc: 0.9433 - val_loss: 0.3399 - val_acc: 0.9091

Epoch 16/35
 - 2s - loss: 0.2275 - acc: 0.9402 - val_loss: 0.3284 - val_acc: 0.9002

Epoch 17/35
 - 2s - loss: 0.2095 - acc: 0.9438 - val_loss: 0.3566 - val_acc: 0.9023

Epoch 18/35
 - 2s - loss: 0.2150 - acc: 0.9415 - val_loss: 0.3667 - val_acc: 0.8894

Epoch 19/35
 - 2s - loss: 0.2058 - acc: 0.9407 - val_loss: 0.3552 - val_acc: 0.9016

Epoch 20/35
 - 2s - loss: 0.2180 - acc: 0.9381 - val_loss: 0.3601 - val_acc: 0.8850

Epoch 21/35
 - 2s - loss: 0.2152 - acc: 0.9423 - val_loss: 0.3474 - val_acc: 0.9050

Epoch 22/35
 - 2s - loss: 0.1932 - acc: 0.9476 - val_loss: 0.3289 - val_acc: 0.9091

Epoch 23/35
 - 2s - loss: 0.2371 - acc: 0.9372 - val_loss: 0.3771 - val_acc: 0.8982

Epoch 24/35
 - 2s - loss: 0.2003 - acc: 0.9444 - val_loss: 0.3267 - val_acc: 0.9023

Epoch 25/35
 - 2s - loss: 0.2099 - acc: 0.9412 - val_loss: 0.3187 - val_acc: 0.8951

Epoch 26/35
 - 2s - loss: 0.2035 - acc: 0.9438 - val_loss: 0.3381 - val_acc: 0.8948

Epoch 27/35
 - 1s - loss: 0.2076 - acc: 0.9418 - val_loss: 0.3626 - val_acc: 0.9009
```

```
Epoch 28/35
 - 1s - loss: 0.1952 - acc: 0.9456 - val_loss: 0.3154 - val_acc: 0.9063

Epoch 29/35
 - 1s - loss: 0.1964 - acc: 0.9461 - val_loss: 0.3691 - val_acc: 0.8816

Epoch 30/35
 - 1s - loss: 0.2152 - acc: 0.9404 - val_loss: 0.3680 - val_acc: 0.8836

Epoch 31/35
 - 1s - loss: 0.2130 - acc: 0.9415 - val_loss: 0.3564 - val_acc: 0.8972

Epoch 32/35
 - 1s - loss: 0.1910 - acc: 0.9455 - val_loss: 0.3605 - val_acc: 0.8850

Epoch 33/35
 - 1s - loss: 0.1915 - acc: 0.9436 - val_loss: 0.3734 - val_acc: 0.9053

Epoch 34/35
 - 1s - loss: 0.2118 - acc: 0.9416 - val_loss: 0.3865 - val_acc: 0.8816

Epoch 35/35
 - 1s - loss: 0.1956 - acc: 0.9482 - val_loss: 0.3561 - val_acc: 0.8738

Train accuracy
0.9231501632208923
Test accuracy:
0.8737699355276553
_________________________________________________________________________________________
Model: "sequential_25"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_49 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_50 (Conv1D)           (None, 118, 32)           6304
_________________________________________________________________
dropout_25 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_25 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_25 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_49 (Dense)             (None, 32)                39968
_________________________________________________________________
dense_50 (Dense)             (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 2s - loss: 8.3492 - acc: 0.8331 - val_loss: 0.9679 - val_acc: 0.8551

Epoch 2/25
 - 1s - loss: 0.4854 - acc: 0.9112 - val_loss: 0.5878 - val_acc: 0.8911

Epoch 3/25
 - 1s - loss: 0.3152 - acc: 0.9339 - val_loss: 0.4644 - val_acc: 0.9125

Epoch 4/25
 - 1s - loss: 0.3250 - acc: 0.9253 - val_loss: 0.5074 - val_acc: 0.9097

Epoch 5/25
 - 1s - loss: 0.3067 - acc: 0.9308 - val_loss: 0.4525 - val_acc: 0.8996

Epoch 6/25
 - 1s - loss: 0.2594 - acc: 0.9397 - val_loss: 0.4766 - val_acc: 0.8575

Epoch 7/25
 - 1s - loss: 0.2440 - acc: 0.9385 - val_loss: 0.4045 - val_acc: 0.8945

Epoch 8/25
 - 1s - loss: 0.2291 - acc: 0.9402 - val_loss: 0.4450 - val_acc: 0.8901
```

```
Epoch 9/25
 - 2s - loss: 0.2462 - acc: 0.9374 - val_loss: 0.3438 - val_acc: 0.9175

Epoch 10/25
 - 1s - loss: 0.2270 - acc: 0.9410 - val_loss: 0.3912 - val_acc: 0.8911

Epoch 11/25
 - 1s - loss: 0.2242 - acc: 0.9421 - val_loss: 0.3610 - val_acc: 0.9165

Epoch 12/25
 - 1s - loss: 0.2395 - acc: 0.9397 - val_loss: 0.3311 - val_acc: 0.9097

Epoch 13/25
 - 2s - loss: 0.2511 - acc: 0.9359 - val_loss: 0.4061 - val_acc: 0.8856

Epoch 14/25
 - 2s - loss: 0.2408 - acc: 0.9410 - val_loss: 0.4050 - val_acc: 0.9057

Epoch 15/25
 - 2s - loss: 0.2255 - acc: 0.9416 - val_loss: 0.3874 - val_acc: 0.8850

Epoch 16/25
 - 2s - loss: 0.2083 - acc: 0.9450 - val_loss: 0.3000 - val_acc: 0.9131

Epoch 17/25
 - 2s - loss: 0.2018 - acc: 0.9437 - val_loss: 0.3358 - val_acc: 0.9043

Epoch 18/25
 - 1s - loss: 0.2066 - acc: 0.9471 - val_loss: 0.3073 - val_acc: 0.9121

Epoch 19/25
 - 1s - loss: 0.2327 - acc: 0.9363 - val_loss: 0.3757 - val_acc: 0.8880

Epoch 20/25
 - 1s - loss: 0.2320 - acc: 0.9396 - val_loss: 0.3593 - val_acc: 0.9060

Epoch 21/25
 - 1s - loss: 0.1956 - acc: 0.9438 - val_loss: 0.3215 - val_acc: 0.9128

Epoch 22/25
 - 1s - loss: 0.2222 - acc: 0.9429 - val_loss: 0.2955 - val_acc: 0.9063

Epoch 23/25
 - 1s - loss: 0.2125 - acc: 0.9406 - val_loss: 0.3613 - val_acc: 0.8901

Epoch 24/25
 - 1s - loss: 0.1907 - acc: 0.9467 - val_loss: 0.3034 - val_acc: 0.8996

Epoch 25/25
 - 1s - loss: 0.2136 - acc: 0.9384 - val_loss: 0.3200 - val_acc: 0.9135

Train accuracy
0.9416485310119695
Test accuracy:
0.9134713267729895
_________________________________________________________________
Model: "sequential_26"
_________________________________________________________________
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
 - 2s - loss: 10.3186 - acc: 0.8399 - val_loss: 1.0137 - val_acc: 0.8972

Epoch 2/25
 - 1s - loss: 0.5054 - acc: 0.9207 - val_loss: 0.6071 - val_acc: 0.8972

Epoch 3/25
 - 1s - loss: 0.3415 - acc: 0.9344 - val_loss: 0.4829 - val_acc: 0.9070

Epoch 4/25
 - 1s - loss: 0.2951 - acc: 0.9329 - val_loss: 0.4217 - val_acc: 0.9104

Epoch 5/25
 - 1s - loss: 0.2994 - acc: 0.9331 - val_loss: 0.4087 - val_acc: 0.9043

Epoch 6/25
 - 1s - loss: 0.2473 - acc: 0.9410 - val_loss: 0.4488 - val_acc: 0.8870

Epoch 7/25
 - 1s - loss: 0.2764 - acc: 0.9357 - val_loss: 0.3826 - val_acc: 0.9016

Epoch 8/25
 - 1s - loss: 0.2361 - acc: 0.9404 - val_loss: 0.4066 - val_acc: 0.8819

Epoch 9/25
 - 2s - loss: 0.2371 - acc: 0.9403 - val_loss: 0.3564 - val_acc: 0.9087

Epoch 10/25
 - 2s - loss: 0.2293 - acc: 0.9408 - val_loss: 0.4256 - val_acc: 0.8381

Epoch 11/25
 - 2s - loss: 0.2444 - acc: 0.9377 - val_loss: 0.3475 - val_acc: 0.9053

Epoch 12/25
 - 2s - loss: 0.2126 - acc: 0.9426 - val_loss: 0.4107 - val_acc: 0.8853

Epoch 13/25
 - 2s - loss: 0.2212 - acc: 0.9411 - val_loss: 0.3573 - val_acc: 0.8999

Epoch 14/25
 - 1s - loss: 0.2446 - acc: 0.9387 - val_loss: 0.4004 - val_acc: 0.8873

Epoch 15/25
 - 1s - loss: 0.2197 - acc: 0.9403 - val_loss: 0.4428 - val_acc: 0.8768

Epoch 16/25
 - 1s - loss: 0.2139 - acc: 0.9416 - val_loss: 0.3504 - val_acc: 0.8914

Epoch 17/25
 - 2s - loss: 0.2000 - acc: 0.9444 - val_loss: 0.4097 - val_acc: 0.8873

Epoch 18/25
 - 2s - loss: 0.2220 - acc: 0.9407 - val_loss: 0.3354 - val_acc: 0.8982

Epoch 19/25
 - 2s - loss: 0.2333 - acc: 0.9359 - val_loss: 0.3332 - val_acc: 0.9077

Epoch 20/25
 - 2s - loss: 0.2097 - acc: 0.9418 - val_loss: 0.3202 - val_acc: 0.9094

Epoch 21/25
 - 1s - loss: 0.2155 - acc: 0.9408 - val_loss: 0.4154 - val_acc: 0.8690

Epoch 22/25
 - 1s - loss: 0.2138 - acc: 0.9412 - val_loss: 0.3808 - val_acc: 0.9006

Epoch 23/25
 - 2s - loss: 0.2027 - acc: 0.9442 - val_loss: 0.3808 - val_acc: 0.8812

Epoch 24/25
 - 2s - loss: 0.2295 - acc: 0.9381 - val_loss: 0.3214 - val_acc: 0.8938

Epoch 25/25
```

```
 -
 - 2s - loss: 0.1951 - acc: 0.9479 - val_loss: 0.3935 - val_acc: 0.8782

Train accuracy
0.9519858541893362
Test accuracy:
0.8781812012215813
_________________________________________________________________________________
Model: "sequential_27"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_53 (Conv1D)           (None, 124, 32)           1472
_________________________________________________________________
conv1d_54 (Conv1D)           (None, 118, 32)           7200
_________________________________________________________________
dropout_27 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_27 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_27 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_53 (Dense)             (None, 32)                39968
_________________________________________________________________
dense_54 (Dense)             (None, 6)                 198
=================================================================
Total params: 48,838
Trainable params: 48,838
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 2s - loss: 11.0672 - acc: 0.7004 - val_loss: 5.0580 - val_acc: 0.8364

Epoch 2/25
 - 2s - loss: 2.5551 - acc: 0.8939 - val_loss: 1.5216 - val_acc: 0.8317

Epoch 3/25
 - 1s - loss: 0.7536 - acc: 0.9287 - val_loss: 0.7836 - val_acc: 0.8979

Epoch 4/25
 - 2s - loss: 0.4074 - acc: 0.9302 - val_loss: 0.6264 - val_acc: 0.8935

Epoch 5/25
 - 2s - loss: 0.3271 - acc: 0.9327 - val_loss: 0.5653 - val_acc: 0.8945

Epoch 6/25
 - 2s - loss: 0.2939 - acc: 0.9340 - val_loss: 0.5452 - val_acc: 0.8809

Epoch 7/25
 - 1s - loss: 0.2785 - acc: 0.9358 - val_loss: 0.4988 - val_acc: 0.9063

Epoch 8/25
 - 1s - loss: 0.2578 - acc: 0.9396 - val_loss: 0.5237 - val_acc: 0.8826

Epoch 9/25
 - 1s - loss: 0.2495 - acc: 0.9391 - val_loss: 0.4618 - val_acc: 0.9002

Epoch 10/25
 - 1s - loss: 0.2300 - acc: 0.9446 - val_loss: 0.4772 - val_acc: 0.9002

Epoch 11/25
 - 1s - loss: 0.2327 - acc: 0.9421 - val_loss: 0.4246 - val_acc: 0.8992

Epoch 12/25
 - 1s - loss: 0.2207 - acc: 0.9418 - val_loss: 0.4463 - val_acc: 0.8887

Epoch 13/25
 - 1s - loss: 0.2198 - acc: 0.9437 - val_loss: 0.4002 - val_acc: 0.9104

Epoch 14/25
 - 2s - loss: 0.2080 - acc: 0.9450 - val_loss: 0.4343 - val_acc: 0.9033

Epoch 15/25
 - 1s - loss: 0.2056 - acc: 0.9446 - val_loss: 0.3807 - val_acc: 0.9101

Epoch 16/25
```

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 - 1s - loss: 0.1964 - acc: 0.9445 - val_loss: 0.3780 - val_acc: 0.8921

Epoch 17/25
 - 1s - loss: 0.1963 - acc: 0.9453 - val_loss: 0.4082 - val_acc: 0.8962

Epoch 18/25
 - 1s - loss: 0.1878 - acc: 0.9460 - val_loss: 0.3813 - val_acc: 0.8958

Epoch 19/25
 - 1s - loss: 0.2009 - acc: 0.9437 - val_loss: 0.3578 - val_acc: 0.8958

Epoch 20/25
 - 1s - loss: 0.1944 - acc: 0.9423 - val_loss: 0.3610 - val_acc: 0.8992

Epoch 21/25
 - 1s - loss: 0.1801 - acc: 0.9484 - val_loss: 0.3919 - val_acc: 0.8938

Epoch 22/25
 - 1s - loss: 0.1826 - acc: 0.9480 - val_loss: 0.3355 - val_acc: 0.9091

Epoch 23/25
 - 1s - loss: 0.1771 - acc: 0.9471 - val_loss: 0.3616 - val_acc: 0.9050

Epoch 24/25
 - 1s - loss: 0.1777 - acc: 0.9474 - val_loss: 0.3294 - val_acc: 0.9125

Epoch 25/25
 - 1s - loss: 0.1805 - acc: 0.9467 - val_loss: 0.3842 - val_acc: 0.8941

Train accuracy
0.9528019586507073
Test accuracy:
0.8941296233457754
_________________________________________________________________
Model: "sequential_28"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_55 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_56 (Conv1D)           (None, 118, 32)           6304
_________________________________________________________________
dropout_28 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_28 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_28 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_55 (Dense)             (None, 32)                39968
_________________________________________________________________
dense_56 (Dense)             (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 2s - loss: 10.7555 - acc: 0.7601 - val_loss: 4.1832 - val_acc: 0.8605

Epoch 2/25
 - 1s - loss: 1.9580 - acc: 0.9090 - val_loss: 1.1852 - val_acc: 0.8466

Epoch 3/25
 - 2s - loss: 0.5722 - acc: 0.9334 - val_loss: 0.7073 - val_acc: 0.9070

Epoch 4/25
 - 1s - loss: 0.3532 - acc: 0.9357 - val_loss: 0.5781 - val_acc: 0.9080

Epoch 5/25
 - 2s - loss: 0.3033 - acc: 0.9362 - val_loss: 0.5142 - val_acc: 0.9050

Epoch 6/25
 - 2s - loss: 0.2669 - acc: 0.9416 - val_loss: 0.5265 - val_acc: 0.8873

Epoch 7/25
```

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 - 1s - loss: 0.2616 - acc: 0.9403 - val_loss: 0.4818 - val_acc: 0.8948

Epoch 8/25
 - 2s - loss: 0.2377 - acc: 0.9441 - val_loss: 0.4621 - val_acc: 0.9036

Epoch 9/25
 - 1s - loss: 0.2366 - acc: 0.9418 - val_loss: 0.4441 - val_acc: 0.9063

Epoch 10/25
 - 1s - loss: 0.2188 - acc: 0.9440 - val_loss: 0.4356 - val_acc: 0.8975

Epoch 11/25
 - 1s - loss: 0.2143 - acc: 0.9446 - val_loss: 0.4163 - val_acc: 0.9087

Epoch 12/25
 - 1s - loss: 0.2180 - acc: 0.9433 - val_loss: 0.4170 - val_acc: 0.8887

Epoch 13/25
 - 1s - loss: 0.2107 - acc: 0.9445 - val_loss: 0.4083 - val_acc: 0.8860

Epoch 14/25
 - 2s - loss: 0.2055 - acc: 0.9448 - val_loss: 0.4064 - val_acc: 0.9179

Epoch 15/25
 - 1s - loss: 0.2242 - acc: 0.9399 - val_loss: 0.3794 - val_acc: 0.9074

Epoch 16/25
 - 1s - loss: 0.1928 - acc: 0.9465 - val_loss: 0.3601 - val_acc: 0.9030

Epoch 17/25
 - 1s - loss: 0.1866 - acc: 0.9494 - val_loss: 0.3731 - val_acc: 0.9033

Epoch 18/25
 - 1s - loss: 0.1992 - acc: 0.9459 - val_loss: 0.3569 - val_acc: 0.9019

Epoch 19/25
 - 1s - loss: 0.1844 - acc: 0.9475 - val_loss: 0.3475 - val_acc: 0.9182

Epoch 20/25
 - 1s - loss: 0.1996 - acc: 0.9414 - val_loss: 0.3363 - val_acc: 0.9155

Epoch 21/25
 - 1s - loss: 0.1810 - acc: 0.9484 - val_loss: 0.3743 - val_acc: 0.9023

Epoch 22/25
 - 2s - loss: 0.1894 - acc: 0.9446 - val_loss: 0.3560 - val_acc: 0.9087

Epoch 23/25
 - 1s - loss: 0.1775 - acc: 0.9478 - val_loss: 0.3642 - val_acc: 0.8894

Epoch 24/25
 - 1s - loss: 0.1851 - acc: 0.9478 - val_loss: 0.3393 - val_acc: 0.8863

Epoch 25/25
 - 2s - loss: 0.1963 - acc: 0.9427 - val_loss: 0.3642 - val_acc: 0.8972

Train accuracy
0.9538900979325353
Test accuracy:
0.8971835765184933
_________________________________________________________________
Model: "sequential_29"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_57 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_58 (Conv1D)           (None, 118, 32)           6304
_________________________________________________________________
dropout_29 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_29 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_29 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_57 (Dense)             (None, 32)                39968
```

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_________________________________________________________________
dense_58 (Dense)             (None, 6)                 198       
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 2s - loss: 2.5653 - acc: 0.8347 - val_loss: 0.6928 - val_acc: 0.8935

Epoch 2/25
 - 1s - loss: 0.4234 - acc: 0.9327 - val_loss: 0.5584 - val_acc: 0.8938

Epoch 3/25
 - 1s - loss: 0.3355 - acc: 0.9438 - val_loss: 0.4676 - val_acc: 0.9158

Epoch 4/25
 - 1s - loss: 0.2799 - acc: 0.9456 - val_loss: 0.3921 - val_acc: 0.9206

Epoch 5/25
 - 2s - loss: 0.2406 - acc: 0.9482 - val_loss: 0.4033 - val_acc: 0.9036

Epoch 6/25
 - 1s - loss: 0.2362 - acc: 0.9467 - val_loss: 0.3982 - val_acc: 0.8812

Epoch 7/25
 - 1s - loss: 0.2175 - acc: 0.9502 - val_loss: 0.3306 - val_acc: 0.9192

Epoch 8/25
 - 1s - loss: 0.1818 - acc: 0.9527 - val_loss: 0.4214 - val_acc: 0.9026

Epoch 9/25
 - 2s - loss: 0.1993 - acc: 0.9498 - val_loss: 0.3075 - val_acc: 0.9220

Epoch 10/25
 - 2s - loss: 0.1729 - acc: 0.9531 - val_loss: 0.3028 - val_acc: 0.9121

Epoch 11/25
 - 1s - loss: 0.1857 - acc: 0.9512 - val_loss: 0.2997 - val_acc: 0.9243

Epoch 12/25
 - 2s - loss: 0.1749 - acc: 0.9502 - val_loss: 0.3147 - val_acc: 0.9043

Epoch 13/25
 - 2s - loss: 0.1728 - acc: 0.9516 - val_loss: 0.2952 - val_acc: 0.9087

Epoch 14/25
 - 2s - loss: 0.1538 - acc: 0.9551 - val_loss: 0.2989 - val_acc: 0.9209

Epoch 15/25
 - 1s - loss: 0.1761 - acc: 0.9504 - val_loss: 0.3259 - val_acc: 0.9067

Epoch 16/25
 - 1s - loss: 0.2014 - acc: 0.9472 - val_loss: 0.2956 - val_acc: 0.9138

Epoch 17/25
 - 1s - loss: 0.1609 - acc: 0.9510 - val_loss: 0.3312 - val_acc: 0.9274

Epoch 18/25
 - 1s - loss: 0.1547 - acc: 0.9528 - val_loss: 0.2670 - val_acc: 0.9199

Epoch 19/25
 - 1s - loss: 0.1616 - acc: 0.9508 - val_loss: 0.2796 - val_acc: 0.9233

Epoch 20/25
 - 1s - loss: 0.1528 - acc: 0.9525 - val_loss: 0.2987 - val_acc: 0.9237

Epoch 21/25
 - 2s - loss: 0.1477 - acc: 0.9517 - val_loss: 0.2727 - val_acc: 0.9260

Epoch 22/25
 - 1s - loss: 0.1703 - acc: 0.9479 - val_loss: 0.2753 - val_acc: 0.9152

Epoch 23/25
 - 1s - loss: 0.1538 - acc: 0.9516 - val_loss: 0.2721 - val_acc: 0.9226
```

```
Epoch 24/25
 - 2s - loss: 0.1605 - acc: 0.9487 - val_loss: 0.4180 - val_acc: 0.8877

Epoch 25/25
 - 2s - loss: 0.1541 - acc: 0.9532 - val_loss: 0.2962 - val_acc: 0.9192

Train accuracy
0.9594668117519043
Test accuracy:
0.9192399049881235
--------------------------------------------------------------------------------
Model: "sequential_30"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_59 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_60 (Conv1D)           (None, 118, 32)           6304
_________________________________________________________________
dropout_30 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_30 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_30 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_59 (Dense)             (None, 32)                39968
_________________________________________________________________
dense_60 (Dense)             (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 1.6384 - acc: 0.8683 - val_loss: 0.8157 - val_acc: 0.8765

Epoch 2/25
 - 3s - loss: 0.3938 - acc: 0.9408 - val_loss: 0.4689 - val_acc: 0.8935

Epoch 3/25
 - 3s - loss: 0.2530 - acc: 0.9444 - val_loss: 0.5307 - val_acc: 0.8643

Epoch 4/25
 - 2s - loss: 0.2221 - acc: 0.9446 - val_loss: 0.3228 - val_acc: 0.9237

Epoch 5/25
 - 3s - loss: 0.2115 - acc: 0.9455 - val_loss: 0.3393 - val_acc: 0.9240

Epoch 6/25
 - 3s - loss: 0.1940 - acc: 0.9476 - val_loss: 0.3527 - val_acc: 0.8914

Epoch 7/25
 - 3s - loss: 0.1947 - acc: 0.9450 - val_loss: 0.3585 - val_acc: 0.9046

Epoch 8/25
 - 3s - loss: 0.1852 - acc: 0.9448 - val_loss: 0.3505 - val_acc: 0.8962

Epoch 9/25
 - 4s - loss: 0.1856 - acc: 0.9472 - val_loss: 0.3262 - val_acc: 0.8999

Epoch 10/25
 - 4s - loss: 0.1836 - acc: 0.9470 - val_loss: 0.3707 - val_acc: 0.8772

Epoch 11/25
 - 4s - loss: 0.1702 - acc: 0.9491 - val_loss: 0.2891 - val_acc: 0.9175

Epoch 12/25
 - 4s - loss: 0.1761 - acc: 0.9467 - val_loss: 0.3201 - val_acc: 0.9138

Epoch 13/25
 - 3s - loss: 0.1696 - acc: 0.9510 - val_loss: 0.2995 - val_acc: 0.9206

Epoch 14/25
 - 4s - loss: 0.1606 - acc: 0.9501 - val_loss: 0.3124 - val_acc: 0.9121
```

```
Epoch 15/25
 - 3s - loss: 0.1782 - acc: 0.9440 - val_loss: 0.3065 - val_acc: 0.9091

Epoch 16/25
 - 4s - loss: 0.1938 - acc: 0.9436 - val_loss: 0.2799 - val_acc: 0.9172

Epoch 17/25
 - 4s - loss: 0.1538 - acc: 0.9518 - val_loss: 0.2810 - val_acc: 0.9274

Epoch 18/25
 - 4s - loss: 0.1550 - acc: 0.9501 - val_loss: 0.2728 - val_acc: 0.9148

Epoch 19/25
 - 2s - loss: 0.1508 - acc: 0.9510 - val_loss: 0.3095 - val_acc: 0.9165

Epoch 20/25
 - 2s - loss: 0.1760 - acc: 0.9456 - val_loss: 0.2982 - val_acc: 0.9053

Epoch 21/25
 - 4s - loss: 0.1617 - acc: 0.9483 - val_loss: 0.2978 - val_acc: 0.9182

Epoch 22/25
 - 3s - loss: 0.1701 - acc: 0.9476 - val_loss: 0.2684 - val_acc: 0.9097

Epoch 23/25
 - 3s - loss: 0.1715 - acc: 0.9444 - val_loss: 0.2798 - val_acc: 0.9080

Epoch 24/25
 - 3s - loss: 0.1721 - acc: 0.9491 - val_loss: 0.3298 - val_acc: 0.8890

Epoch 25/25
 - 3s - loss: 0.1650 - acc: 0.9504 - val_loss: 0.2810 - val_acc: 0.9192

Train accuracy
0.9587867247007617
Test accuracy:
0.9192399049881235
_________________________________________________________________________________
Model: "sequential_31"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_61 (Conv1D)           (None, 126, 28)           784
_________________________________________________________________
conv1d_62 (Conv1D)           (None, 122, 32)           4512
_________________________________________________________________
dropout_31 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_31 (MaxPooling (None, 61, 32)            0
_________________________________________________________________
flatten_31 (Flatten)         (None, 1952)              0
_________________________________________________________________
dense_61 (Dense)             (None, 32)                62496
_________________________________________________________________
dense_62 (Dense)             (None, 6)                 198
=================================================================
Total params: 67,990
Trainable params: 67,990
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 2.4878 - acc: 0.8149 - val_loss: 0.6991 - val_acc: 0.8761

Epoch 2/25
 - 3s - loss: 0.4154 - acc: 0.9196 - val_loss: 0.5601 - val_acc: 0.8612

Epoch 3/25
 - 3s - loss: 0.3278 - acc: 0.9241 - val_loss: 0.4868 - val_acc: 0.8677

Epoch 4/25
 - 3s - loss: 0.2965 - acc: 0.9301 - val_loss: 0.4543 - val_acc: 0.8751

Epoch 5/25
 - 3s - loss: 0.2639 - acc: 0.9344 - val_loss: 0.4340 - val_acc: 0.8768
```

```
Epoch 6/25
 - 3s - loss: 0.2465 - acc: 0.9378 - val_loss: 0.4078 - val_acc: 0.8823

Epoch 7/25
 - 2s - loss: 0.2467 - acc: 0.9368 - val_loss: 0.4576 - val_acc: 0.8636

Epoch 8/25
 - 3s - loss: 0.2399 - acc: 0.9391 - val_loss: 0.3710 - val_acc: 0.9009

Epoch 9/25
 - 3s - loss: 0.2336 - acc: 0.9373 - val_loss: 0.4022 - val_acc: 0.8778

Epoch 10/25
 - 3s - loss: 0.2203 - acc: 0.9389 - val_loss: 0.5456 - val_acc: 0.8317

Epoch 11/25
 - 4s - loss: 0.2253 - acc: 0.9421 - val_loss: 0.3766 - val_acc: 0.8816

Epoch 12/25
 - 4s - loss: 0.2163 - acc: 0.9427 - val_loss: 0.3862 - val_acc: 0.8782

Epoch 13/25
 - 4s - loss: 0.2329 - acc: 0.9370 - val_loss: 0.5195 - val_acc: 0.8439

Epoch 14/25
 - 4s - loss: 0.2125 - acc: 0.9452 - val_loss: 0.4589 - val_acc: 0.8751

Epoch 15/25
 - 4s - loss: 0.2207 - acc: 0.9412 - val_loss: 0.4063 - val_acc: 0.8700

Epoch 16/25
 - 4s - loss: 0.1996 - acc: 0.9452 - val_loss: 0.3834 - val_acc: 0.8758

Epoch 17/25
 - 4s - loss: 0.2064 - acc: 0.9445 - val_loss: 0.3614 - val_acc: 0.8856

Epoch 18/25
 - 4s - loss: 0.2125 - acc: 0.9407 - val_loss: 0.3970 - val_acc: 0.8941

Epoch 19/25
 - 3s - loss: 0.1996 - acc: 0.9433 - val_loss: 0.4011 - val_acc: 0.8904

Epoch 20/25
 - 3s - loss: 0.2040 - acc: 0.9434 - val_loss: 0.3429 - val_acc: 0.9002

Epoch 21/25
 - 3s - loss: 0.1920 - acc: 0.9446 - val_loss: 0.3876 - val_acc: 0.8761

Epoch 22/25
 - 4s - loss: 0.2018 - acc: 0.9444 - val_loss: 0.4459 - val_acc: 0.8907

Epoch 23/25
 - 4s - loss: 0.1908 - acc: 0.9433 - val_loss: 0.3841 - val_acc: 0.8921

Epoch 24/25
 - 3s - loss: 0.1873 - acc: 0.9461 - val_loss: 0.3259 - val_acc: 0.8890

Epoch 25/25
 - 3s - loss: 0.2018 - acc: 0.9459 - val_loss: 0.3680 - val_acc: 0.8789

Train accuracy
0.9581066376496191
Test accuracy:
0.8788598574821853
_________________________________________________________________
Model: "sequential_32"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_63 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_64 (Conv1D)           (None, 118, 32)           6304
_________________________________________________________________
dropout_32 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_32 (MaxPooling (None, 39, 32)            0
```

```
_________________________________________________________________
flatten_32 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_63 (Dense)             (None, 32)                39968
_________________________________________________________________
dense_64 (Dense)             (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 0.6991 - acc: 0.8585 - val_loss: 0.6171 - val_acc: 0.8972

Epoch 2/25
 - 2s - loss: 0.4009 - acc: 0.9442 - val_loss: 0.5531 - val_acc: 0.8890

Epoch 3/25
 - 3s - loss: 0.3156 - acc: 0.9528 - val_loss: 0.4691 - val_acc: 0.9230

Epoch 4/25
 - 3s - loss: 0.2870 - acc: 0.9527 - val_loss: 0.4002 - val_acc: 0.9192

Epoch 5/25
 - 4s - loss: 0.2308 - acc: 0.9540 - val_loss: 0.3513 - val_acc: 0.9237

Epoch 6/25
 - 4s - loss: 0.1946 - acc: 0.9588 - val_loss: 0.3757 - val_acc: 0.8996

Epoch 7/25
 - 3s - loss: 0.1767 - acc: 0.9610 - val_loss: 0.4094 - val_acc: 0.9101

Epoch 8/25
 - 4s - loss: 0.1644 - acc: 0.9603 - val_loss: 0.3553 - val_acc: 0.9148

Epoch 9/25
 - 4s - loss: 0.1683 - acc: 0.9573 - val_loss: 0.3891 - val_acc: 0.9013

Epoch 10/25
 - 3s - loss: 0.1658 - acc: 0.9557 - val_loss: 0.3295 - val_acc: 0.9148

Epoch 11/25
 - 2s - loss: 0.1327 - acc: 0.9635 - val_loss: 0.3179 - val_acc: 0.9108

Epoch 12/25
 - 3s - loss: 0.1466 - acc: 0.9569 - val_loss: 0.3538 - val_acc: 0.9091

Epoch 13/25
 - 3s - loss: 0.1369 - acc: 0.9626 - val_loss: 0.3186 - val_acc: 0.9199

Epoch 14/25
 - 3s - loss: 0.1225 - acc: 0.9648 - val_loss: 0.3063 - val_acc: 0.9152

Epoch 15/25
 - 3s - loss: 0.1316 - acc: 0.9604 - val_loss: 0.3004 - val_acc: 0.9240

Epoch 16/25
 - 3s - loss: 0.1278 - acc: 0.9581 - val_loss: 0.2889 - val_acc: 0.9308

Epoch 17/25
 - 3s - loss: 0.1344 - acc: 0.9599 - val_loss: 0.2784 - val_acc: 0.9332

Epoch 18/25
 - 4s - loss: 0.1121 - acc: 0.9635 - val_loss: 0.3127 - val_acc: 0.9192

Epoch 19/25
 - 4s - loss: 0.1083 - acc: 0.9668 - val_loss: 0.3258 - val_acc: 0.9053

Epoch 20/25
 - 4s - loss: 0.1391 - acc: 0.9570 - val_loss: 0.2630 - val_acc: 0.9298

Epoch 21/25
 - 3s - loss: 0.1112 - acc: 0.9640 - val_loss: 0.2957 - val_acc: 0.9162

Epoch 22/25
 - 3s - loss: 0.1155 - acc: 0.9650 - val_loss: 0.2902 - val_acc: 0.9060
```

```
 - 3s - loss: 0.1155 - acc: 0.9650 - val_loss: 0.2892 - val_acc: 0.9060

Epoch 23/25
 - 4s - loss: 0.1113 - acc: 0.9644 - val_loss: 0.2904 - val_acc: 0.9182

Epoch 24/25
 - 4s - loss: 0.1039 - acc: 0.9668 - val_loss: 0.2868 - val_acc: 0.9247

Epoch 25/25
 - 5s - loss: 0.1012 - acc: 0.9695 - val_loss: 0.2663 - val_acc: 0.9253

Train accuracy
0.9725244831338411
Test accuracy:
0.9253478113335596
_________________________________________________________________________________
Model: "sequential_33"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_65 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_66 (Conv1D)           (None, 120, 32)           4512
_________________________________________________________________
dropout_33 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_33 (MaxPooling (None, 60, 32)            0
_________________________________________________________________
flatten_33 (Flatten)         (None, 1920)              0
_________________________________________________________________
dense_65 (Dense)             (None, 32)                61472
_________________________________________________________________
dense_66 (Dense)             (None, 6)                 198
=================================================================
Total params: 67,470
Trainable params: 67,470
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 25.1398 - acc: 0.7640 - val_loss: 1.0693 - val_acc: 0.7513

Epoch 2/25
 - 2s - loss: 0.6314 - acc: 0.8487 - val_loss: 0.8420 - val_acc: 0.7631

Epoch 3/25
 - 3s - loss: 0.5324 - acc: 0.8698 - val_loss: 0.7156 - val_acc: 0.8463

Epoch 4/25
 - 3s - loss: 0.4987 - acc: 0.8766 - val_loss: 0.7198 - val_acc: 0.8324

Epoch 5/25
 - 3s - loss: 0.4689 - acc: 0.8784 - val_loss: 0.6233 - val_acc: 0.8629

Epoch 6/25
 - 4s - loss: 0.4245 - acc: 0.8950 - val_loss: 0.6348 - val_acc: 0.8375

Epoch 7/25
 - 4s - loss: 0.4120 - acc: 0.8954 - val_loss: 0.5529 - val_acc: 0.8694

Epoch 8/25
 - 2s - loss: 0.4082 - acc: 0.8932 - val_loss: 0.6029 - val_acc: 0.8205

Epoch 9/25
 - 3s - loss: 0.3867 - acc: 0.8999 - val_loss: 0.5665 - val_acc: 0.8157

Epoch 10/25
 - 3s - loss: 0.3981 - acc: 0.8965 - val_loss: 0.7761 - val_acc: 0.7706

Epoch 11/25
 - 3s - loss: 0.3679 - acc: 0.9074 - val_loss: 0.5236 - val_acc: 0.8707

Epoch 12/25
 - 3s - loss: 0.3629 - acc: 0.9075 - val_loss: 0.5654 - val_acc: 0.8531

Epoch 13/25
 - 4s - loss: 0.3576 - acc: 0.9070 - val_loss: 0.5157 - val_acc: 0.8517
```

```
 - 4s - loss: 0.3576 - acc: 0.9072 - val_loss: 0.5157 - val_acc: 0.8517

Epoch 14/25
 - 2s - loss: 0.3427 - acc: 0.9121 - val_loss: 0.4690 - val_acc: 0.8873

Epoch 15/25
 - 3s - loss: 0.3590 - acc: 0.9042 - val_loss: 0.5016 - val_acc: 0.8575

Epoch 16/25
 - 3s - loss: 0.3342 - acc: 0.9125 - val_loss: 0.4811 - val_acc: 0.8616

Epoch 17/25
 - 2s - loss: 0.3325 - acc: 0.9144 - val_loss: 0.5207 - val_acc: 0.8493

Epoch 18/25
 - 3s - loss: 0.3346 - acc: 0.9124 - val_loss: 0.4302 - val_acc: 0.8897

Epoch 19/25
 - 2s - loss: 0.3406 - acc: 0.9105 - val_loss: 0.4441 - val_acc: 0.8823

Epoch 20/25
 - 3s - loss: 0.3140 - acc: 0.9174 - val_loss: 0.4423 - val_acc: 0.8761

Epoch 21/25
 - 4s - loss: 0.3229 - acc: 0.9154 - val_loss: 0.6688 - val_acc: 0.7920

Epoch 22/25
 - 4s - loss: 0.3259 - acc: 0.9166 - val_loss: 0.4087 - val_acc: 0.8853

Epoch 23/25
 - 2s - loss: 0.3034 - acc: 0.9237 - val_loss: 0.4064 - val_acc: 0.8744

Epoch 24/25
 - 2s - loss: 0.3124 - acc: 0.9233 - val_loss: 0.4610 - val_acc: 0.8476

Epoch 25/25
 - 2s - loss: 0.3109 - acc: 0.9172 - val_loss: 0.4263 - val_acc: 0.8867

Train accuracy
0.9076441784548422
Test accuracy:
0.8866644044791313
--------------------------------------------------------------------------------
Model: "sequential_34"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_67 (Conv1D)           (None, 126, 28)           784
_________________________________________________________________
conv1d_68 (Conv1D)           (None, 120, 32)           6304
_________________________________________________________________
dropout_34 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_34 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_34 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_67 (Dense)             (None, 32)                40992
_________________________________________________________________
dense_68 (Dense)             (None, 6)                 198
=================================================================
Total params: 48,278
Trainable params: 48,278
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 10.4492 - acc: 0.7743 - val_loss: 1.6397 - val_acc: 0.7774

Epoch 2/25
 - 3s - loss: 0.7276 - acc: 0.8736 - val_loss: 0.8218 - val_acc: 0.8225

Epoch 3/25
 - 3s - loss: 0.4623 - acc: 0.8938 - val_loss: 0.6653 - val_acc: 0.8548

Epoch 4/25
```

```
 - 4s - loss: 0.4245 - acc: 0.8984 - val_loss: 0.6561 - val_acc: 0.8548

Epoch 5/25
 - 4s - loss: 0.3884 - acc: 0.9089 - val_loss: 0.5819 - val_acc: 0.8565

Epoch 6/25
 - 3s - loss: 0.3521 - acc: 0.9158 - val_loss: 0.6182 - val_acc: 0.8005

Epoch 7/25
 - 2s - loss: 0.3380 - acc: 0.9215 - val_loss: 0.5366 - val_acc: 0.8697

Epoch 8/25
 - 2s - loss: 0.3206 - acc: 0.9219 - val_loss: 0.5330 - val_acc: 0.8812

Epoch 9/25
 - 3s - loss: 0.2990 - acc: 0.9304 - val_loss: 0.4997 - val_acc: 0.8537

Epoch 10/25
 - 2s - loss: 0.3000 - acc: 0.9248 - val_loss: 0.4461 - val_acc: 0.8880

Epoch 11/25
 - 3s - loss: 0.2765 - acc: 0.9328 - val_loss: 0.4236 - val_acc: 0.8938

Epoch 12/25
 - 2s - loss: 0.2796 - acc: 0.9300 - val_loss: 0.5526 - val_acc: 0.8358

Epoch 13/25
 - 3s - loss: 0.2827 - acc: 0.9274 - val_loss: 0.4313 - val_acc: 0.8938

Epoch 14/25
 - 3s - loss: 0.2637 - acc: 0.9344 - val_loss: 0.4797 - val_acc: 0.8690

Epoch 15/25
 - 2s - loss: 0.2756 - acc: 0.9268 - val_loss: 0.4596 - val_acc: 0.8721

Epoch 16/25
 - 3s - loss: 0.2583 - acc: 0.9304 - val_loss: 0.4345 - val_acc: 0.8870

Epoch 17/25
 - 3s - loss: 0.2519 - acc: 0.9348 - val_loss: 0.4271 - val_acc: 0.8687

Epoch 18/25
 - 3s - loss: 0.2435 - acc: 0.9344 - val_loss: 0.4838 - val_acc: 0.8626

Epoch 19/25
 - 3s - loss: 0.2416 - acc: 0.9325 - val_loss: 0.4457 - val_acc: 0.8931

Epoch 20/25
 - 3s - loss: 0.2360 - acc: 0.9370 - val_loss: 0.4359 - val_acc: 0.8772

Epoch 21/25
 - 3s - loss: 0.2410 - acc: 0.9343 - val_loss: 0.4470 - val_acc: 0.8660

Epoch 22/25
 - 2s - loss: 0.2236 - acc: 0.9391 - val_loss: 0.4644 - val_acc: 0.8775

Epoch 23/25
 - 3s - loss: 0.2297 - acc: 0.9357 - val_loss: 0.4225 - val_acc: 0.8823

Epoch 24/25
 - 2s - loss: 0.2323 - acc: 0.9359 - val_loss: 0.4716 - val_acc: 0.8252

Epoch 25/25
 - 2s - loss: 0.2251 - acc: 0.9361 - val_loss: 0.4169 - val_acc: 0.8924

Train accuracy
0.9349836779107725
Test accuracy:
0.8924329826942654
---------------------------------------------------------------------------------
Model: "sequential_35"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_69 (Conv1D)           (None, 122, 28)           1792
_________________________________________________________________
conv1d_70 (Conv1D)           (None, 116, 32)           6304
```

```
_________________________________________________________________
dropout_35 (Dropout)         (None, 116, 32)           0
_________________________________________________________________
max_pooling1d_35 (MaxPooling (None, 38, 32)            0
_________________________________________________________________
flatten_35 (Flatten)         (None, 1216)              0
_________________________________________________________________
dense_69 (Dense)             (None, 32)                38944
_________________________________________________________________
dense_70 (Dense)             (None, 6)                 198
=================================================================
Total params: 47,238
Trainable params: 47,238
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 6.9392 - acc: 0.8356 - val_loss: 0.7787 - val_acc: 0.8263

Epoch 2/25
 - 2s - loss: 0.4590 - acc: 0.9038 - val_loss: 0.6366 - val_acc: 0.8714

Epoch 3/25
 - 2s - loss: 0.3700 - acc: 0.9236 - val_loss: 0.5867 - val_acc: 0.8839

Epoch 4/25
 - 2s - loss: 0.3356 - acc: 0.9240 - val_loss: 0.5975 - val_acc: 0.8609

Epoch 5/25
 - 3s - loss: 0.3229 - acc: 0.9293 - val_loss: 0.4910 - val_acc: 0.8761

Epoch 6/25
 - 3s - loss: 0.2883 - acc: 0.9329 - val_loss: 0.5683 - val_acc: 0.8195

Epoch 7/25
 - 2s - loss: 0.2921 - acc: 0.9321 - val_loss: 0.4617 - val_acc: 0.8935

Epoch 8/25
 - 2s - loss: 0.2720 - acc: 0.9342 - val_loss: 0.4284 - val_acc: 0.9006

Epoch 9/25
 - 2s - loss: 0.2697 - acc: 0.9393 - val_loss: 0.4736 - val_acc: 0.8687

Epoch 10/25
 - 2s - loss: 0.2541 - acc: 0.9363 - val_loss: 0.5681 - val_acc: 0.8137

Epoch 11/25
 - 2s - loss: 0.2704 - acc: 0.9324 - val_loss: 0.3844 - val_acc: 0.8996

Epoch 12/25
 - 3s - loss: 0.2305 - acc: 0.9415 - val_loss: 0.4226 - val_acc: 0.8792

Epoch 13/25
 - 3s - loss: 0.2641 - acc: 0.9348 - val_loss: 0.4708 - val_acc: 0.8816

Epoch 14/25
 - 2s - loss: 0.2434 - acc: 0.9391 - val_loss: 0.3601 - val_acc: 0.9121

Epoch 15/25
 - 2s - loss: 0.2269 - acc: 0.9406 - val_loss: 0.3845 - val_acc: 0.9026

Epoch 16/25
 - 2s - loss: 0.2367 - acc: 0.9366 - val_loss: 0.4337 - val_acc: 0.8985

Epoch 17/25
 - 2s - loss: 0.2321 - acc: 0.9384 - val_loss: 0.3973 - val_acc: 0.8962

Epoch 18/25
 - 2s - loss: 0.2248 - acc: 0.9414 - val_loss: 0.3871 - val_acc: 0.8884

Epoch 19/25
 - 3s - loss: 0.2529 - acc: 0.9344 - val_loss: 0.4113 - val_acc: 0.8931

Epoch 20/25
 - 3s - loss: 0.2363 - acc: 0.9382 - val_loss: 0.3721 - val_acc: 0.9070
```

```
Epoch 21/25
 - 2s - loss: 0.2141 - acc: 0.9433 - val_loss: 0.3687 - val_acc: 0.8955

Epoch 22/25
 - 2s - loss: 0.2326 - acc: 0.9392 - val_loss: 0.3992 - val_acc: 0.8839

Epoch 23/25
 - 3s - loss: 0.2221 - acc: 0.9421 - val_loss: 0.3462 - val_acc: 0.9053

Epoch 24/25
 - 3s - loss: 0.2096 - acc: 0.9453 - val_loss: 0.3499 - val_acc: 0.9040

Epoch 25/25
 - 2s - loss: 0.2242 - acc: 0.9412 - val_loss: 0.4128 - val_acc: 0.8972

Train accuracy
0.9413764961915125
Test accuracy:
0.8971835765184933
--------------------------------------------------------------------------------
Model: "sequential_36"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_71 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_72 (Conv1D)           (None, 118, 32)           6304
_________________________________________________________________
dropout_36 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_36 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_36 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_71 (Dense)             (None, 32)                39968
_________________________________________________________________
dense_72 (Dense)             (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 2.6755 - acc: 0.8406 - val_loss: 0.8586 - val_acc: 0.8337

Epoch 2/25
 - 3s - loss: 0.4301 - acc: 0.9272 - val_loss: 0.5783 - val_acc: 0.8921

Epoch 3/25
 - 3s - loss: 0.3029 - acc: 0.9387 - val_loss: 0.4688 - val_acc: 0.9196

Epoch 4/25
 - 2s - loss: 0.2968 - acc: 0.9325 - val_loss: 0.4230 - val_acc: 0.9175

Epoch 5/25
 - 3s - loss: 0.2604 - acc: 0.9362 - val_loss: 0.4214 - val_acc: 0.9080

Epoch 6/25
 - 2s - loss: 0.2395 - acc: 0.9396 - val_loss: 0.4474 - val_acc: 0.8426

Epoch 7/25
 - 2s - loss: 0.2265 - acc: 0.9455 - val_loss: 0.3779 - val_acc: 0.9063

Epoch 8/25
 - 2s - loss: 0.2109 - acc: 0.9445 - val_loss: 0.5226 - val_acc: 0.8551

Epoch 9/25
 - 2s - loss: 0.2225 - acc: 0.9433 - val_loss: 0.3516 - val_acc: 0.9104

Epoch 10/25
 - 3s - loss: 0.2346 - acc: 0.9392 - val_loss: 0.3332 - val_acc: 0.9043

Epoch 11/25
 - 2s - loss: 0.2098 - acc: 0.9410 - val_loss: 0.3329 - val_acc: 0.9158
```

```
Epoch 12/25
 - 2s - loss: 0.1992 - acc: 0.9457 - val_loss: 0.3368 - val_acc: 0.9091

Epoch 13/25
 - 2s - loss: 0.2046 - acc: 0.9455 - val_loss: 0.3389 - val_acc: 0.9084

Epoch 14/25
 - 2s - loss: 0.1997 - acc: 0.9475 - val_loss: 0.3912 - val_acc: 0.8833

Epoch 15/25
 - 2s - loss: 0.1995 - acc: 0.9465 - val_loss: 0.3285 - val_acc: 0.9121

Epoch 16/25
 - 2s - loss: 0.1883 - acc: 0.9480 - val_loss: 0.3620 - val_acc: 0.8972

Epoch 17/25
 - 2s - loss: 0.1931 - acc: 0.9465 - val_loss: 0.3578 - val_acc: 0.8758

Epoch 18/25
 - 2s - loss: 0.1919 - acc: 0.9482 - val_loss: 0.3003 - val_acc: 0.9080

Epoch 19/25
 - 2s - loss: 0.1933 - acc: 0.9445 - val_loss: 0.3041 - val_acc: 0.9118

Epoch 20/25
 - 2s - loss: 0.2084 - acc: 0.9449 - val_loss: 0.3782 - val_acc: 0.8948

Epoch 21/25
 - 3s - loss: 0.1704 - acc: 0.9499 - val_loss: 0.3374 - val_acc: 0.9013

Epoch 22/25
 - 2s - loss: 0.1975 - acc: 0.9450 - val_loss: 0.3159 - val_acc: 0.9097

Epoch 23/25
 - 2s - loss: 0.1841 - acc: 0.9457 - val_loss: 0.2977 - val_acc: 0.9131

Epoch 24/25
 - 2s - loss: 0.1760 - acc: 0.9506 - val_loss: 0.3171 - val_acc: 0.8962

Epoch 25/25
 - 2s - loss: 0.1924 - acc: 0.9449 - val_loss: 0.3299 - val_acc: 0.9023

Train accuracy
0.948721436343852
Test accuracy:
0.9022734984730234
--------------------------------------------------------------------------------
Model: "sequential_37"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_73 (Conv1D)           (None, 122, 28)           1792
_________________________________________________________________
conv1d_74 (Conv1D)           (None, 118, 32)           4512
_________________________________________________________________
dropout_37 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_37 (MaxPooling (None, 59, 32)            0
_________________________________________________________________
flatten_37 (Flatten)         (None, 1888)              0
_________________________________________________________________
dense_73 (Dense)             (None, 32)                60448
_________________________________________________________________
dense_74 (Dense)             (None, 6)                 198
=================================================================
Total params: 66,950
Trainable params: 66,950
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 3.6669 - acc: 0.8226 - val_loss: 0.5531 - val_acc: 0.8870

Epoch 2/25
 - 2s - loss: 0.3621 - acc: 0.9095 - val_loss: 0.9435 - val_acc: 0.7319
```

```
Epoch 3/25
 - 2s - loss: 0.3052 - acc: 0.9214 - val_loss: 0.4059 - val_acc: 0.9060

Epoch 4/25
 - 3s - loss: 0.2743 - acc: 0.9253 - val_loss: 0.6302 - val_acc: 0.7771

Epoch 5/25
 - 3s - loss: 0.2654 - acc: 0.9294 - val_loss: 0.4176 - val_acc: 0.8799

Epoch 6/25
 - 2s - loss: 0.2567 - acc: 0.9293 - val_loss: 0.4087 - val_acc: 0.8890

Epoch 7/25
 - 2s - loss: 0.2523 - acc: 0.9325 - val_loss: 0.3261 - val_acc: 0.9091

Epoch 8/25
 - 2s - loss: 0.2522 - acc: 0.9298 - val_loss: 0.3840 - val_acc: 0.8945

Epoch 9/25
 - 2s - loss: 0.2485 - acc: 0.9346 - val_loss: 0.3166 - val_acc: 0.9169

Epoch 10/25
 - 2s - loss: 0.2451 - acc: 0.9320 - val_loss: 0.3481 - val_acc: 0.9043

Epoch 11/25
 - 2s - loss: 0.2488 - acc: 0.9279 - val_loss: 0.3154 - val_acc: 0.9152

Epoch 12/25
 - 2s - loss: 0.2428 - acc: 0.9328 - val_loss: 0.3932 - val_acc: 0.9009

Epoch 13/25
 - 2s - loss: 0.2455 - acc: 0.9304 - val_loss: 0.3061 - val_acc: 0.9006

Epoch 14/25
 - 3s - loss: 0.2440 - acc: 0.9324 - val_loss: 0.5818 - val_acc: 0.8286

Epoch 15/25
 - 2s - loss: 0.2429 - acc: 0.9323 - val_loss: 0.3555 - val_acc: 0.9182

Epoch 16/25
 - 2s - loss: 0.2408 - acc: 0.9336 - val_loss: 0.3947 - val_acc: 0.8683

Epoch 17/25
 - 2s - loss: 0.2391 - acc: 0.9323 - val_loss: 0.3694 - val_acc: 0.8958

Epoch 18/25
 - 2s - loss: 0.2426 - acc: 0.9314 - val_loss: 0.4134 - val_acc: 0.8799

Epoch 19/25
 - 2s - loss: 0.2422 - acc: 0.9324 - val_loss: 0.3544 - val_acc: 0.9033

Epoch 20/25
 - 2s - loss: 0.2325 - acc: 0.9340 - val_loss: 0.4485 - val_acc: 0.8755

Epoch 21/25
 - 2s - loss: 0.2325 - acc: 0.9346 - val_loss: 0.5588 - val_acc: 0.8381

Epoch 22/25
 - 2s - loss: 0.2535 - acc: 0.9334 - val_loss: 0.3187 - val_acc: 0.8958

Epoch 23/25
 - 2s - loss: 0.2379 - acc: 0.9312 - val_loss: 0.3246 - val_acc: 0.8989

Epoch 24/25
 - 2s - loss: 0.2466 - acc: 0.9310 - val_loss: 0.3696 - val_acc: 0.8673

Epoch 25/25
 - 2s - loss: 0.2416 - acc: 0.9321 - val_loss: 0.4624 - val_acc: 0.8578

Train accuracy
0.8898258976500494
Test accuracy:
0.8578215134034611
_________________________________________________________________________________
Model: "sequential_38"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
```

```
=================================================================
conv1d_75 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_76 (Conv1D)           (None, 118, 16)           3152
_________________________________________________________________
dropout_38 (Dropout)         (None, 118, 16)           0
_________________________________________________________________
max_pooling1d_38 (MaxPooling (None, 39, 16)            0
_________________________________________________________________
flatten_38 (Flatten)         (None, 624)               0
_________________________________________________________________
dense_75 (Dense)             (None, 32)                20000
_________________________________________________________________
dense_76 (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: 14.8683 - acc: 0.7361 - val_loss: 1.0473 - val_acc: 0.7869

Epoch 2/25
 - 2s - loss: 0.6110 - acc: 0.8524 - val_loss: 0.8933 - val_acc: 0.7794

Epoch 3/25
 - 3s - loss: 0.5306 - acc: 0.8736 - val_loss: 0.7383 - val_acc: 0.8470

Epoch 4/25
 - 2s - loss: 0.4995 - acc: 0.8739 - val_loss: 0.7464 - val_acc: 0.8375

Epoch 5/25
 - 2s - loss: 0.4685 - acc: 0.8818 - val_loss: 0.7286 - val_acc: 0.7991

Epoch 6/25
 - 3s - loss: 0.4592 - acc: 0.8830 - val_loss: 0.7015 - val_acc: 0.8039

Epoch 7/25
 - 2s - loss: 0.4172 - acc: 0.8970 - val_loss: 0.6634 - val_acc: 0.8317

Epoch 8/25
 - 2s - loss: 0.4032 - acc: 0.8973 - val_loss: 0.7373 - val_acc: 0.8093

Epoch 9/25
 - 2s - loss: 0.3941 - acc: 0.8995 - val_loss: 0.6236 - val_acc: 0.8283

Epoch 10/25
 - 2s - loss: 0.4041 - acc: 0.9003 - val_loss: 0.7531 - val_acc: 0.7825

Epoch 11/25
 - 2s - loss: 0.3785 - acc: 0.9030 - val_loss: 0.5713 - val_acc: 0.8738

Epoch 12/25
 - 2s - loss: 0.3686 - acc: 0.9072 - val_loss: 0.7260 - val_acc: 0.7825

Epoch 13/25
 - 2s - loss: 0.3749 - acc: 0.9074 - val_loss: 0.5420 - val_acc: 0.8663

Epoch 14/25
 - 2s - loss: 0.3594 - acc: 0.9095 - val_loss: 0.5846 - val_acc: 0.8307

Epoch 15/25
 - 2s - loss: 0.3531 - acc: 0.9101 - val_loss: 0.5447 - val_acc: 0.8666

Epoch 16/25
 - 2s - loss: 0.3418 - acc: 0.9154 - val_loss: 0.5394 - val_acc: 0.8331

Epoch 17/25
 - 2s - loss: 0.3378 - acc: 0.9140 - val_loss: 0.4835 - val_acc: 0.8918

Epoch 18/25
 - 2s - loss: 0.3402 - acc: 0.9150 - val_loss: 0.4828 - val_acc: 0.8833

Epoch 19/25
 - 2s - loss: 0.3421 - acc: 0.9072 - val_loss: 0.4938 - val_acc: 0.8785
```

```
Epoch 20/25
 - 2s - loss: 0.3330 - acc: 0.9177 - val_loss: 0.5119 - val_acc: 0.8626

Epoch 21/25
 - 2s - loss: 0.3139 - acc: 0.9202 - val_loss: 0.5649 - val_acc: 0.8483

Epoch 22/25
 - 3s - loss: 0.2951 - acc: 0.9280 - val_loss: 0.4642 - val_acc: 0.8877

Epoch 23/25
 - 2s - loss: 0.3023 - acc: 0.9217 - val_loss: 0.5154 - val_acc: 0.8470

Epoch 24/25
 - 3s - loss: 0.3015 - acc: 0.9203 - val_loss: 0.6501 - val_acc: 0.7984

Epoch 25/25
 - 4s - loss: 0.3152 - acc: 0.9203 - val_loss: 0.5039 - val_acc: 0.8643

Train accuracy
0.9022034820457019
Test accuracy:
0.8642687478791992
--------------------------------------------------------------------------------
Model: "sequential_39"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_77 (Conv1D)           (None, 126, 42)           1176
_________________________________________________________________
conv1d_78 (Conv1D)           (None, 120, 32)           9440
_________________________________________________________________
dropout_39 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_39 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_39 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_77 (Dense)             (None, 32)                40992
_________________________________________________________________
dense_78 (Dense)             (None, 6)                 198
=================================================================
Total params: 51,806
Trainable params: 51,806
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 17.1090 - acc: 0.6800 - val_loss: 0.9996 - val_acc: 0.6593

Epoch 2/25
 - 2s - loss: 0.6696 - acc: 0.7788 - val_loss: 1.0616 - val_acc: 0.5803

Epoch 3/25
 - 2s - loss: 0.6211 - acc: 0.8001 - val_loss: 0.7934 - val_acc: 0.7981

Epoch 4/25
 - 2s - loss: 0.5903 - acc: 0.8205 - val_loss: 0.8088 - val_acc: 0.7557

Epoch 5/25
 - 2s - loss: 0.5640 - acc: 0.8338 - val_loss: 0.8799 - val_acc: 0.6770

Epoch 6/25
 - 3s - loss: 0.5411 - acc: 0.8466 - val_loss: 0.8134 - val_acc: 0.7635

Epoch 7/25
 - 2s - loss: 0.5221 - acc: 0.8564 - val_loss: 0.6490 - val_acc: 0.8588

Epoch 8/25
 - 2s - loss: 0.5099 - acc: 0.8613 - val_loss: 0.8618 - val_acc: 0.6851

Epoch 9/25
 - 3s - loss: 0.5027 - acc: 0.8579 - val_loss: 0.9580 - val_acc: 0.6461

Epoch 10/25
 - 3s - loss: 0.4908 - acc: 0.8685 - val loss: 0.6356 - val acc: 0.8371
```

```
Epoch 11/25
 - 2s - loss: 0.4709 - acc: 0.8726 - val_loss: 1.0376 - val_acc: 0.6607

Epoch 12/25
 - 2s - loss: 0.4753 - acc: 0.8721 - val_loss: 0.7318 - val_acc: 0.8198

Epoch 13/25
 - 3s - loss: 0.4588 - acc: 0.8745 - val_loss: 0.6937 - val_acc: 0.8436

Epoch 14/25
 - 3s - loss: 0.4600 - acc: 0.8723 - val_loss: 0.7353 - val_acc: 0.7984

Epoch 15/25
 - 3s - loss: 0.4538 - acc: 0.8840 - val_loss: 0.8450 - val_acc: 0.7275

Epoch 16/25
 - 2s - loss: 0.4577 - acc: 0.8754 - val_loss: 0.7354 - val_acc: 0.7299

Epoch 17/25
 - 3s - loss: 0.4409 - acc: 0.8808 - val_loss: 0.6092 - val_acc: 0.8388

Epoch 18/25
 - 3s - loss: 0.4541 - acc: 0.8802 - val_loss: 0.7945 - val_acc: 0.7642

Epoch 19/25
 - 2s - loss: 0.4323 - acc: 0.8815 - val_loss: 1.1086 - val_acc: 0.6535

Epoch 20/25
 - 2s - loss: 0.4376 - acc: 0.8849 - val_loss: 0.7506 - val_acc: 0.7520

Epoch 21/25
 - 2s - loss: 0.4232 - acc: 0.8866 - val_loss: 0.9306 - val_acc: 0.6698

Epoch 22/25
 - 2s - loss: 0.4227 - acc: 0.8915 - val_loss: 0.6888 - val_acc: 0.7608

Epoch 23/25
 - 2s - loss: 0.4141 - acc: 0.8940 - val_loss: 0.7158 - val_acc: 0.7757

Epoch 24/25
 - 3s - loss: 0.4085 - acc: 0.8973 - val_loss: 0.8658 - val_acc: 0.7160

Epoch 25/25
 - 3s - loss: 0.3995 - acc: 0.8980 - val_loss: 1.8566 - val_acc: 0.4656

Train accuracy
0.509385201240909
Test accuracy:
0.46555819479457233
--------------------------------------------------------------------------------
Model: "sequential_40"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_79 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_80 (Conv1D)           (None, 120, 32)           4512
_________________________________________________________________
dropout_40 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_40 (MaxPooling (None, 60, 32)            0
_________________________________________________________________
flatten_40 (Flatten)         (None, 1920)              0
_________________________________________________________________
dense_79 (Dense)             (None, 32)                61472
_________________________________________________________________
dense_80 (Dense)             (None, 6)                 198
=================================================================
Total params: 67,470
Trainable params: 67,470
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 3s - loss: 11.8167 - acc: 0.8229 - val loss: 0.7699 - val acc: 0.7808
```

```
Epoch 2/35
 - 3s - loss: 0.4935 - acc: 0.8847 - val_loss: 0.6631 - val_acc: 0.8032

Epoch 3/35
 - 4s - loss: 0.4043 - acc: 0.9011 - val_loss: 0.4724 - val_acc: 0.8948

Epoch 4/35
 - 5s - loss: 0.3709 - acc: 0.9090 - val_loss: 0.4519 - val_acc: 0.8880

Epoch 5/35
 - 5s - loss: 0.3551 - acc: 0.9102 - val_loss: 0.4280 - val_acc: 0.8992

Epoch 6/35
 - 5s - loss: 0.3238 - acc: 0.9187 - val_loss: 0.4549 - val_acc: 0.8653

Epoch 7/35
 - 3s - loss: 0.3085 - acc: 0.9212 - val_loss: 0.4139 - val_acc: 0.8775

Epoch 8/35
 - 4s - loss: 0.2999 - acc: 0.9232 - val_loss: 0.4042 - val_acc: 0.8816

Epoch 9/35
 - 3s - loss: 0.2992 - acc: 0.9246 - val_loss: 0.4059 - val_acc: 0.8673

Epoch 10/35
 - 2s - loss: 0.2889 - acc: 0.9237 - val_loss: 0.5541 - val_acc: 0.8198

Epoch 11/35
 - 3s - loss: 0.3003 - acc: 0.9238 - val_loss: 0.3624 - val_acc: 0.9006

Epoch 12/35
 - 4s - loss: 0.2740 - acc: 0.9283 - val_loss: 0.4064 - val_acc: 0.8921

Epoch 13/35
 - 4s - loss: 0.2757 - acc: 0.9266 - val_loss: 0.3881 - val_acc: 0.8707

Epoch 14/35
 - 5s - loss: 0.3080 - acc: 0.9215 - val_loss: 0.3662 - val_acc: 0.8884

Epoch 15/35
 - 5s - loss: 0.2699 - acc: 0.9293 - val_loss: 0.4502 - val_acc: 0.8273

Epoch 16/35
 - 4s - loss: 0.2962 - acc: 0.9193 - val_loss: 0.3378 - val_acc: 0.8992

Epoch 17/35
 - 4s - loss: 0.2847 - acc: 0.9267 - val_loss: 0.3593 - val_acc: 0.8965

Epoch 18/35
 - 4s - loss: 0.2717 - acc: 0.9276 - val_loss: 0.4683 - val_acc: 0.8480

Epoch 19/35
 - 3s - loss: 0.2760 - acc: 0.9251 - val_loss: 0.3426 - val_acc: 0.9131

Epoch 20/35
 - 5s - loss: 0.2762 - acc: 0.9246 - val_loss: 0.3571 - val_acc: 0.8853

Epoch 21/35
 - 3s - loss: 0.2765 - acc: 0.9270 - val_loss: 0.3830 - val_acc: 0.8751

Epoch 22/35
 - 3s - loss: 0.2644 - acc: 0.9297 - val_loss: 0.3582 - val_acc: 0.8999

Epoch 23/35
 - 4s - loss: 0.2766 - acc: 0.9301 - val_loss: 0.5284 - val_acc: 0.8595

Epoch 24/35
 - 4s - loss: 0.2942 - acc: 0.9282 - val_loss: 0.4440 - val_acc: 0.8592

Epoch 25/35
 - 3s - loss: 0.2722 - acc: 0.9264 - val_loss: 0.3884 - val_acc: 0.8765

Epoch 26/35
 - 3s - loss: 0.2715 - acc: 0.9275 - val_loss: 0.3422 - val_acc: 0.9036

Epoch 27/35
```

```
 - 4s - loss: 0.2678 - acc: 0.9308 - val_loss: 0.3564 - val_acc: 0.8809

Epoch 28/35
 - 3s - loss: 0.2573 - acc: 0.9317 - val_loss: 0.3392 - val_acc: 0.9002

Epoch 29/35
 - 5s - loss: 0.2688 - acc: 0.9313 - val_loss: 0.3873 - val_acc: 0.8663

Epoch 30/35
 - 5s - loss: 0.2444 - acc: 0.9323 - val_loss: 0.3327 - val_acc: 0.8887

Epoch 31/35
 - 5s - loss: 0.2716 - acc: 0.9293 - val_loss: 0.3572 - val_acc: 0.8928

Epoch 32/35
 - 4s - loss: 0.2577 - acc: 0.9320 - val_loss: 0.4861 - val_acc: 0.8446

Epoch 33/35
 - 3s - loss: 0.2882 - acc: 0.9245 - val_loss: 0.3781 - val_acc: 0.8782

Epoch 34/35
 - 3s - loss: 0.2643 - acc: 0.9320 - val_loss: 0.3723 - val_acc: 0.8666

Epoch 35/35
 - 3s - loss: 0.2470 - acc: 0.9380 - val_loss: 0.4304 - val_acc: 0.8517

Train accuracy
0.9047878128400435
Test accuracy:
0.8517136070580251
_________________________________________________________________
Model: "sequential_41"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_81 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_82 (Conv1D)           (None, 118, 16)           3152
_________________________________________________________________
dropout_41 (Dropout)         (None, 118, 16)           0
_________________________________________________________________
max_pooling1d_41 (MaxPooling (None, 39, 16)            0
_________________________________________________________________
flatten_41 (Flatten)         (None, 624)               0
_________________________________________________________________
dense_81 (Dense)             (None, 32)                20000
_________________________________________________________________
dense_82 (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
 - 4s - loss: 9.0344 - acc: 0.8040 - val_loss: 0.6328 - val_acc: 0.8873

Epoch 2/30
 - 4s - loss: 0.3853 - acc: 0.9132 - val_loss: 0.6052 - val_acc: 0.8225

Epoch 3/30
 - 2s - loss: 0.3265 - acc: 0.9208 - val_loss: 0.4678 - val_acc: 0.8951

Epoch 4/30
 - 2s - loss: 0.2871 - acc: 0.9259 - val_loss: 0.4405 - val_acc: 0.8605

Epoch 5/30
 - 2s - loss: 0.2668 - acc: 0.9267 - val_loss: 0.3815 - val_acc: 0.8918

Epoch 6/30
 - 2s - loss: 0.2463 - acc: 0.9317 - val_loss: 0.5521 - val_acc: 0.8178

Epoch 7/30
 - 2s - loss: 0.2339 - acc: 0.9376 - val_loss: 0.3327 - val_acc: 0.9040

Epoch 8/30
```

Epoch 8/30
 - 3s - loss: 0.2295 - acc: 0.9359 - val_loss: 0.3842 - val_acc: 0.8958

Epoch 9/30
 - 4s - loss: 0.2169 - acc: 0.9374 - val_loss: 0.3706 - val_acc: 0.8880

Epoch 10/30
 - 4s - loss: 0.2121 - acc: 0.9388 - val_loss: 0.3514 - val_acc: 0.9030

Epoch 11/30
 - 4s - loss: 0.2005 - acc: 0.9396 - val_loss: 0.3413 - val_acc: 0.8918

Epoch 12/30
 - 4s - loss: 0.2137 - acc: 0.9351 - val_loss: 0.3598 - val_acc: 0.8982

Epoch 13/30
 - 5s - loss: 0.1995 - acc: 0.9389 - val_loss: 0.2808 - val_acc: 0.9067

Epoch 14/30
 - 5s - loss: 0.2011 - acc: 0.9407 - val_loss: 0.3418 - val_acc: 0.8911

Epoch 15/30
 - 3s - loss: 0.1922 - acc: 0.9422 - val_loss: 0.3626 - val_acc: 0.8945

Epoch 16/30
 - 2s - loss: 0.1877 - acc: 0.9404 - val_loss: 0.3289 - val_acc: 0.8894

Epoch 17/30
 - 2s - loss: 0.2010 - acc: 0.9395 - val_loss: 0.3360 - val_acc: 0.9084

Epoch 18/30
 - 2s - loss: 0.1869 - acc: 0.9429 - val_loss: 0.4212 - val_acc: 0.8778

Epoch 19/30
 - 2s - loss: 0.1828 - acc: 0.9407 - val_loss: 0.2970 - val_acc: 0.8999

Epoch 20/30
 - 2s - loss: 0.1885 - acc: 0.9397 - val_loss: 0.2971 - val_acc: 0.9101

Epoch 21/30
 - 2s - loss: 0.1824 - acc: 0.9433 - val_loss: 0.2804 - val_acc: 0.9030

Epoch 22/30
 - 2s - loss: 0.1938 - acc: 0.9426 - val_loss: 0.2829 - val_acc: 0.9094

Epoch 23/30
 - 2s - loss: 0.1760 - acc: 0.9415 - val_loss: 0.3575 - val_acc: 0.8853

Epoch 24/30
 - 2s - loss: 0.1773 - acc: 0.9427 - val_loss: 0.3356 - val_acc: 0.8931

Epoch 25/30
 - 2s - loss: 0.1865 - acc: 0.9411 - val_loss: 0.3309 - val_acc: 0.9152

Epoch 26/30
 - 2s - loss: 0.1861 - acc: 0.9425 - val_loss: 0.3140 - val_acc: 0.9084

Epoch 27/30
 - 3s - loss: 0.1785 - acc: 0.9403 - val_loss: 0.4232 - val_acc: 0.8728

Epoch 28/30
 - 2s - loss: 0.1800 - acc: 0.9430 - val_loss: 0.2779 - val_acc: 0.9087

Epoch 29/30
 - 2s - loss: 0.1795 - acc: 0.9426 - val_loss: 0.3164 - val_acc: 0.8985

Epoch 30/30
 - 2s - loss: 0.1843 - acc: 0.9427 - val_loss: 0.2932 - val_acc: 0.8999

Train accuracy
0.9416485310119695
Test accuracy:
0.8998982015609094

Model: "sequential_42"
_
Layer (type)   Output Shape   Param #
=

```
conv1d_83 (Conv1D)           (None, 122, 42)           2688
_________________________________________________________________
conv1d_84 (Conv1D)           (None, 116, 32)           9440
_________________________________________________________________
dropout_42 (Dropout)         (None, 116, 32)           0
_________________________________________________________________
max_pooling1d_42 (MaxPooling (None, 38, 32)            0
_________________________________________________________________
flatten_42 (Flatten)         (None, 1216)              0
_________________________________________________________________
dense_83 (Dense)             (None, 32)                38944
_________________________________________________________________
dense_84 (Dense)             (None, 6)                 198
=================================================================
Total params: 51,270
Trainable params: 51,270
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 5.8403 - acc: 0.7874 - val_loss: 0.7351 - val_acc: 0.8646

Epoch 2/25
 - 2s - loss: 0.4910 - acc: 0.8844 - val_loss: 0.6666 - val_acc: 0.8721

Epoch 3/25
 - 2s - loss: 0.3882 - acc: 0.9143 - val_loss: 0.5416 - val_acc: 0.8850

Epoch 4/25
 - 3s - loss: 0.3613 - acc: 0.9128 - val_loss: 0.5548 - val_acc: 0.8707

Epoch 5/25
 - 2s - loss: 0.3422 - acc: 0.9161 - val_loss: 0.5259 - val_acc: 0.8629

Epoch 6/25
 - 2s - loss: 0.3321 - acc: 0.9180 - val_loss: 0.4922 - val_acc: 0.8643

Epoch 7/25
 - 2s - loss: 0.3182 - acc: 0.9244 - val_loss: 0.5353 - val_acc: 0.8514

Epoch 8/25
 - 2s - loss: 0.2993 - acc: 0.9255 - val_loss: 0.5034 - val_acc: 0.8568

Epoch 9/25
 - 2s - loss: 0.2827 - acc: 0.9331 - val_loss: 0.4856 - val_acc: 0.8361

Epoch 10/25
 - 2s - loss: 0.3049 - acc: 0.9246 - val_loss: 0.4789 - val_acc: 0.8582

Epoch 11/25
 - 2s - loss: 0.2977 - acc: 0.9251 - val_loss: 0.4968 - val_acc: 0.8592

Epoch 12/25
 - 2s - loss: 0.2903 - acc: 0.9309 - val_loss: 0.5096 - val_acc: 0.8521

Epoch 13/25
 - 2s - loss: 0.2847 - acc: 0.9310 - val_loss: 0.5914 - val_acc: 0.8035

Epoch 14/25
 - 3s - loss: 0.2896 - acc: 0.9280 - val_loss: 0.3599 - val_acc: 0.9196

Epoch 15/25
 - 2s - loss: 0.2822 - acc: 0.9301 - val_loss: 0.5448 - val_acc: 0.8358

Epoch 16/25
 - 2s - loss: 0.2760 - acc: 0.9342 - val_loss: 0.4127 - val_acc: 0.8823

Epoch 17/25
 - 3s - loss: 0.2752 - acc: 0.9290 - val_loss: 0.5049 - val_acc: 0.8480

Epoch 18/25
 - 2s - loss: 0.2797 - acc: 0.9313 - val_loss: 0.4000 - val_acc: 0.8911

Epoch 19/25
 - 2s - loss: 0.2761 - acc: 0.9302 - val_loss: 0.4825 - val_acc: 0.8683
```

```
Epoch 20/25
 - 2s - loss: 0.3119 - acc: 0.9249 - val_loss: 0.3751 - val_acc: 0.9084

Epoch 21/25
 - 2s - loss: 0.2600 - acc: 0.9359 - val_loss: 0.4262 - val_acc: 0.8768

Epoch 22/25
 - 2s - loss: 0.2649 - acc: 0.9339 - val_loss: 0.4224 - val_acc: 0.8812

Epoch 23/25
 - 2s - loss: 0.2618 - acc: 0.9304 - val_loss: 0.3818 - val_acc: 0.8897

Epoch 24/25
 - 2s - loss: 0.2480 - acc: 0.9346 - val_loss: 0.5082 - val_acc: 0.8358

Epoch 25/25
 - 2s - loss: 0.2671 - acc: 0.9293 - val_loss: 0.5164 - val_acc: 0.8280

Train accuracy
0.8771762785636561
Test accuracy:
0.827960637936885
--------------------------------------------------------------------------------
Model: "sequential_43"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_85 (Conv1D)           (None, 126, 28)           784
_________________________________________________________________
conv1d_86 (Conv1D)           (None, 120, 24)           4728
_________________________________________________________________
dropout_43 (Dropout)         (None, 120, 24)           0
_________________________________________________________________
max_pooling1d_43 (MaxPooling (None, 60, 24)            0
_________________________________________________________________
flatten_43 (Flatten)         (None, 1440)              0
_________________________________________________________________
dense_85 (Dense)             (None, 32)                46112
_________________________________________________________________
dense_86 (Dense)             (None, 6)                 198
=================================================================
Total params: 51,822
Trainable params: 51,822
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 7.5032 - acc: 0.7738 - val_loss: 0.8148 - val_acc: 0.8032

Epoch 2/25
 - 1s - loss: 0.5377 - acc: 0.8690 - val_loss: 0.6780 - val_acc: 0.8022

Epoch 3/25
 - 1s - loss: 0.4316 - acc: 0.8968 - val_loss: 0.5366 - val_acc: 0.8951

Epoch 4/25
 - 1s - loss: 0.4089 - acc: 0.8998 - val_loss: 0.5452 - val_acc: 0.8633

Epoch 5/25
 - 1s - loss: 0.3762 - acc: 0.9078 - val_loss: 0.5289 - val_acc: 0.8772

Epoch 6/25
 - 1s - loss: 0.3349 - acc: 0.9193 - val_loss: 0.4468 - val_acc: 0.8867

Epoch 7/25
 - 1s - loss: 0.3563 - acc: 0.9157 - val_loss: 0.4778 - val_acc: 0.8561

Epoch 8/25
 - 1s - loss: 0.3115 - acc: 0.9263 - val_loss: 0.4259 - val_acc: 0.8738

Epoch 9/25
 - 1s - loss: 0.3020 - acc: 0.9268 - val_loss: 0.4164 - val_acc: 0.8897

Epoch 10/25
 - 1s - loss: 0.3099 - acc: 0.9241 - val_loss: 0.4143 - val_acc: 0.8948
```

```
Epoch 11/25
 - 1s - loss: 0.2974 - acc: 0.9270 - val_loss: 0.4622 - val_acc: 0.8524

Epoch 12/25
 - 1s - loss: 0.2927 - acc: 0.9255 - val_loss: 0.4657 - val_acc: 0.8765

Epoch 13/25
 - 1s - loss: 0.2922 - acc: 0.9278 - val_loss: 0.4305 - val_acc: 0.8867

Epoch 14/25
 - 1s - loss: 0.2850 - acc: 0.9297 - val_loss: 0.4716 - val_acc: 0.8649

Epoch 15/25
 - 1s - loss: 0.2970 - acc: 0.9280 - val_loss: 0.4349 - val_acc: 0.8697

Epoch 16/25
 - 1s - loss: 0.2902 - acc: 0.9287 - val_loss: 0.3558 - val_acc: 0.8938

Epoch 17/25
 - 1s - loss: 0.2620 - acc: 0.9324 - val_loss: 0.4939 - val_acc: 0.8527

Epoch 18/25
 - 1s - loss: 0.2492 - acc: 0.9365 - val_loss: 0.4039 - val_acc: 0.8799

Epoch 19/25
 - 1s - loss: 0.2874 - acc: 0.9264 - val_loss: 0.4220 - val_acc: 0.8697

Epoch 20/25
 - 1s - loss: 0.2599 - acc: 0.9332 - val_loss: 0.4064 - val_acc: 0.8823

Epoch 21/25
 - 1s - loss: 0.2460 - acc: 0.9331 - val_loss: 0.4580 - val_acc: 0.8500

Epoch 22/25
 - 1s - loss: 0.2544 - acc: 0.9320 - val_loss: 0.4201 - val_acc: 0.8812

Epoch 23/25
 - 1s - loss: 0.2760 - acc: 0.9251 - val_loss: 0.4239 - val_acc: 0.8901

Epoch 24/25
 - 1s - loss: 0.2632 - acc: 0.9348 - val_loss: 0.4097 - val_acc: 0.8819

Epoch 25/25
 - 1s - loss: 0.2774 - acc: 0.9278 - val_loss: 0.4693 - val_acc: 0.8633

Train accuracy
0.9175734494015234
Test accuracy:
0.8632507634882932
_________________________________________________________________________________________
Model: "sequential_44"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_87 (Conv1D)           (None, 124, 42)           1932
_________________________________________________________________
conv1d_88 (Conv1D)           (None, 120, 32)           6752
_________________________________________________________________
dropout_44 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_44 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_44 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_87 (Dense)             (None, 32)                40992
_________________________________________________________________
dense_88 (Dense)             (None, 6)                 198
=================================================================
Total params: 49,874
Trainable params: 49,874
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 4s - loss: 24.2218 - acc: 0.6970 - val_loss: 1.0493 - val_acc: 0.5836
```

```
Epoch 2/30
 - 2s - loss: 0.6377 - acc: 0.8059 - val_loss: 0.9484 - val_acc: 0.6325

Epoch 3/30
 - 2s - loss: 0.5699 - acc: 0.8297 - val_loss: 0.7102 - val_acc: 0.8476

Epoch 4/30
 - 2s - loss: 0.5409 - acc: 0.8449 - val_loss: 0.6632 - val_acc: 0.8344

Epoch 5/30
 - 2s - loss: 0.5113 - acc: 0.8598 - val_loss: 0.9081 - val_acc: 0.6359

Epoch 6/30
 - 2s - loss: 0.4967 - acc: 0.8658 - val_loss: 0.7257 - val_acc: 0.7917

Epoch 7/30
 - 2s - loss: 0.4711 - acc: 0.8753 - val_loss: 0.5622 - val_acc: 0.8714

Epoch 8/30
 - 2s - loss: 0.4671 - acc: 0.8762 - val_loss: 0.5446 - val_acc: 0.8578

Epoch 9/30
 - 2s - loss: 0.4530 - acc: 0.8826 - val_loss: 0.7376 - val_acc: 0.7720

Epoch 10/30
 - 2s - loss: 0.4399 - acc: 0.8840 - val_loss: 0.5203 - val_acc: 0.8775

Epoch 11/30
 - 2s - loss: 0.4364 - acc: 0.8849 - val_loss: 0.9721 - val_acc: 0.6719

Epoch 12/30
 - 2s - loss: 0.4307 - acc: 0.8894 - val_loss: 0.6812 - val_acc: 0.8551

Epoch 13/30
 - 2s - loss: 0.4151 - acc: 0.8894 - val_loss: 0.5115 - val_acc: 0.8656

Epoch 14/30
 - 2s - loss: 0.4061 - acc: 0.8930 - val_loss: 0.7077 - val_acc: 0.7757

Epoch 15/30
 - 2s - loss: 0.4018 - acc: 0.9003 - val_loss: 0.5833 - val_acc: 0.8436

Epoch 16/30
 - 2s - loss: 0.3937 - acc: 0.8955 - val_loss: 0.4868 - val_acc: 0.8670

Epoch 17/30
 - 2s - loss: 0.3891 - acc: 0.9003 - val_loss: 0.5114 - val_acc: 0.8592

Epoch 18/30
 - 2s - loss: 0.3905 - acc: 0.8940 - val_loss: 0.5299 - val_acc: 0.8575

Epoch 19/30
 - 2s - loss: 0.3934 - acc: 0.8927 - val_loss: 0.7868 - val_acc: 0.7194

Epoch 20/30
 - 2s - loss: 0.3771 - acc: 0.9006 - val_loss: 0.6848 - val_acc: 0.7927

Epoch 21/30
 - 2s - loss: 0.3749 - acc: 0.9033 - val_loss: 0.5406 - val_acc: 0.8537

Epoch 22/30
 - 2s - loss: 0.3811 - acc: 0.9033 - val_loss: 0.7148 - val_acc: 0.7737

Epoch 23/30
 - 2s - loss: 0.3758 - acc: 0.8988 - val_loss: 0.4667 - val_acc: 0.8795

Epoch 24/30
 - 2s - loss: 0.3779 - acc: 0.9034 - val_loss: 0.7032 - val_acc: 0.8045

Epoch 25/30
 - 2s - loss: 0.3729 - acc: 0.9055 - val_loss: 0.6151 - val_acc: 0.7940

Epoch 26/30
 - 2s - loss: 0.3665 - acc: 0.9075 - val_loss: 0.5198 - val_acc: 0.8619

Epoch 27/30
 - 2s - loss: 0.3656 - acc: 0.9068 - val_loss: 0.4313 - val_acc: 0.8628
```

```
 - 2s - loss: 0.3656 - acc: 0.9068 - val_loss: 0.4313 - val_acc: 0.8622

Epoch 28/30
 - 2s - loss: 0.3671 - acc: 0.8987 - val_loss: 0.4234 - val_acc: 0.8795

Epoch 29/30
 - 2s - loss: 0.3668 - acc: 0.9060 - val_loss: 0.5788 - val_acc: 0.8347

Epoch 30/30
 - 2s - loss: 0.3658 - acc: 0.9061 - val_loss: 0.4320 - val_acc: 0.8707

Train accuracy
0.9398803046789989
Test accuracy:
0.8707159823549372
--------------------------------------------------------------------------------
Model: "sequential_45"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_89 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_90 (Conv1D)           (None, 118, 16)           3152
_________________________________________________________________
dropout_45 (Dropout)         (None, 118, 16)           0
_________________________________________________________________
max_pooling1d_45 (MaxPooling (None, 39, 16)            0
_________________________________________________________________
flatten_45 (Flatten)         (None, 624)               0
_________________________________________________________________
dense_89 (Dense)             (None, 32)                20000
_________________________________________________________________
dense_90 (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 1/35
 - 4s - loss: 2.0452 - acc: 0.7988 - val_loss: 0.7245 - val_acc: 0.8032

Epoch 2/35
 - 2s - loss: 0.4345 - acc: 0.8951 - val_loss: 0.6316 - val_acc: 0.8273

Epoch 3/35
 - 2s - loss: 0.3650 - acc: 0.9144 - val_loss: 0.5347 - val_acc: 0.8918

Epoch 4/35
 - 2s - loss: 0.3358 - acc: 0.9165 - val_loss: 0.5290 - val_acc: 0.8721

Epoch 5/35
 - 2s - loss: 0.3417 - acc: 0.9188 - val_loss: 0.5073 - val_acc: 0.8795

Epoch 6/35
 - 2s - loss: 0.3025 - acc: 0.9255 - val_loss: 0.5794 - val_acc: 0.8303

Epoch 7/35
 - 2s - loss: 0.3146 - acc: 0.9230 - val_loss: 0.4392 - val_acc: 0.8802

Epoch 8/35
 - 2s - loss: 0.2956 - acc: 0.9229 - val_loss: 0.5338 - val_acc: 0.8439

Epoch 9/35
 - 2s - loss: 0.2875 - acc: 0.9259 - val_loss: 0.4260 - val_acc: 0.8687

Epoch 10/35
 - 2s - loss: 0.3118 - acc: 0.9219 - val_loss: 0.5903 - val_acc: 0.8134

Epoch 11/35
 - 2s - loss: 0.2943 - acc: 0.9249 - val_loss: 0.4438 - val_acc: 0.8907

Epoch 12/35
 - 2s - loss: 0.2674 - acc: 0.9320 - val_loss: 0.5155 - val_acc: 0.8324

Epoch 13/35
 - 2s - loss: 0.2660 - acc: 0.9305 - val_loss: 0.4413 - val_acc: 0.8561
```

```
 - 2s - loss: 0.2668 - acc: 0.9305 - val_loss: 0.4413 - val_acc: 0.8561

Epoch 14/35
 - 3s - loss: 0.2787 - acc: 0.9279 - val_loss: 0.4203 - val_acc: 0.8575

Epoch 15/35
 - 3s - loss: 0.2682 - acc: 0.9270 - val_loss: 0.6584 - val_acc: 0.7855

Epoch 16/35
 - 3s - loss: 0.3059 - acc: 0.9253 - val_loss: 0.3524 - val_acc: 0.8979

Epoch 17/35
 - 3s - loss: 0.2865 - acc: 0.9240 - val_loss: 0.3816 - val_acc: 0.9074

Epoch 18/35
 - 3s - loss: 0.2593 - acc: 0.9321 - val_loss: 0.3984 - val_acc: 0.8806

Epoch 19/35
 - 2s - loss: 0.2561 - acc: 0.9319 - val_loss: 0.4247 - val_acc: 0.8951

Epoch 20/35
 - 2s - loss: 0.2951 - acc: 0.9260 - val_loss: 0.3699 - val_acc: 0.8833

Epoch 21/35
 - 2s - loss: 0.2692 - acc: 0.9295 - val_loss: 0.4725 - val_acc: 0.8510

Epoch 22/35
 - 2s - loss: 0.2589 - acc: 0.9357 - val_loss: 0.3947 - val_acc: 0.8785

Epoch 23/35
 - 2s - loss: 0.2950 - acc: 0.9264 - val_loss: 0.6206 - val_acc: 0.7659

Epoch 24/35
 - 2s - loss: 0.2556 - acc: 0.9334 - val_loss: 0.4340 - val_acc: 0.8711

Epoch 25/35
 - 2s - loss: 0.2344 - acc: 0.9377 - val_loss: 0.3628 - val_acc: 0.8755

Epoch 26/35
 - 2s - loss: 0.2897 - acc: 0.9260 - val_loss: 0.3867 - val_acc: 0.8639

Epoch 27/35
 - 2s - loss: 0.2514 - acc: 0.9342 - val_loss: 0.4461 - val_acc: 0.8585

Epoch 28/35
 - 2s - loss: 0.2423 - acc: 0.9377 - val_loss: 0.3718 - val_acc: 0.8996

Epoch 29/35
 - 2s - loss: 0.2565 - acc: 0.9317 - val_loss: 0.4025 - val_acc: 0.8894

Epoch 30/35
 - 2s - loss: 0.2425 - acc: 0.9393 - val_loss: 0.3832 - val_acc: 0.8921

Epoch 31/35
 - 2s - loss: 0.2664 - acc: 0.9331 - val_loss: 0.3860 - val_acc: 0.8812

Epoch 32/35
 - 2s - loss: 0.2310 - acc: 0.9410 - val_loss: 0.3569 - val_acc: 0.8765

Epoch 33/35
 - 2s - loss: 0.2832 - acc: 0.9289 - val_loss: 0.4727 - val_acc: 0.8544

Epoch 34/35
 - 2s - loss: 0.2433 - acc: 0.9381 - val_loss: 0.3520 - val_acc: 0.8782

Epoch 35/35
 - 3s - loss: 0.2379 - acc: 0.9380 - val_loss: 0.4226 - val_acc: 0.8361

Train accuracy
0.8949945593035908
Test accuracy:
0.836104513064133
_________________________________________________________________
Model: "sequential_46"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
```

```
conv1d_91 (Conv1D)           (None, 122, 28)           1792
_________________________________________________________________
conv1d_92 (Conv1D)           (None, 116, 24)           4728
_________________________________________________________________
dropout_46 (Dropout)         (None, 116, 24)           0
_________________________________________________________________
max_pooling1d_46 (MaxPooling (None, 38, 24)            0
_________________________________________________________________
flatten_46 (Flatten)         (None, 912)               0
_________________________________________________________________
dense_91 (Dense)             (None, 64)                58432
_________________________________________________________________
dense_92 (Dense)             (None, 6)                 390
=================================================================
Total params: 65,342
Trainable params: 65,342
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 8.1721 - acc: 0.8424 - val_loss: 0.6893 - val_acc: 0.8738

Epoch 2/25
 - 2s - loss: 0.4190 - acc: 0.9124 - val_loss: 0.5900 - val_acc: 0.8537

Epoch 3/25
 - 2s - loss: 0.3662 - acc: 0.9211 - val_loss: 0.5234 - val_acc: 0.9046

Epoch 4/25
 - 2s - loss: 0.3217 - acc: 0.9272 - val_loss: 0.4810 - val_acc: 0.8873

Epoch 5/25
 - 2s - loss: 0.3081 - acc: 0.9266 - val_loss: 0.4606 - val_acc: 0.8924

Epoch 6/25
 - 2s - loss: 0.3121 - acc: 0.9236 - val_loss: 0.5105 - val_acc: 0.8853

Epoch 7/25
 - 2s - loss: 0.2925 - acc: 0.9328 - val_loss: 0.3956 - val_acc: 0.9053

Epoch 8/25
 - 2s - loss: 0.2846 - acc: 0.9309 - val_loss: 0.4518 - val_acc: 0.8958

Epoch 9/25
 - 2s - loss: 0.2764 - acc: 0.9314 - val_loss: 0.3829 - val_acc: 0.9209

Epoch 10/25
 - 2s - loss: 0.2864 - acc: 0.9306 - val_loss: 0.5186 - val_acc: 0.8147

Epoch 11/25
 - 2s - loss: 0.2728 - acc: 0.9287 - val_loss: 0.3897 - val_acc: 0.8890

Epoch 12/25
 - 2s - loss: 0.2796 - acc: 0.9290 - val_loss: 0.4471 - val_acc: 0.8792

Epoch 13/25
 - 2s - loss: 0.2784 - acc: 0.9295 - val_loss: 0.4120 - val_acc: 0.8965

Epoch 14/25
 - 3s - loss: 0.2777 - acc: 0.9306 - val_loss: 0.3951 - val_acc: 0.8907

Epoch 15/25
 - 4s - loss: 0.2837 - acc: 0.9249 - val_loss: 0.5125 - val_acc: 0.8368

Epoch 16/25
 - 3s - loss: 0.2640 - acc: 0.9321 - val_loss: 0.3610 - val_acc: 0.8948

Epoch 17/25
 - 2s - loss: 0.2726 - acc: 0.9293 - val_loss: 0.4392 - val_acc: 0.8700

Epoch 18/25
 - 3s - loss: 0.2548 - acc: 0.9335 - val_loss: 0.3955 - val_acc: 0.8870

Epoch 19/25
 - 2s - loss: 0.2783 - acc: 0.9312 - val_loss: 0.3523 - val_acc: 0.8877
```

```
Epoch 20/25
 - 2s - loss: 0.2508 - acc: 0.9334 - val_loss: 0.4008 - val_acc: 0.8646

Epoch 21/25
 - 2s - loss: 0.2662 - acc: 0.9300 - val_loss: 0.4775 - val_acc: 0.8409

Epoch 22/25
 - 3s - loss: 0.2426 - acc: 0.9359 - val_loss: 0.4802 - val_acc: 0.8429

Epoch 23/25
 - 3s - loss: 0.2563 - acc: 0.9290 - val_loss: 0.4044 - val_acc: 0.8911

Epoch 24/25
 - 4s - loss: 0.2318 - acc: 0.9384 - val_loss: 0.4163 - val_acc: 0.8402

Epoch 25/25
 - 4s - loss: 0.2486 - acc: 0.9321 - val_loss: 0.4067 - val_acc: 0.8741

Train accuracy
0.9047878128400435
Test accuracy:
0.8741092636579573
_________________________________________________________________________________________
Model: "sequential_47"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_93 (Conv1D)           (None, 124, 42)           1932
_________________________________________________________________
conv1d_94 (Conv1D)           (None, 118, 32)           9440
_________________________________________________________________
dropout_47 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_47 (MaxPooling (None, 59, 32)            0
_________________________________________________________________
flatten_47 (Flatten)         (None, 1888)              0
_________________________________________________________________
dense_93 (Dense)             (None, 32)                60448
_________________________________________________________________
dense_94 (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 1/30
 - 3s - loss: 42.6650 - acc: 0.7565 - val_loss: 6.2176 - val_acc: 0.8453

Epoch 2/30
 - 1s - loss: 1.5086 - acc: 0.8734 - val_loss: 0.8920 - val_acc: 0.7099

Epoch 3/30
 - 1s - loss: 0.4382 - acc: 0.8988 - val_loss: 0.5641 - val_acc: 0.8663

Epoch 4/30
 - 1s - loss: 0.3639 - acc: 0.9127 - val_loss: 0.7533 - val_acc: 0.7465

Epoch 5/30
 - 1s - loss: 0.3402 - acc: 0.9173 - val_loss: 0.4304 - val_acc: 0.9121

Epoch 6/30
 - 1s - loss: 0.3123 - acc: 0.9236 - val_loss: 0.5806 - val_acc: 0.8062

Epoch 7/30
 - 1s - loss: 0.3006 - acc: 0.9225 - val_loss: 0.3948 - val_acc: 0.8948

Epoch 8/30
 - 1s - loss: 0.2989 - acc: 0.9236 - val_loss: 0.4156 - val_acc: 0.8921

Epoch 9/30
 - 1s - loss: 0.2835 - acc: 0.9325 - val_loss: 0.3941 - val_acc: 0.8884

Epoch 10/30
 - 2s - loss: 0.2750 - acc: 0.9249 - val_loss: 0.4909 - val_acc: 0.8415
```

```
Epoch 11/30
 - 2s - loss: 0.2736 - acc: 0.9312 - val_loss: 0.3805 - val_acc: 0.8955

Epoch 12/30
 - 1s - loss: 0.2678 - acc: 0.9308 - val_loss: 0.4001 - val_acc: 0.8999

Epoch 13/30
 - 1s - loss: 0.2598 - acc: 0.9274 - val_loss: 0.3464 - val_acc: 0.9006

Epoch 14/30
 - 1s - loss: 0.2536 - acc: 0.9336 - val_loss: 0.3674 - val_acc: 0.8996

Epoch 15/30
 - 1s - loss: 0.2580 - acc: 0.9314 - val_loss: 0.3374 - val_acc: 0.9101

Epoch 16/30
 - 1s - loss: 0.2510 - acc: 0.9324 - val_loss: 0.5301 - val_acc: 0.8392

Epoch 17/30
 - 1s - loss: 0.2540 - acc: 0.9324 - val_loss: 0.3468 - val_acc: 0.9002

Epoch 18/30
 - 1s - loss: 0.2446 - acc: 0.9334 - val_loss: 0.3716 - val_acc: 0.8914

Epoch 19/30
 - 1s - loss: 0.2421 - acc: 0.9363 - val_loss: 0.3987 - val_acc: 0.8856

Epoch 20/30
 - 2s - loss: 0.2389 - acc: 0.9343 - val_loss: 0.3601 - val_acc: 0.8951

Epoch 21/30
 - 2s - loss: 0.2318 - acc: 0.9327 - val_loss: 0.3626 - val_acc: 0.8938

Epoch 22/30
 - 2s - loss: 0.2342 - acc: 0.9339 - val_loss: 0.5513 - val_acc: 0.8168

Epoch 23/30
 - 1s - loss: 0.2273 - acc: 0.9368 - val_loss: 0.3502 - val_acc: 0.8999

Epoch 24/30
 - 1s - loss: 0.2258 - acc: 0.9370 - val_loss: 0.3579 - val_acc: 0.8972

Epoch 25/30
 - 1s - loss: 0.2323 - acc: 0.9343 - val_loss: 0.8910 - val_acc: 0.7051

Epoch 26/30
 - 1s - loss: 0.2319 - acc: 0.9342 - val_loss: 0.3717 - val_acc: 0.8890

Epoch 27/30
 - 1s - loss: 0.2303 - acc: 0.9325 - val_loss: 0.3567 - val_acc: 0.8955

Epoch 28/30
 - 1s - loss: 0.2267 - acc: 0.9365 - val_loss: 0.4769 - val_acc: 0.8663

Epoch 29/30
 - 1s - loss: 0.2250 - acc: 0.9365 - val_loss: 0.3340 - val_acc: 0.8996

Epoch 30/30
 - 1s - loss: 0.2213 - acc: 0.9372 - val_loss: 0.3571 - val_acc: 0.8911

Train accuracy
0.9507616974972797
Test accuracy:
0.8910756701730573
_________________________________________________________________________________________
Model: "sequential_48"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_95 (Conv1D)           (None, 126, 28)           784
_________________________________________________________________
conv1d_96 (Conv1D)           (None, 122, 32)           4512
_________________________________________________________________
dropout_48 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_48 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
```

```
flatten_48 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_95 (Dense)             (None, 32)                40992
_________________________________________________________________
dense_96 (Dense)             (None, 6)                 198
=================================================================
Total params: 46,486
Trainable params: 46,486
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 26.4174 - acc: 0.7235 - val_loss: 2.0627 - val_acc: 0.7170

Epoch 2/25
 - 2s - loss: 0.9056 - acc: 0.8214 - val_loss: 1.0440 - val_acc: 0.7143

Epoch 3/25
 - 3s - loss: 0.6361 - acc: 0.8399 - val_loss: 0.8232 - val_acc: 0.8232

Epoch 4/25
 - 2s - loss: 0.5741 - acc: 0.8474 - val_loss: 0.8612 - val_acc: 0.8035

Epoch 5/25
 - 2s - loss: 0.5334 - acc: 0.8592 - val_loss: 0.7829 - val_acc: 0.7930

Epoch 6/25
 - 3s - loss: 0.4956 - acc: 0.8727 - val_loss: 0.7623 - val_acc: 0.8147

Epoch 7/25
 - 3s - loss: 0.4789 - acc: 0.8730 - val_loss: 0.6987 - val_acc: 0.8524

Epoch 8/25
 - 3s - loss: 0.4704 - acc: 0.8788 - val_loss: 0.7397 - val_acc: 0.8249

Epoch 9/25
 - 2s - loss: 0.4565 - acc: 0.8830 - val_loss: 0.6448 - val_acc: 0.8341

Epoch 10/25
 - 2s - loss: 0.4453 - acc: 0.8807 - val_loss: 0.6962 - val_acc: 0.8402

Epoch 11/25
 - 3s - loss: 0.4070 - acc: 0.8939 - val_loss: 0.6238 - val_acc: 0.8626

Epoch 12/25
 - 3s - loss: 0.4157 - acc: 0.8897 - val_loss: 0.7007 - val_acc: 0.8083

Epoch 13/25
 - 3s - loss: 0.4156 - acc: 0.8897 - val_loss: 0.6149 - val_acc: 0.8456

Epoch 14/25
 - 2s - loss: 0.4014 - acc: 0.8981 - val_loss: 0.7254 - val_acc: 0.7384

Epoch 15/25
 - 2s - loss: 0.3857 - acc: 0.8989 - val_loss: 0.5939 - val_acc: 0.8619

Epoch 16/25
 - 2s - loss: 0.3768 - acc: 0.9045 - val_loss: 0.5643 - val_acc: 0.8728

Epoch 17/25
 - 2s - loss: 0.3653 - acc: 0.9100 - val_loss: 0.5893 - val_acc: 0.8470

Epoch 18/25
 - 2s - loss: 0.3482 - acc: 0.9121 - val_loss: 0.5093 - val_acc: 0.8829

Epoch 19/25
 - 2s - loss: 0.3567 - acc: 0.9091 - val_loss: 0.5323 - val_acc: 0.8663

Epoch 20/25
 - 2s - loss: 0.3397 - acc: 0.9129 - val_loss: 0.5144 - val_acc: 0.8721

Epoch 21/25
 - 2s - loss: 0.3399 - acc: 0.9124 - val_loss: 0.6173 - val_acc: 0.8029

Epoch 22/25
 - 2s - loss: 0.3385 - acc: 0.9136 - val_loss: 0.4756 - val_acc: 0.8795
```

```
Epoch 23/25
 - 3s - loss: 0.3259 - acc: 0.9196 - val_loss: 0.6004 - val_acc: 0.8093

Epoch 24/25
 - 2s - loss: 0.3218 - acc: 0.9197 - val_loss: 0.5118 - val_acc: 0.8361

Epoch 25/25
 - 3s - loss: 0.3198 - acc: 0.9181 - val_loss: 0.5125 - val_acc: 0.8639

Train accuracy
0.9166213275299239
Test accuracy:
0.8639294197488971
--------------------------------------------------------------------------------
Model: "sequential_49"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_97 (Conv1D)           (None, 124, 32)           1472
_________________________________________________________________
conv1d_98 (Conv1D)           (None, 118, 16)           3600
_________________________________________________________________
dropout_49 (Dropout)         (None, 118, 16)           0
_________________________________________________________________
max_pooling1d_49 (MaxPooling (None, 39, 16)            0
_________________________________________________________________
flatten_49 (Flatten)         (None, 624)               0
_________________________________________________________________
dense_97 (Dense)             (None, 64)                40000
_________________________________________________________________
dense_98 (Dense)             (None, 6)                 390
=================================================================
Total params: 45,462
Trainable params: 45,462
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 14.7135 - acc: 0.7633 - val_loss: 0.9997 - val_acc: 0.6620

Epoch 2/25
 - 2s - loss: 0.6502 - acc: 0.8383 - val_loss: 0.8945 - val_acc: 0.7628

Epoch 3/25
 - 1s - loss: 0.5518 - acc: 0.8613 - val_loss: 0.6978 - val_acc: 0.8717

Epoch 4/25
 - 1s - loss: 0.5273 - acc: 0.8683 - val_loss: 0.6917 - val_acc: 0.8551

Epoch 5/25
 - 1s - loss: 0.5216 - acc: 0.8686 - val_loss: 0.6808 - val_acc: 0.8531

Epoch 6/25
 - 1s - loss: 0.4715 - acc: 0.8811 - val_loss: 0.6399 - val_acc: 0.8171

Epoch 7/25
 - 1s - loss: 0.4443 - acc: 0.8894 - val_loss: 0.5673 - val_acc: 0.8880

Epoch 8/25
 - 1s - loss: 0.4343 - acc: 0.8953 - val_loss: 0.5835 - val_acc: 0.8670

Epoch 9/25
 - 1s - loss: 0.4220 - acc: 0.8980 - val_loss: 0.6032 - val_acc: 0.8412

Epoch 10/25
 - 1s - loss: 0.4056 - acc: 0.9000 - val_loss: 0.9097 - val_acc: 0.7187

Epoch 11/25
 - 1s - loss: 0.4309 - acc: 0.8983 - val_loss: 0.6113 - val_acc: 0.8331

Epoch 12/25
 - 1s - loss: 0.3874 - acc: 0.9083 - val_loss: 0.5136 - val_acc: 0.8622

Epoch 13/25
 - 1s - loss: 0.3740 - acc: 0.9142 - val_loss: 0.6285 - val_acc: 0.8395
```

```
Epoch 14/25
 - 1s - loss: 0.3838 - acc: 0.9081 - val_loss: 0.5509 - val_acc: 0.8673

Epoch 15/25
 - 1s - loss: 0.4151 - acc: 0.9041 - val_loss: 0.6370 - val_acc: 0.8314

Epoch 16/25
 - 1s - loss: 0.3964 - acc: 0.9131 - val_loss: 0.6194 - val_acc: 0.8005

Epoch 17/25
 - 1s - loss: 0.3505 - acc: 0.9170 - val_loss: 0.6245 - val_acc: 0.7923

Epoch 18/25
 - 1s - loss: 0.3738 - acc: 0.9100 - val_loss: 0.5083 - val_acc: 0.8758

Epoch 19/25
 - 1s - loss: 0.3578 - acc: 0.9161 - val_loss: 0.4746 - val_acc: 0.8683

Epoch 20/25
 - 1s - loss: 0.3383 - acc: 0.9204 - val_loss: 0.5141 - val_acc: 0.8459

Epoch 21/25
 - 1s - loss: 0.3716 - acc: 0.9106 - val_loss: 0.7396 - val_acc: 0.7791

Epoch 22/25
 - 1s - loss: 0.3461 - acc: 0.9174 - val_loss: 0.6268 - val_acc: 0.7974

Epoch 23/25
 - 1s - loss: 0.3504 - acc: 0.9132 - val_loss: 0.6064 - val_acc: 0.8079

Epoch 24/25
 - 1s - loss: 0.3687 - acc: 0.9135 - val_loss: 0.5480 - val_acc: 0.8622

Epoch 25/25
 - 1s - loss: 0.4207 - acc: 0.9071 - val_loss: 0.6567 - val_acc: 0.8337

Train accuracy
0.8992110990206746
Test accuracy:
0.833729216152019
---------------------------------------------------------------------------------
Model: "sequential_50"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_99 (Conv1D)           (None, 122, 28)           1792
_________________________________________________________________
conv1d_100 (Conv1D)          (None, 116, 24)           4728
_________________________________________________________________
dropout_50 (Dropout)         (None, 116, 24)           0
_________________________________________________________________
max_pooling1d_50 (MaxPooling (None, 38, 24)            0
_________________________________________________________________
flatten_50 (Flatten)         (None, 912)               0
_________________________________________________________________
dense_99 (Dense)             (None, 32)                29216
_________________________________________________________________
dense_100 (Dense)            (None, 6)                 198
=================================================================
Total params: 35,934
Trainable params: 35,934
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 2s - loss: 7.7047 - acc: 0.6910 - val_loss: 1.1987 - val_acc: 0.5677

Epoch 2/35
 - 1s - loss: 0.6305 - acc: 0.8339 - val_loss: 0.8343 - val_acc: 0.7506

Epoch 3/35
 - 1s - loss: 0.5218 - acc: 0.8822 - val_loss: 0.6973 - val_acc: 0.8110

Epoch 4/35
 - 1s - loss: 0.4466 - acc: 0.8928 - val_loss: 0.9206 - val_acc: 0.6651
```

```
Epoch 5/35
 - 1s - loss: 0.4273 - acc: 0.8993 - val_loss: 0.5426 - val_acc: 0.8989

Epoch 6/35
 - 1s - loss: 0.3949 - acc: 0.9036 - val_loss: 0.5429 - val_acc: 0.8565

Epoch 7/35
 - 1s - loss: 0.3623 - acc: 0.9157 - val_loss: 0.5350 - val_acc: 0.8585

Epoch 8/35
 - 1s - loss: 0.3738 - acc: 0.9110 - val_loss: 0.5232 - val_acc: 0.8751

Epoch 9/35
 - 1s - loss: 0.3609 - acc: 0.9146 - val_loss: 0.4708 - val_acc: 0.8938

Epoch 10/35
 - 1s - loss: 0.3514 - acc: 0.9140 - val_loss: 0.5019 - val_acc: 0.8802

Epoch 11/35
 - 1s - loss: 0.3593 - acc: 0.9091 - val_loss: 0.4926 - val_acc: 0.8700

Epoch 12/35
 - 1s - loss: 0.3449 - acc: 0.9158 - val_loss: 0.5288 - val_acc: 0.8534

Epoch 13/35
 - 1s - loss: 0.3299 - acc: 0.9163 - val_loss: 0.5000 - val_acc: 0.8673

Epoch 14/35
 - 1s - loss: 0.3274 - acc: 0.9131 - val_loss: 0.5709 - val_acc: 0.8154

Epoch 15/35
 - 1s - loss: 0.3313 - acc: 0.9140 - val_loss: 0.4789 - val_acc: 0.8792

Epoch 16/35
 - 1s - loss: 0.3138 - acc: 0.9187 - val_loss: 0.4774 - val_acc: 0.8649

Epoch 17/35
 - 1s - loss: 0.3279 - acc: 0.9197 - val_loss: 0.6246 - val_acc: 0.7862

Epoch 18/35
 - 1s - loss: 0.3140 - acc: 0.9200 - val_loss: 0.7382 - val_acc: 0.7676

Epoch 19/35
 - 1s - loss: 0.3070 - acc: 0.9188 - val_loss: 0.4638 - val_acc: 0.8619

Epoch 20/35
 - 1s - loss: 0.3289 - acc: 0.9172 - val_loss: 0.4405 - val_acc: 0.8694

Epoch 21/35
 - 1s - loss: 0.3066 - acc: 0.9259 - val_loss: 0.4453 - val_acc: 0.8768

Epoch 22/35
 - 1s - loss: 0.3171 - acc: 0.9195 - val_loss: 0.4092 - val_acc: 0.8765

Epoch 23/35
 - 1s - loss: 0.3053 - acc: 0.9199 - val_loss: 0.4203 - val_acc: 0.8653

Epoch 24/35
 - 1s - loss: 0.3114 - acc: 0.9217 - val_loss: 0.5070 - val_acc: 0.8415

Epoch 25/35
 - 1s - loss: 0.3127 - acc: 0.9136 - val_loss: 0.9772 - val_acc: 0.6617

Epoch 26/35
 - 1s - loss: 0.3021 - acc: 0.9206 - val_loss: 0.4924 - val_acc: 0.8554

Epoch 27/35
 - 1s - loss: 0.3059 - acc: 0.9211 - val_loss: 0.4196 - val_acc: 0.8928

Epoch 28/35
 - 1s - loss: 0.3230 - acc: 0.9192 - val_loss: 0.4304 - val_acc: 0.8921

Epoch 29/35
 - 1s - loss: 0.3129 - acc: 0.9214 - val_loss: 0.5281 - val_acc: 0.8436

Epoch 30/35
```

```
 -
 - 1s - loss: 0.3042 - acc: 0.9240 - val_loss: 0.4139 - val_acc: 0.8985

Epoch 31/35
 - 1s - loss: 0.3072 - acc: 0.9197 - val_loss: 1.0016 - val_acc: 0.6637

Epoch 32/35
 - 1s - loss: 0.3184 - acc: 0.9232 - val_loss: 0.4998 - val_acc: 0.8375

Epoch 33/35
 - 1s - loss: 0.3150 - acc: 0.9208 - val_loss: 0.5327 - val_acc: 0.8307

Epoch 34/35
 - 1s - loss: 0.3137 - acc: 0.9210 - val_loss: 0.4735 - val_acc: 0.8537

Epoch 35/35
 - 1s - loss: 0.3045 - acc: 0.9188 - val_loss: 0.4457 - val_acc: 0.8487

Train accuracy
0.9159412404787813
Test accuracy:
0.8486596538853071
--------------------------------------------------------------------------------
Model: "sequential_51"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_101 (Conv1D)          (None, 124, 42)           1932
_________________________________________________________________
conv1d_102 (Conv1D)          (None, 122, 32)           4064
_________________________________________________________________
dropout_51 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_51 (MaxPooling (None, 61, 32)            0
_________________________________________________________________
flatten_51 (Flatten)         (None, 1952)              0
_________________________________________________________________
dense_101 (Dense)            (None, 32)                62496
_________________________________________________________________
dense_102 (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
 - 3s - loss: 12.3458 - acc: 0.7616 - val_loss: 0.7815 - val_acc: 0.8337

Epoch 2/30
 - 1s - loss: 0.5603 - acc: 0.8598 - val_loss: 0.6946 - val_acc: 0.8398

Epoch 3/30
 - 1s - loss: 0.4728 - acc: 0.8864 - val_loss: 0.6484 - val_acc: 0.8493

Epoch 4/30
 - 1s - loss: 0.4589 - acc: 0.8856 - val_loss: 0.6491 - val_acc: 0.8324

Epoch 5/30
 - 1s - loss: 0.4252 - acc: 0.8977 - val_loss: 0.5442 - val_acc: 0.8711

Epoch 6/30
 - 1s - loss: 0.3765 - acc: 0.9041 - val_loss: 0.5794 - val_acc: 0.8293

Epoch 7/30
 - 1s - loss: 0.3823 - acc: 0.9098 - val_loss: 0.5794 - val_acc: 0.8514

Epoch 8/30
 - 1s - loss: 0.3551 - acc: 0.9129 - val_loss: 0.5590 - val_acc: 0.8375

Epoch 9/30
 - 1s - loss: 0.3505 - acc: 0.9157 - val_loss: 0.5753 - val_acc: 0.8290

Epoch 10/30
 - 1s - loss: 0.3584 - acc: 0.9095 - val_loss: 0.4700 - val_acc: 0.8700

Epoch 11/30
```

```
 - 1s - loss: 0.3317 - acc: 0.9181 - val_loss: 0.4350 - val_acc: 0.8904

Epoch 12/30
 - 2s - loss: 0.3337 - acc: 0.9146 - val_loss: 0.5570 - val_acc: 0.8609

Epoch 13/30
 - 2s - loss: 0.3245 - acc: 0.9226 - val_loss: 0.5278 - val_acc: 0.8707

Epoch 14/30
 - 1s - loss: 0.3358 - acc: 0.9154 - val_loss: 0.5100 - val_acc: 0.8734

Epoch 15/30
 - 1s - loss: 0.3516 - acc: 0.9094 - val_loss: 0.4799 - val_acc: 0.8806

Epoch 16/30
 - 1s - loss: 0.3230 - acc: 0.9200 - val_loss: 0.4176 - val_acc: 0.8853

Epoch 17/30
 - 1s - loss: 0.3056 - acc: 0.9246 - val_loss: 0.4551 - val_acc: 0.8867

Epoch 18/30
 - 1s - loss: 0.3142 - acc: 0.9203 - val_loss: 0.4732 - val_acc: 0.8677

Epoch 19/30
 - 1s - loss: 0.3343 - acc: 0.9183 - val_loss: 0.4532 - val_acc: 0.8700

Epoch 20/30
 - 1s - loss: 0.3003 - acc: 0.9245 - val_loss: 0.3995 - val_acc: 0.8975

Epoch 21/30
 - 1s - loss: 0.2804 - acc: 0.9253 - val_loss: 0.4769 - val_acc: 0.8548

Epoch 22/30
 - 1s - loss: 0.2982 - acc: 0.9211 - val_loss: 0.4939 - val_acc: 0.8476

Epoch 23/30
 - 1s - loss: 0.2888 - acc: 0.9261 - val_loss: 0.4213 - val_acc: 0.8992

Epoch 24/30
 - 1s - loss: 0.3002 - acc: 0.9253 - val_loss: 0.4970 - val_acc: 0.8748

Epoch 25/30
 - 1s - loss: 0.2978 - acc: 0.9229 - val_loss: 0.4276 - val_acc: 0.8853

Epoch 26/30
 - 1s - loss: 0.2849 - acc: 0.9257 - val_loss: 0.4294 - val_acc: 0.8948

Epoch 27/30
 - 1s - loss: 0.3161 - acc: 0.9191 - val_loss: 0.3930 - val_acc: 0.9013

Epoch 28/30
 - 1s - loss: 0.2945 - acc: 0.9279 - val_loss: 0.4420 - val_acc: 0.8755

Epoch 29/30
 - 1s - loss: 0.2694 - acc: 0.9282 - val_loss: 0.3919 - val_acc: 0.8918

Epoch 30/30
 - 1s - loss: 0.2667 - acc: 0.9290 - val_loss: 0.4239 - val_acc: 0.8778

Train accuracy
0.933215451577802
Test accuracy:
0.8778418730912793
_________________________________________________________________
Model: "sequential_52"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_103 (Conv1D)          (None, 126, 28)           784
_________________________________________________________________
conv1d_104 (Conv1D)          (None, 120, 32)           6304
_________________________________________________________________
dropout_52 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_52 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_52 (Flatten)         (None, 1280)              0
```

```
_________________________________________________________________
dense_103 (Dense)            (None, 64)                81984
_________________________________________________________________
dense_104 (Dense)            (None, 6)                 390
=================================================================
Total params: 89,462
Trainable params: 89,462
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 10.0787 - acc: 0.8206 - val_loss: 1.1377 - val_acc: 0.8191

Epoch 2/25
 - 2s - loss: 0.5821 - acc: 0.9030 - val_loss: 0.7139 - val_acc: 0.8616

Epoch 3/25
 - 3s - loss: 0.3798 - acc: 0.9226 - val_loss: 0.5927 - val_acc: 0.8741

Epoch 4/25
 - 4s - loss: 0.3527 - acc: 0.9196 - val_loss: 0.6089 - val_acc: 0.8504

Epoch 5/25
 - 4s - loss: 0.3234 - acc: 0.9260 - val_loss: 0.5355 - val_acc: 0.8680

Epoch 6/25
 - 3s - loss: 0.2894 - acc: 0.9300 - val_loss: 0.6021 - val_acc: 0.7805

Epoch 7/25
 - 2s - loss: 0.2821 - acc: 0.9334 - val_loss: 0.4616 - val_acc: 0.8829

Epoch 8/25
 - 2s - loss: 0.2761 - acc: 0.9317 - val_loss: 0.4814 - val_acc: 0.8765

Epoch 9/25
 - 2s - loss: 0.2641 - acc: 0.9344 - val_loss: 0.4496 - val_acc: 0.8738

Epoch 10/25
 - 2s - loss: 0.2553 - acc: 0.9351 - val_loss: 0.4165 - val_acc: 0.8772

Epoch 11/25
 - 2s - loss: 0.2470 - acc: 0.9384 - val_loss: 0.4130 - val_acc: 0.8880

Epoch 12/25
 - 2s - loss: 0.2405 - acc: 0.9372 - val_loss: 0.4082 - val_acc: 0.8924

Epoch 13/25
 - 2s - loss: 0.2571 - acc: 0.9321 - val_loss: 0.4313 - val_acc: 0.8880

Epoch 14/25
 - 2s - loss: 0.2401 - acc: 0.9387 - val_loss: 0.4205 - val_acc: 0.8748

Epoch 15/25
 - 2s - loss: 0.2382 - acc: 0.9338 - val_loss: 0.4801 - val_acc: 0.8354

Epoch 16/25
 - 3s - loss: 0.2243 - acc: 0.9377 - val_loss: 0.4310 - val_acc: 0.8629

Epoch 17/25
 - 2s - loss: 0.2184 - acc: 0.9393 - val_loss: 0.3883 - val_acc: 0.8863

Epoch 18/25
 - 3s - loss: 0.2147 - acc: 0.9430 - val_loss: 0.3686 - val_acc: 0.8958

Epoch 19/25
 - 3s - loss: 0.2257 - acc: 0.9376 - val_loss: 0.3826 - val_acc: 0.8901

Epoch 20/25
 - 3s - loss: 0.2306 - acc: 0.9358 - val_loss: 0.3964 - val_acc: 0.8721

Epoch 21/25
 - 2s - loss: 0.2136 - acc: 0.9418 - val_loss: 0.4599 - val_acc: 0.8554

Epoch 22/25
 - 2s - loss: 0.2131 - acc: 0.9415 - val_loss: 0.3752 - val_acc: 0.8931
```

```
Epoch 23/25
 - 2s - loss: 0.2103 - acc: 0.9406 - val_loss: 0.4543 - val_acc: 0.8622

Epoch 24/25
 - 2s - loss: 0.2190 - acc: 0.9416 - val_loss: 0.4567 - val_acc: 0.8398

Epoch 25/25
 - 2s - loss: 0.2168 - acc: 0.9403 - val_loss: 0.3857 - val_acc: 0.8802

Train accuracy
0.948449401523395
Test accuracy:
0.8802171700033933
_________________________________________________________________
Model: "sequential_53"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_105 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_106 (Conv1D)          (None, 120, 16)           2576
_________________________________________________________________
dropout_53 (Dropout)         (None, 120, 16)           0
_________________________________________________________________
max_pooling1d_53 (MaxPooling (None, 40, 16)            0
_________________________________________________________________
flatten_53 (Flatten)         (None, 640)               0
_________________________________________________________________
dense_105 (Dense)            (None, 32)                20512
_________________________________________________________________
dense_106 (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: 17.4291 - acc: 0.7825 - val_loss: 0.8043 - val_acc: 0.8018

Epoch 2/25
 - 3s - loss: 0.5312 - acc: 0.8765 - val_loss: 0.7095 - val_acc: 0.8297

Epoch 3/25
 - 3s - loss: 0.4174 - acc: 0.9064 - val_loss: 0.5596 - val_acc: 0.8918

Epoch 4/25
 - 2s - loss: 0.4051 - acc: 0.9022 - val_loss: 0.6101 - val_acc: 0.8446

Epoch 5/25
 - 2s - loss: 0.3753 - acc: 0.9109 - val_loss: 0.5039 - val_acc: 0.8826

Epoch 6/25
 - 2s - loss: 0.3451 - acc: 0.9170 - val_loss: 0.4901 - val_acc: 0.8616

Epoch 7/25
 - 3s - loss: 0.3347 - acc: 0.9218 - val_loss: 0.4760 - val_acc: 0.8765

Epoch 8/25
 - 3s - loss: 0.3436 - acc: 0.9202 - val_loss: 0.4618 - val_acc: 0.8772

Epoch 9/25
 - 3s - loss: 0.3282 - acc: 0.9223 - val_loss: 0.4635 - val_acc: 0.8446

Epoch 10/25
 - 2s - loss: 0.3196 - acc: 0.9226 - val_loss: 0.8668 - val_acc: 0.7139

Epoch 11/25
 - 2s - loss: 0.3352 - acc: 0.9215 - val_loss: 0.5080 - val_acc: 0.8694

Epoch 12/25
 - 2s - loss: 0.3099 - acc: 0.9234 - val_loss: 0.4706 - val_acc: 0.8724

Epoch 13/25
 - 2s - loss: 0.3136 - acc: 0.9242 - val_loss: 0.4951 - val_acc: 0.8473
```

```
Epoch 14/25
 - 2s - loss: 0.3050 - acc: 0.9282 - val_loss: 0.3965 - val_acc: 0.8839

Epoch 15/25
 - 2s - loss: 0.3005 - acc: 0.9252 - val_loss: 0.5158 - val_acc: 0.8256

Epoch 16/25
 - 3s - loss: 0.2957 - acc: 0.9266 - val_loss: 0.4113 - val_acc: 0.8935

Epoch 17/25
 - 3s - loss: 0.2874 - acc: 0.9270 - val_loss: 0.4618 - val_acc: 0.8633

Epoch 18/25
 - 2s - loss: 0.3121 - acc: 0.9252 - val_loss: 0.3561 - val_acc: 0.8955

Epoch 19/25
 - 2s - loss: 0.2911 - acc: 0.9257 - val_loss: 0.3676 - val_acc: 0.8931

Epoch 20/25
 - 2s - loss: 0.2992 - acc: 0.9245 - val_loss: 0.3776 - val_acc: 0.8901

Epoch 21/25
 - 2s - loss: 0.2830 - acc: 0.9287 - val_loss: 0.4596 - val_acc: 0.8558

Epoch 22/25
 - 2s - loss: 0.2763 - acc: 0.9278 - val_loss: 0.3607 - val_acc: 0.8914

Epoch 23/25
 - 2s - loss: 0.2884 - acc: 0.9276 - val_loss: 0.9517 - val_acc: 0.6926

Epoch 24/25
 - 2s - loss: 0.2855 - acc: 0.9293 - val_loss: 0.4213 - val_acc: 0.8653

Epoch 25/25
 - 2s - loss: 0.2853 - acc: 0.9276 - val_loss: 0.3849 - val_acc: 0.8904

Train accuracy
0.9488574537540805
Test accuracy:
0.8903970139124533
--------------------------------------------------------------------------------
Model: "sequential_54"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_107 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_108 (Conv1D)          (None, 122, 24)           2040
_________________________________________________________________
dropout_54 (Dropout)         (None, 122, 24)           0
_________________________________________________________________
max_pooling1d_54 (MaxPooling (None, 40, 24)            0
_________________________________________________________________
flatten_54 (Flatten)         (None, 960)               0
_________________________________________________________________
dense_107 (Dense)            (None, 64)                61504
_________________________________________________________________
dense_108 (Dense)            (None, 6)                 390
=================================================================
Total params: 65,222
Trainable params: 65,222
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 3s - loss: 15.0217 - acc: 0.6937 - val_loss: 1.0845 - val_acc: 0.7075

Epoch 2/35
 - 1s - loss: 0.7159 - acc: 0.8075 - val_loss: 0.8663 - val_acc: 0.7611

Epoch 3/35
 - 1s - loss: 0.6025 - acc: 0.8392 - val_loss: 0.6701 - val_acc: 0.8778

Epoch 4/35
 - 1s - loss: 0.5353 - acc: 0.8675 - val_loss: 0.7229 - val_acc: 0.7944
```

```
Epoch 5/35
 - 1s - loss: 0.5190 - acc: 0.8761 - val_loss: 0.5742 - val_acc: 0.8728

Epoch 6/35
 - 1s - loss: 0.4786 - acc: 0.8769 - val_loss: 0.5704 - val_acc: 0.8531

Epoch 7/35
 - 1s - loss: 0.4564 - acc: 0.8885 - val_loss: 0.5306 - val_acc: 0.8741

Epoch 8/35
 - 1s - loss: 0.4435 - acc: 0.8891 - val_loss: 0.5252 - val_acc: 0.8765

Epoch 9/35
 - 1s - loss: 0.4232 - acc: 0.8964 - val_loss: 0.7166 - val_acc: 0.7401

Epoch 10/35
 - 1s - loss: 0.4109 - acc: 0.8947 - val_loss: 0.5319 - val_acc: 0.8480

Epoch 11/35
 - 1s - loss: 0.4042 - acc: 0.8979 - val_loss: 0.4611 - val_acc: 0.8887

Epoch 12/35
 - 1s - loss: 0.3998 - acc: 0.8947 - val_loss: 0.5793 - val_acc: 0.8364

Epoch 13/35
 - 1s - loss: 0.4014 - acc: 0.8955 - val_loss: 0.5207 - val_acc: 0.8429

Epoch 14/35
 - 1s - loss: 0.3923 - acc: 0.8988 - val_loss: 0.5134 - val_acc: 0.8521

Epoch 15/35
 - 1s - loss: 0.3807 - acc: 0.9033 - val_loss: 0.5115 - val_acc: 0.8415

Epoch 16/35
 - 1s - loss: 0.3828 - acc: 0.9023 - val_loss: 0.5073 - val_acc: 0.8785

Epoch 17/35
 - 1s - loss: 0.3688 - acc: 0.9042 - val_loss: 0.6605 - val_acc: 0.7638

Epoch 18/35
 - 1s - loss: 0.3681 - acc: 0.9056 - val_loss: 0.6309 - val_acc: 0.8212

Epoch 19/35
 - 1s - loss: 0.3605 - acc: 0.9047 - val_loss: 0.4765 - val_acc: 0.8690

Epoch 20/35
 - 1s - loss: 0.3547 - acc: 0.9057 - val_loss: 0.4897 - val_acc: 0.8517

Epoch 21/35
 - 1s - loss: 0.3484 - acc: 0.9089 - val_loss: 0.5335 - val_acc: 0.8378

Epoch 22/35
 - 1s - loss: 0.3700 - acc: 0.9034 - val_loss: 0.4671 - val_acc: 0.8507

Epoch 23/35
 - 1s - loss: 0.3493 - acc: 0.9090 - val_loss: 0.4602 - val_acc: 0.8789

Epoch 24/35
 - 1s - loss: 0.3419 - acc: 0.9083 - val_loss: 0.4951 - val_acc: 0.8368

Epoch 25/35
 - 1s - loss: 0.3603 - acc: 0.9060 - val_loss: 0.5153 - val_acc: 0.8487

Epoch 26/35
 - 1s - loss: 0.3267 - acc: 0.9109 - val_loss: 1.0788 - val_acc: 0.6403

Epoch 27/35
 - 1s - loss: 0.3503 - acc: 0.9061 - val_loss: 0.5214 - val_acc: 0.8252

Epoch 28/35
 - 1s - loss: 0.3397 - acc: 0.9067 - val_loss: 0.7596 - val_acc: 0.7611

Epoch 29/35
 - 1s - loss: 0.3523 - acc: 0.9022 - val_loss: 0.4922 - val_acc: 0.8687

Epoch 30/35
 - 1s - loss: 0.3434 - acc: 0.9119 - val_loss: 0.4575 - val_acc: 0.8653
```

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 - 1s - loss: 0.3454 - acc: 0.9119 - val_loss: 0.4575 - val_acc: 0.8095

Epoch 31/35
 - 1s - loss: 0.3480 - acc: 0.9076 - val_loss: 0.6113 - val_acc: 0.8086

Epoch 32/35
 - 1s - loss: 0.3349 - acc: 0.9125 - val_loss: 0.5839 - val_acc: 0.8191

Epoch 33/35
 - 1s - loss: 0.3236 - acc: 0.9132 - val_loss: 0.7571 - val_acc: 0.7021

Epoch 34/35
 - 1s - loss: 0.3321 - acc: 0.9100 - val_loss: 0.5460 - val_acc: 0.8351

Epoch 35/35
 - 1s - loss: 0.3332 - acc: 0.9108 - val_loss: 0.4952 - val_acc: 0.8534

Train accuracy
0.8834330794341676
Test accuracy:
0.8534102477095351
--------------------------------------------------------------------------------
Model: "sequential_55"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_109 (Conv1D)          (None, 122, 28)           1792
_________________________________________________________________
conv1d_110 (Conv1D)          (None, 116, 32)           6304
_________________________________________________________________
dropout_55 (Dropout)         (None, 116, 32)           0
_________________________________________________________________
max_pooling1d_55 (MaxPooling (None, 58, 32)            0
_________________________________________________________________
flatten_55 (Flatten)         (None, 1856)              0
_________________________________________________________________
dense_109 (Dense)            (None, 32)                59424
_________________________________________________________________
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 1/30
 - 4s - loss: 9.0561 - acc: 0.7927 - val_loss: 0.9556 - val_acc: 0.6539

Epoch 2/30
 - 2s - loss: 0.5720 - acc: 0.8528 - val_loss: 0.7999 - val_acc: 0.7262

Epoch 3/30
 - 2s - loss: 0.5121 - acc: 0.8662 - val_loss: 0.6739 - val_acc: 0.8198

Epoch 4/30
 - 2s - loss: 0.4964 - acc: 0.8687 - val_loss: 0.6360 - val_acc: 0.8351

Epoch 5/30
 - 2s - loss: 0.4683 - acc: 0.8806 - val_loss: 0.6358 - val_acc: 0.8432

Epoch 6/30
 - 2s - loss: 0.4484 - acc: 0.8830 - val_loss: 0.7709 - val_acc: 0.7296

Epoch 7/30
 - 2s - loss: 0.4497 - acc: 0.8845 - val_loss: 0.5102 - val_acc: 0.8711

Epoch 8/30
 - 2s - loss: 0.4431 - acc: 0.8925 - val_loss: 0.5591 - val_acc: 0.8660

Epoch 9/30
 - 2s - loss: 0.4307 - acc: 0.8902 - val_loss: 0.5418 - val_acc: 0.8619

Epoch 10/30
 - 2s - loss: 0.4090 - acc: 0.8966 - val_loss: 0.5961 - val_acc: 0.8446

Epoch 11/30
 - 2s - loss: 0.3947 - acc: 0.9011 - val_loss: 0.5866 - val_acc: 0.8534
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 - 2s - loss: 0.3947 - acc: 0.9011 - val_loss: 0.5866 - val_acc: 0.8554

Epoch 12/30
 - 2s - loss: 0.3869 - acc: 0.9026 - val_loss: 0.5938 - val_acc: 0.8422

Epoch 13/30
 - 2s - loss: 0.4024 - acc: 0.8988 - val_loss: 0.4989 - val_acc: 0.8314

Epoch 14/30
 - 2s - loss: 0.3701 - acc: 0.9047 - val_loss: 0.5419 - val_acc: 0.8704

Epoch 15/30
 - 3s - loss: 0.3836 - acc: 0.9052 - val_loss: 0.4744 - val_acc: 0.8789

Epoch 16/30
 - 3s - loss: 0.3982 - acc: 0.8987 - val_loss: 0.5953 - val_acc: 0.8171

Epoch 17/30
 - 2s - loss: 0.3671 - acc: 0.9032 - val_loss: 0.5794 - val_acc: 0.8073

Epoch 18/30
 - 2s - loss: 0.3533 - acc: 0.9090 - val_loss: 0.6222 - val_acc: 0.8124

Epoch 19/30
 - 2s - loss: 0.3735 - acc: 0.9025 - val_loss: 0.5419 - val_acc: 0.8643

Epoch 20/30
 - 2s - loss: 0.3564 - acc: 0.9071 - val_loss: 0.6048 - val_acc: 0.8442

Epoch 21/30
 - 2s - loss: 0.3487 - acc: 0.9105 - val_loss: 0.5288 - val_acc: 0.8527

Epoch 22/30
 - 2s - loss: 0.3397 - acc: 0.9110 - val_loss: 0.5303 - val_acc: 0.8436

Epoch 23/30
 - 2s - loss: 0.3673 - acc: 0.9061 - val_loss: 0.5318 - val_acc: 0.8198

Epoch 24/30
 - 2s - loss: 0.3574 - acc: 0.9079 - val_loss: 0.4641 - val_acc: 0.8571

Epoch 25/30
 - 2s - loss: 0.3476 - acc: 0.9117 - val_loss: 0.5421 - val_acc: 0.8612

Epoch 26/30
 - 2s - loss: 0.3210 - acc: 0.9195 - val_loss: 0.4578 - val_acc: 0.8738

Epoch 27/30
 - 2s - loss: 0.3544 - acc: 0.9119 - val_loss: 0.4944 - val_acc: 0.8799

Epoch 28/30
 - 2s - loss: 0.3448 - acc: 0.9113 - val_loss: 0.5583 - val_acc: 0.8636

Epoch 29/30
 - 2s - loss: 0.3455 - acc: 0.9151 - val_loss: 0.4581 - val_acc: 0.8738

Epoch 30/30
 - 2s - loss: 0.3250 - acc: 0.9155 - val_loss: 0.5488 - val_acc: 0.8388

Train accuracy
0.914309031491181
Test accuracy:
0.8388191381065491
_________________________________________________________________
Model: "sequential_56"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_111 (Conv1D)          (None, 124, 42)           1932
_________________________________________________________________
conv1d_112 (Conv1D)          (None, 118, 32)           9440
_________________________________________________________________
dropout_56 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_56 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_56 (Flatten)         (None, 1248)              0
```

```
_________________________________________________________________
dense_111 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_112 (Dense)            (None, 6)                 198
=================================================================
Total params: 51,538
Trainable params: 51,538
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 18.1718 - acc: 0.7533 - val_loss: 3.2455 - val_acc: 0.8456

Epoch 2/25
 - 2s - loss: 1.1761 - acc: 0.9003 - val_loss: 0.8311 - val_acc: 0.8819

Epoch 3/25
 - 3s - loss: 0.4343 - acc: 0.9211 - val_loss: 0.6407 - val_acc: 0.8873

Epoch 4/25
 - 2s - loss: 0.3762 - acc: 0.9221 - val_loss: 0.6331 - val_acc: 0.8480

Epoch 5/25
 - 2s - loss: 0.3335 - acc: 0.9291 - val_loss: 0.5490 - val_acc: 0.8968

Epoch 6/25
 - 2s - loss: 0.2971 - acc: 0.9343 - val_loss: 0.5404 - val_acc: 0.8517

Epoch 7/25
 - 2s - loss: 0.2925 - acc: 0.9313 - val_loss: 0.4737 - val_acc: 0.8972

Epoch 8/25
 - 2s - loss: 0.2650 - acc: 0.9376 - val_loss: 0.4760 - val_acc: 0.9006

Epoch 9/25
 - 3s - loss: 0.2644 - acc: 0.9359 - val_loss: 0.4507 - val_acc: 0.8921

Epoch 10/25
 - 2s - loss: 0.2643 - acc: 0.9331 - val_loss: 0.5570 - val_acc: 0.8293

Epoch 11/25
 - 2s - loss: 0.2498 - acc: 0.9381 - val_loss: 0.4121 - val_acc: 0.9057

Epoch 12/25
 - 2s - loss: 0.2374 - acc: 0.9391 - val_loss: 0.4228 - val_acc: 0.8992

Epoch 13/25
 - 2s - loss: 0.2413 - acc: 0.9369 - val_loss: 0.4768 - val_acc: 0.8497

Epoch 14/25
 - 2s - loss: 0.2341 - acc: 0.9402 - val_loss: 0.4177 - val_acc: 0.9121

Epoch 15/25
 - 2s - loss: 0.2355 - acc: 0.9377 - val_loss: 0.4574 - val_acc: 0.8639

Epoch 16/25
 - 3s - loss: 0.2221 - acc: 0.9408 - val_loss: 0.3931 - val_acc: 0.8826

Epoch 17/25
 - 2s - loss: 0.2306 - acc: 0.9399 - val_loss: 0.4100 - val_acc: 0.8999

Epoch 18/25
 - 2s - loss: 0.2136 - acc: 0.9416 - val_loss: 0.3842 - val_acc: 0.8945

Epoch 19/25
 - 2s - loss: 0.2265 - acc: 0.9363 - val_loss: 0.3758 - val_acc: 0.8989

Epoch 20/25
 - 2s - loss: 0.2107 - acc: 0.9429 - val_loss: 0.3703 - val_acc: 0.8941

Epoch 21/25
 - 2s - loss: 0.2214 - acc: 0.9396 - val_loss: 0.3905 - val_acc: 0.8823

Epoch 22/25
 - 2s - loss: 0.2056 - acc: 0.9426 - val_loss: 0.3853 - val_acc: 0.8839

Epoch 23/25
```

```
Epoch 23/25
 - 2s - loss: 0.2054 - acc: 0.9423 - val_loss: 0.3443 - val_acc: 0.8979

Epoch 24/25
 - 2s - loss: 0.2022 - acc: 0.9433 - val_loss: 0.3830 - val_acc: 0.8707

Epoch 25/25
 - 2s - loss: 0.2118 - acc: 0.9414 - val_loss: 0.3785 - val_acc: 0.8870

Train accuracy
0.940968443960827
Test accuracy:
0.8870037326094333
--------------------------------------------------------------------------------
Model: "sequential_57"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_113 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_114 (Conv1D)          (None, 122, 24)           2328
_________________________________________________________________
dropout_57 (Dropout)         (None, 122, 24)           0
_________________________________________________________________
max_pooling1d_57 (MaxPooling (None, 40, 24)            0
_________________________________________________________________
flatten_57 (Flatten)         (None, 960)               0
_________________________________________________________________
dense_113 (Dense)            (None, 64)                61504
_________________________________________________________________
dense_114 (Dense)            (None, 6)                 390
=================================================================
Total params: 65,694
Trainable params: 65,694
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 27.0947 - acc: 0.7276 - val_loss: 4.7909 - val_acc: 0.7849

Epoch 2/25
 - 1s - loss: 1.8037 - acc: 0.8449 - val_loss: 0.9813 - val_acc: 0.7838

Epoch 3/25
 - 1s - loss: 0.5849 - acc: 0.8798 - val_loss: 0.7526 - val_acc: 0.8582

Epoch 4/25
 - 1s - loss: 0.4904 - acc: 0.8894 - val_loss: 0.6847 - val_acc: 0.8711

Epoch 5/25
 - 1s - loss: 0.4548 - acc: 0.8932 - val_loss: 0.6519 - val_acc: 0.8378

Epoch 6/25
 - 1s - loss: 0.4320 - acc: 0.8987 - val_loss: 0.6154 - val_acc: 0.8595

Epoch 7/25
 - 1s - loss: 0.4537 - acc: 0.8970 - val_loss: 0.6132 - val_acc: 0.8911

Epoch 8/25
 - 1s - loss: 0.3926 - acc: 0.9093 - val_loss: 0.5652 - val_acc: 0.8677

Epoch 9/25
 - 1s - loss: 0.3878 - acc: 0.9063 - val_loss: 0.5407 - val_acc: 0.8850

Epoch 10/25
 - 1s - loss: 0.3538 - acc: 0.9127 - val_loss: 0.5630 - val_acc: 0.8772

Epoch 11/25
 - 1s - loss: 0.3484 - acc: 0.9128 - val_loss: 0.5195 - val_acc: 0.8816

Epoch 12/25
 - 1s - loss: 0.3266 - acc: 0.9221 - val_loss: 0.5222 - val_acc: 0.8850

Epoch 13/25
 - 1s - loss: 0.3446 - acc: 0.9169 - val_loss: 0.4971 - val_acc: 0.8867

Epoch 14/25
```

```
Epoch 14/25
 - 1s - loss: 0.3127 - acc: 0.9260 - val_loss: 0.4917 - val_acc: 0.9013

Epoch 15/25
 - 1s - loss: 0.3139 - acc: 0.9233 - val_loss: 0.4675 - val_acc: 0.8901

Epoch 16/25
 - 1s - loss: 0.3283 - acc: 0.9176 - val_loss: 0.4796 - val_acc: 0.8785

Epoch 17/25
 - 1s - loss: 0.2935 - acc: 0.9286 - val_loss: 0.4853 - val_acc: 0.8751

Epoch 18/25
 - 1s - loss: 0.2977 - acc: 0.9271 - val_loss: 0.4327 - val_acc: 0.8843

Epoch 19/25
 - 1s - loss: 0.3138 - acc: 0.9214 - val_loss: 0.4464 - val_acc: 0.8897

Epoch 20/25
 - 1s - loss: 0.2985 - acc: 0.9242 - val_loss: 0.4360 - val_acc: 0.8894

Epoch 21/25
 - 1s - loss: 0.3023 - acc: 0.9221 - val_loss: 0.5393 - val_acc: 0.8449

Epoch 22/25
 - 1s - loss: 0.3089 - acc: 0.9266 - val_loss: 0.4188 - val_acc: 0.8921

Epoch 23/25
 - 1s - loss: 0.2826 - acc: 0.9263 - val_loss: 0.4429 - val_acc: 0.8968

Epoch 24/25
 - 1s - loss: 0.2629 - acc: 0.9350 - val_loss: 0.4202 - val_acc: 0.8914

Epoch 25/25
 - 1s - loss: 0.2844 - acc: 0.9285 - val_loss: 0.4739 - val_acc: 0.8646

Train accuracy
0.93430359085963
Test accuracy:
0.8646080760095012
_________________________________________________________________
Model: "sequential_58"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_115 (Conv1D)          (None, 126, 28)           784
_________________________________________________________________
conv1d_116 (Conv1D)          (None, 120, 16)           3152
_________________________________________________________________
dropout_58 (Dropout)         (None, 120, 16)           0
_________________________________________________________________
max_pooling1d_58 (MaxPooling (None, 40, 16)            0
_________________________________________________________________
flatten_58 (Flatten)         (None, 640)               0
_________________________________________________________________
dense_115 (Dense)            (None, 32)                20512
_________________________________________________________________
dense_116 (Dense)            (None, 6)                 198
=================================================================
Total params: 24,646
Trainable params: 24,646
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 3s - loss: 13.9473 - acc: 0.7417 - val_loss: 1.2580 - val_acc: 0.8480

Epoch 2/35
 - 1s - loss: 0.6523 - acc: 0.8414 - val_loss: 0.8202 - val_acc: 0.7638

Epoch 3/35
 - 1s - loss: 0.4820 - acc: 0.8776 - val_loss: 0.6457 - val_acc: 0.8649

Epoch 4/35
 - 2s - loss: 0.4093 - acc: 0.8984 - val_loss: 0.7390 - val_acc: 0.7567
```

```
Epoch 5/35
 - 1s - loss: 0.3732 - acc: 0.9089 - val_loss: 0.5220 - val_acc: 0.8962

Epoch 6/35
 - 1s - loss: 0.3512 - acc: 0.9151 - val_loss: 0.5889 - val_acc: 0.8459

Epoch 7/35
 - 1s - loss: 0.3351 - acc: 0.9140 - val_loss: 0.4746 - val_acc: 0.8772

Epoch 8/35
 - 1s - loss: 0.3265 - acc: 0.9149 - val_loss: 0.4673 - val_acc: 0.8945

Epoch 9/35
 - 1s - loss: 0.3201 - acc: 0.9196 - val_loss: 0.4586 - val_acc: 0.8772

Epoch 10/35
 - 1s - loss: 0.3148 - acc: 0.9174 - val_loss: 0.7073 - val_acc: 0.7628

Epoch 11/35
 - 1s - loss: 0.3039 - acc: 0.9237 - val_loss: 0.5948 - val_acc: 0.7937

Epoch 12/35
 - 1s - loss: 0.2968 - acc: 0.9253 - val_loss: 0.4155 - val_acc: 0.8948

Epoch 13/35
 - 1s - loss: 0.2956 - acc: 0.9237 - val_loss: 0.4314 - val_acc: 0.8633

Epoch 14/35
 - 1s - loss: 0.2854 - acc: 0.9276 - val_loss: 0.4930 - val_acc: 0.8422

Epoch 15/35
 - 1s - loss: 0.2867 - acc: 0.9244 - val_loss: 0.4835 - val_acc: 0.8476

Epoch 16/35
 - 1s - loss: 0.2850 - acc: 0.9215 - val_loss: 0.4059 - val_acc: 0.8707

Epoch 17/35
 - 1s - loss: 0.2814 - acc: 0.9233 - val_loss: 0.4891 - val_acc: 0.8426

Epoch 18/35
 - 1s - loss: 0.2722 - acc: 0.9272 - val_loss: 0.4717 - val_acc: 0.8792

Epoch 19/35
 - 1s - loss: 0.2760 - acc: 0.9285 - val_loss: 0.4439 - val_acc: 0.8646

Epoch 20/35
 - 1s - loss: 0.2718 - acc: 0.9274 - val_loss: 0.4155 - val_acc: 0.8622

Epoch 21/35
 - 1s - loss: 0.2659 - acc: 0.9274 - val_loss: 0.4246 - val_acc: 0.8636

Epoch 22/35
 - 1s - loss: 0.2763 - acc: 0.9285 - val_loss: 0.3573 - val_acc: 0.8853

Epoch 23/35
 - 1s - loss: 0.2778 - acc: 0.9271 - val_loss: 0.3629 - val_acc: 0.9026

Epoch 24/35
 - 1s - loss: 0.2616 - acc: 0.9298 - val_loss: 0.3457 - val_acc: 0.9070

Epoch 25/35
 - 1s - loss: 0.2720 - acc: 0.9275 - val_loss: 0.4179 - val_acc: 0.8744

Epoch 26/35
 - 1s - loss: 0.2677 - acc: 0.9276 - val_loss: 0.3874 - val_acc: 0.8860

Epoch 27/35
 - 1s - loss: 0.2577 - acc: 0.9295 - val_loss: 0.3573 - val_acc: 0.8985

Epoch 28/35
 - 1s - loss: 0.2637 - acc: 0.9294 - val_loss: 0.4057 - val_acc: 0.8758

Epoch 29/35
 - 1s - loss: 0.2546 - acc: 0.9293 - val_loss: 0.3865 - val_acc: 0.8724

Epoch 30/35
 - 1s - loss: 0.2563 - acc: 0.9305 - val_loss: 0.3455 - val_acc: 0.9013
```

```
Epoch 31/35
 - 1s - loss: 0.2557 - acc: 0.9272 - val_loss: 0.3702 - val_acc: 0.8741

Epoch 32/35
 - 1s - loss: 0.2594 - acc: 0.9308 - val_loss: 0.3832 - val_acc: 0.8639

Epoch 33/35
 - 1s - loss: 0.2618 - acc: 0.9289 - val_loss: 0.3728 - val_acc: 0.8887

Epoch 34/35
 - 1s - loss: 0.2557 - acc: 0.9313 - val_loss: 0.3666 - val_acc: 0.8751

Epoch 35/35
 - 1s - loss: 0.2569 - acc: 0.9305 - val_loss: 0.3565 - val_acc: 0.8856

Train accuracy
0.9314472252448314
Test accuracy:
0.8856464200882254
--------------------------------------------------------------------------------
Model: "sequential_59"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_117 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_118 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_59 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_59 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_59 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_117 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_118 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 14.8563 - acc: 0.7558 - val_loss: 1.0088 - val_acc: 0.8083

Epoch 2/25
 - 1s - loss: 0.6092 - acc: 0.8562 - val_loss: 0.8193 - val_acc: 0.8249

Epoch 3/25
 - 1s - loss: 0.4962 - acc: 0.8823 - val_loss: 0.8367 - val_acc: 0.8212

Epoch 4/25
 - 1s - loss: 0.4881 - acc: 0.8764 - val_loss: 0.7496 - val_acc: 0.8442

Epoch 5/25
 - 1s - loss: 0.4526 - acc: 0.8883 - val_loss: 0.6641 - val_acc: 0.8870

Epoch 6/25
 - 1s - loss: 0.4047 - acc: 0.8996 - val_loss: 0.6200 - val_acc: 0.8405

Epoch 7/25
 - 1s - loss: 0.4376 - acc: 0.8893 - val_loss: 0.6317 - val_acc: 0.8466

Epoch 8/25
 - 1s - loss: 0.3847 - acc: 0.9044 - val_loss: 0.6286 - val_acc: 0.8504

Epoch 9/25
 - 1s - loss: 0.3922 - acc: 0.9032 - val_loss: 0.5702 - val_acc: 0.8656

Epoch 10/25
 - 1s - loss: 0.3779 - acc: 0.9004 - val_loss: 0.5879 - val_acc: 0.8490

Epoch 11/25
 - 1s - loss: 0.3617 - acc: 0.9066 - val_loss: 0.5705 - val_acc: 0.8578
```

```
Epoch 12/25
 - 1s - loss: 0.3767 - acc: 0.9037 - val_loss: 0.5929 - val_acc: 0.8392

Epoch 13/25
 - 1s - loss: 0.3685 - acc: 0.9051 - val_loss: 0.5030 - val_acc: 0.8856

Epoch 14/25
 - 1s - loss: 0.3257 - acc: 0.9159 - val_loss: 0.4877 - val_acc: 0.9006

Epoch 15/25
 - 1s - loss: 0.3463 - acc: 0.9112 - val_loss: 0.5020 - val_acc: 0.8575

Epoch 16/25
 - 1s - loss: 0.3470 - acc: 0.9100 - val_loss: 0.5976 - val_acc: 0.8215

Epoch 17/25
 - 1s - loss: 0.3279 - acc: 0.9168 - val_loss: 0.5157 - val_acc: 0.8714

Epoch 18/25
 - 1s - loss: 0.3237 - acc: 0.9178 - val_loss: 0.4473 - val_acc: 0.8856

Epoch 19/25
 - 1s - loss: 0.3277 - acc: 0.9161 - val_loss: 0.4711 - val_acc: 0.8806

Epoch 20/25
 - 1s - loss: 0.3040 - acc: 0.9185 - val_loss: 0.4614 - val_acc: 0.8870

Epoch 21/25
 - 1s - loss: 0.3295 - acc: 0.9149 - val_loss: 0.5597 - val_acc: 0.8453

Epoch 22/25
 - 1s - loss: 0.3385 - acc: 0.9125 - val_loss: 0.4397 - val_acc: 0.9009

Epoch 23/25
 - 1s - loss: 0.3153 - acc: 0.9192 - val_loss: 0.4494 - val_acc: 0.8772

Epoch 24/25
 - 1s - loss: 0.3227 - acc: 0.9207 - val_loss: 0.4486 - val_acc: 0.8741

Epoch 25/25
 - 1s - loss: 0.3447 - acc: 0.9144 - val_loss: 0.5441 - val_acc: 0.8409

Train accuracy
0.8939064200217628
Test accuracy:
0.8408551068883611
--------------------------------------------------------------------------------
Model: "sequential_60"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_119 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_120 (Conv1D)          (None, 120, 32)           5152
_________________________________________________________________
dropout_60 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_60 (MaxPooling (None, 60, 32)            0
_________________________________________________________________
flatten_60 (Flatten)         (None, 1920)              0
_________________________________________________________________
dense_119 (Dense)            (None, 32)                61472
_________________________________________________________________
dense_120 (Dense)            (None, 6)                 198
=================================================================
Total params: 68,294
Trainable params: 68,294
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 22.3134 - acc: 0.7779 - val_loss: 0.9026 - val_acc: 0.7984

Epoch 2/30
 - 2s - loss: 0.5483 - acc: 0.8758 - val_loss: 0.7864 - val_acc: 0.7662
```

```
Epoch 3/30
 - 2s - loss: 0.4530 - acc: 0.8951 - val_loss: 0.6020 - val_acc: 0.8768

Epoch 4/30
 - 2s - loss: 0.4031 - acc: 0.9066 - val_loss: 0.6451 - val_acc: 0.8358

Epoch 5/30
 - 3s - loss: 0.3917 - acc: 0.9061 - val_loss: 0.5355 - val_acc: 0.8816

Epoch 6/30
 - 3s - loss: 0.3565 - acc: 0.9108 - val_loss: 0.5415 - val_acc: 0.8595

Epoch 7/30
 - 4s - loss: 0.3437 - acc: 0.9157 - val_loss: 0.5186 - val_acc: 0.8765

Epoch 8/30
 - 3s - loss: 0.3240 - acc: 0.9180 - val_loss: 0.5131 - val_acc: 0.8761

Epoch 9/30
 - 3s - loss: 0.3249 - acc: 0.9199 - val_loss: 0.4705 - val_acc: 0.8616

Epoch 10/30
 - 3s - loss: 0.3185 - acc: 0.9165 - val_loss: 0.6473 - val_acc: 0.7940

Epoch 11/30
 - 3s - loss: 0.3009 - acc: 0.9225 - val_loss: 0.4408 - val_acc: 0.8867

Epoch 12/30
 - 2s - loss: 0.3058 - acc: 0.9191 - val_loss: 0.4198 - val_acc: 0.9013

Epoch 13/30
 - 2s - loss: 0.3032 - acc: 0.9219 - val_loss: 0.4013 - val_acc: 0.9040

Epoch 14/30
 - 2s - loss: 0.3052 - acc: 0.9173 - val_loss: 0.4819 - val_acc: 0.8738

Epoch 15/30
 - 2s - loss: 0.2870 - acc: 0.9240 - val_loss: 0.6237 - val_acc: 0.8049

Epoch 16/30
 - 2s - loss: 0.2970 - acc: 0.9234 - val_loss: 0.4004 - val_acc: 0.8836

Epoch 17/30
 - 2s - loss: 0.2800 - acc: 0.9248 - val_loss: 0.3836 - val_acc: 0.9043

Epoch 18/30
 - 3s - loss: 0.2806 - acc: 0.9279 - val_loss: 0.3913 - val_acc: 0.8941

Epoch 19/30
 - 2s - loss: 0.2858 - acc: 0.9251 - val_loss: 0.4104 - val_acc: 0.9009

Epoch 20/30
 - 2s - loss: 0.2651 - acc: 0.9310 - val_loss: 0.3797 - val_acc: 0.8853

Epoch 21/30
 - 2s - loss: 0.2805 - acc: 0.9242 - val_loss: 0.4209 - val_acc: 0.8955

Epoch 22/30
 - 2s - loss: 0.2778 - acc: 0.9275 - val_loss: 0.3884 - val_acc: 0.9077

Epoch 23/30
 - 3s - loss: 0.2748 - acc: 0.9261 - val_loss: 0.3710 - val_acc: 0.8982

Epoch 24/30
 - 3s - loss: 0.2721 - acc: 0.9308 - val_loss: 0.4097 - val_acc: 0.8799

Epoch 25/30
 - 2s - loss: 0.2699 - acc: 0.9287 - val_loss: 0.3578 - val_acc: 0.9053

Epoch 26/30
 - 3s - loss: 0.2595 - acc: 0.9306 - val_loss: 0.4055 - val_acc: 0.8843

Epoch 27/30
 - 3s - loss: 0.2591 - acc: 0.9290 - val_loss: 0.3600 - val_acc: 0.9057

Epoch 28/30
```

```
 - 3s - loss: 0.2637 - acc: 0.9309 - val_loss: 0.3346 - val_acc: 0.9111

Epoch 29/30
 - 3s - loss: 0.2614 - acc: 0.9306 - val_loss: 0.3979 - val_acc: 0.8799

Epoch 30/30
 - 3s - loss: 0.2542 - acc: 0.9324 - val_loss: 0.3588 - val_acc: 0.9002

Train accuracy
0.9382480957562568
Test accuracy:
0.9002375296912114
_________________________________________________________________________________
Model: "sequential_61"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_121 (Conv1D)          (None, 122, 28)           1792
_________________________________________________________________
conv1d_122 (Conv1D)          (None, 120, 32)           2720
_________________________________________________________________
dropout_61 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_61 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_61 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_121 (Dense)            (None, 64)                81984
_________________________________________________________________
dense_122 (Dense)            (None, 6)                 390
=================================================================
Total params: 86,886
Trainable params: 86,886
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 10.5136 - acc: 0.8164 - val_loss: 0.8200 - val_acc: 0.8079

Epoch 2/25
 - 4s - loss: 0.5200 - acc: 0.8856 - val_loss: 0.7614 - val_acc: 0.7974

Epoch 3/25
 - 4s - loss: 0.4625 - acc: 0.8947 - val_loss: 0.6581 - val_acc: 0.8728

Epoch 4/25
 - 3s - loss: 0.3994 - acc: 0.9047 - val_loss: 0.6273 - val_acc: 0.8660

Epoch 5/25
 - 2s - loss: 0.3833 - acc: 0.9052 - val_loss: 0.6006 - val_acc: 0.8531

Epoch 6/25
 - 2s - loss: 0.3631 - acc: 0.9146 - val_loss: 0.5615 - val_acc: 0.8785

Epoch 7/25
 - 3s - loss: 0.3338 - acc: 0.9170 - val_loss: 0.4855 - val_acc: 0.9033

Epoch 8/25
 - 2s - loss: 0.3305 - acc: 0.9187 - val_loss: 0.5693 - val_acc: 0.8792

Epoch 9/25
 - 3s - loss: 0.3283 - acc: 0.9187 - val_loss: 0.4997 - val_acc: 0.8731

Epoch 10/25
 - 4s - loss: 0.3076 - acc: 0.9211 - val_loss: 0.6644 - val_acc: 0.8137

Epoch 11/25
 - 3s - loss: 0.3057 - acc: 0.9266 - val_loss: 0.4107 - val_acc: 0.8972

Epoch 12/25
 - 3s - loss: 0.2886 - acc: 0.9297 - val_loss: 0.5034 - val_acc: 0.8656

Epoch 13/25
 - 3s - loss: 0.2861 - acc: 0.9282 - val_loss: 0.5014 - val_acc: 0.8524

Epoch 14/25
```

```
 - 3s - loss: 0.2895 - acc: 0.9266 - val_loss: 0.5494 - val_acc: 0.8395

Epoch 15/25
 - 2s - loss: 0.3039 - acc: 0.9211 - val_loss: 0.5817 - val_acc: 0.8459

Epoch 16/25
 - 2s - loss: 0.2620 - acc: 0.9362 - val_loss: 0.4063 - val_acc: 0.8935

Epoch 17/25
 - 3s - loss: 0.2623 - acc: 0.9325 - val_loss: 0.3987 - val_acc: 0.9019

Epoch 18/25
 - 2s - loss: 0.2784 - acc: 0.9316 - val_loss: 0.4091 - val_acc: 0.8918

Epoch 19/25
 - 2s - loss: 0.2799 - acc: 0.9272 - val_loss: 0.4772 - val_acc: 0.8714

Epoch 20/25
 - 2s - loss: 0.2627 - acc: 0.9320 - val_loss: 0.3694 - val_acc: 0.9084

Epoch 21/25
 - 2s - loss: 0.2648 - acc: 0.9289 - val_loss: 0.5907 - val_acc: 0.8276

Epoch 22/25
 - 2s - loss: 0.2479 - acc: 0.9353 - val_loss: 0.4004 - val_acc: 0.8860

Epoch 23/25
 - 2s - loss: 0.2621 - acc: 0.9313 - val_loss: 0.4084 - val_acc: 0.8853

Epoch 24/25
 - 2s - loss: 0.2701 - acc: 0.9287 - val_loss: 0.4191 - val_acc: 0.8938

Epoch 25/25
 - 2s - loss: 0.2476 - acc: 0.9338 - val_loss: 0.4210 - val_acc: 0.8775

Train accuracy
0.9091403699673558
Test accuracy:
0.8775025449609772
_________________________________________________________________________________________
Model: "sequential_62"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_123 (Conv1D)          (None, 124, 42)           1932
_________________________________________________________________
conv1d_124 (Conv1D)          (None, 118, 24)           7080
_________________________________________________________________
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, 32)                29984
_________________________________________________________________
dense_124 (Dense)            (None, 6)                 198
=================================================================
Total params: 39,194
Trainable params: 39,194
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 3.5778 - acc: 0.8021 - val_loss: 0.8284 - val_acc: 0.8680

Epoch 2/25
 - 1s - loss: 0.5585 - acc: 0.9170 - val_loss: 0.6094 - val_acc: 0.8856

Epoch 3/25
 - 1s - loss: 0.3876 - acc: 0.9343 - val_loss: 0.5397 - val_acc: 0.8965

Epoch 4/25
 - 1s - loss: 0.3115 - acc: 0.9381 - val_loss: 0.4608 - val_acc: 0.9026

Epoch 5/25
```

```
 -
 - 1s - loss: 0.2898 - acc: 0.9365 - val_loss: 0.6821 - val_acc: 0.8409

Epoch 6/25
 - 1s - loss: 0.2634 - acc: 0.9406 - val_loss: 0.4019 - val_acc: 0.8924

Epoch 7/25
 - 1s - loss: 0.2758 - acc: 0.9411 - val_loss: 0.3485 - val_acc: 0.9141

Epoch 8/25
 - 1s - loss: 0.2262 - acc: 0.9444 - val_loss: 0.3402 - val_acc: 0.9206

Epoch 9/25
 - 1s - loss: 0.2308 - acc: 0.9422 - val_loss: 0.3199 - val_acc: 0.9169

Epoch 10/25
 - 1s - loss: 0.2246 - acc: 0.9412 - val_loss: 0.4269 - val_acc: 0.9118

Epoch 11/25
 - 1s - loss: 0.2057 - acc: 0.9468 - val_loss: 0.3331 - val_acc: 0.9186

Epoch 12/25
 - 1s - loss: 0.2543 - acc: 0.9381 - val_loss: 0.3241 - val_acc: 0.9138

Epoch 13/25
 - 1s - loss: 0.1984 - acc: 0.9460 - val_loss: 0.3238 - val_acc: 0.9131

Epoch 14/25
 - 1s - loss: 0.1893 - acc: 0.9486 - val_loss: 0.3267 - val_acc: 0.9199

Epoch 15/25
 - 1s - loss: 0.1861 - acc: 0.9470 - val_loss: 0.3153 - val_acc: 0.9135

Epoch 16/25
 - 1s - loss: 0.1871 - acc: 0.9463 - val_loss: 0.3379 - val_acc: 0.9043

Epoch 17/25
 - 1s - loss: 0.1888 - acc: 0.9460 - val_loss: 0.3376 - val_acc: 0.9213

Epoch 18/25
 - 1s - loss: 0.1845 - acc: 0.9490 - val_loss: 0.3118 - val_acc: 0.9118

Epoch 19/25
 - 1s - loss: 0.1718 - acc: 0.9491 - val_loss: 0.3482 - val_acc: 0.9030

Epoch 20/25
 - 1s - loss: 0.1931 - acc: 0.9449 - val_loss: 0.3390 - val_acc: 0.9080

Epoch 21/25
 - 1s - loss: 0.1959 - acc: 0.9452 - val_loss: 0.3515 - val_acc: 0.9094

Epoch 22/25
 - 1s - loss: 0.1917 - acc: 0.9474 - val_loss: 0.3479 - val_acc: 0.8945

Epoch 23/25
 - 1s - loss: 0.1643 - acc: 0.9499 - val_loss: 0.2932 - val_acc: 0.9138

Epoch 24/25
 - 1s - loss: 0.1674 - acc: 0.9483 - val_loss: 0.3018 - val_acc: 0.9087

Epoch 25/25
 - 1s - loss: 0.1725 - acc: 0.9486 - val_loss: 0.3528 - val_acc: 0.9026

Train accuracy
0.9428726877040261
Test accuracy:
0.9026128266033254
_________________________________________________________________
Model: "sequential_63"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_125 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_126 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_63 (Dropout)         (None, 118, 32)           0
```

```
_________________________________________________________________
max_pooling1d_63 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_63 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_125 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_126 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 3s - loss: 57.5110 - acc: 0.7554 - val_loss: 28.9256 - val_acc: 0.7357

Epoch 2/35
 - 1s - loss: 14.4107 - acc: 0.8768 - val_loss: 5.2600 - val_acc: 0.7547

Epoch 3/35
 - 1s - loss: 2.0067 - acc: 0.8836 - val_loss: 0.9052 - val_acc: 0.9030

Epoch 4/35
 - 1s - loss: 0.5486 - acc: 0.8930 - val_loss: 0.8705 - val_acc: 0.6773

Epoch 5/35
 - 1s - loss: 0.4464 - acc: 0.9011 - val_loss: 0.5948 - val_acc: 0.9023

Epoch 6/35
 - 1s - loss: 0.3853 - acc: 0.9128 - val_loss: 0.5673 - val_acc: 0.8561

Epoch 7/35
 - 1s - loss: 0.3518 - acc: 0.9184 - val_loss: 0.4953 - val_acc: 0.8928

Epoch 8/35
 - 1s - loss: 0.3324 - acc: 0.9211 - val_loss: 0.5119 - val_acc: 0.8761

Epoch 9/35
 - 1s - loss: 0.3166 - acc: 0.9259 - val_loss: 0.4605 - val_acc: 0.9046

Epoch 10/35
 - 1s - loss: 0.3074 - acc: 0.9246 - val_loss: 0.4635 - val_acc: 0.8962

Epoch 11/35
 - 1s - loss: 0.2964 - acc: 0.9287 - val_loss: 0.4295 - val_acc: 0.9026

Epoch 12/35
 - 1s - loss: 0.2829 - acc: 0.9290 - val_loss: 0.4295 - val_acc: 0.9057

Epoch 13/35
 - 1s - loss: 0.2813 - acc: 0.9287 - val_loss: 0.3974 - val_acc: 0.9057

Epoch 14/35
 - 1s - loss: 0.2725 - acc: 0.9301 - val_loss: 0.4789 - val_acc: 0.8711

Epoch 15/35
 - 1s - loss: 0.2746 - acc: 0.9331 - val_loss: 0.3964 - val_acc: 0.9019

Epoch 16/35
 - 1s - loss: 0.2636 - acc: 0.9316 - val_loss: 0.3843 - val_acc: 0.8887

Epoch 17/35
 - 1s - loss: 0.2574 - acc: 0.9334 - val_loss: 0.5682 - val_acc: 0.8544

Epoch 18/35
 - 1s - loss: 0.2609 - acc: 0.9328 - val_loss: 0.3883 - val_acc: 0.8975

Epoch 19/35
 - 1s - loss: 0.2484 - acc: 0.9339 - val_loss: 0.3685 - val_acc: 0.9002

Epoch 20/35
 - 1s - loss: 0.2520 - acc: 0.9317 - val_loss: 0.4852 - val_acc: 0.8347

Epoch 21/35
 - 1s - loss: 0.2421 - acc: 0.9359 - val_loss: 0.3697 - val_acc: 0.8965
```

```
Epoch 22/35
 - 1s - loss: 0.2413 - acc: 0.9348 - val_loss: 0.3462 - val_acc: 0.9080

Epoch 23/35
 - 1s - loss: 0.2493 - acc: 0.9320 - val_loss: 0.4333 - val_acc: 0.8500

Epoch 24/35
 - 1s - loss: 0.2367 - acc: 0.9396 - val_loss: 0.9772 - val_acc: 0.6498

Epoch 25/35
 - 1s - loss: 0.2393 - acc: 0.9327 - val_loss: 0.3645 - val_acc: 0.9040

Epoch 26/35
 - 1s - loss: 0.2403 - acc: 0.9344 - val_loss: 0.3874 - val_acc: 0.9013

Epoch 27/35
 - 1s - loss: 0.2352 - acc: 0.9376 - val_loss: 0.6746 - val_acc: 0.7428

Epoch 28/35
 - 1s - loss: 0.2360 - acc: 0.9396 - val_loss: 0.4436 - val_acc: 0.8731

Epoch 29/35
 - 1s - loss: 0.2337 - acc: 0.9346 - val_loss: 0.3654 - val_acc: 0.9063

Epoch 30/35
 - 1s - loss: 0.2360 - acc: 0.9361 - val_loss: 0.3268 - val_acc: 0.8989

Epoch 31/35
 - 1s - loss: 0.2379 - acc: 0.9358 - val_loss: 0.3604 - val_acc: 0.8816

Epoch 32/35
 - 1s - loss: 0.2281 - acc: 0.9374 - val_loss: 0.3485 - val_acc: 0.8918

Epoch 33/35
 - 1s - loss: 0.2339 - acc: 0.9359 - val_loss: 0.5542 - val_acc: 0.8022

Epoch 34/35
 - 1s - loss: 0.2335 - acc: 0.9340 - val_loss: 0.3375 - val_acc: 0.9009

Epoch 35/35
 - 1s - loss: 0.2266 - acc: 0.9362 - val_loss: 0.3532 - val_acc: 0.8982

Train accuracy
0.9390642001527697
Test accuracy:
0.8982015609093994
--------------------------------------------------------------------------------
Model: "sequential_64"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_127 (Conv1D)          (None, 126, 28)           784
_________________________________________________________________
conv1d_128 (Conv1D)          (None, 124, 16)           1360
_________________________________________________________________
dropout_64 (Dropout)         (None, 124, 16)           0
_________________________________________________________________
max_pooling1d_64 (MaxPooling (None, 62, 16)            0
_________________________________________________________________
flatten_64 (Flatten)         (None, 992)               0
_________________________________________________________________
dense_127 (Dense)            (None, 64)                63552
_________________________________________________________________
dense_128 (Dense)            (None, 6)                 390
=================================================================
Total params: 66,086
Trainable params: 66,086
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 17.7435 - acc: 0.7405 - val_loss: 1.1275 - val_acc: 0.7316

Epoch 2/25
 - 2s - loss: 0.7049 - acc: 0.8263 - val_loss: 0.9080 - val_acc: 0.7218
```

```
Epoch 3/25
 - 2s - loss: 0.5905 - acc: 0.8504 - val_loss: 0.7365 - val_acc: 0.8266

Epoch 4/25
 - 2s - loss: 0.5667 - acc: 0.8478 - val_loss: 0.7987 - val_acc: 0.7988

Epoch 5/25
 - 2s - loss: 0.5134 - acc: 0.8641 - val_loss: 0.7112 - val_acc: 0.8130

Epoch 6/25
 - 2s - loss: 0.4748 - acc: 0.8813 - val_loss: 0.6961 - val_acc: 0.8154

Epoch 7/25
 - 2s - loss: 0.4462 - acc: 0.8862 - val_loss: 0.6406 - val_acc: 0.8351

Epoch 8/25
 - 2s - loss: 0.4564 - acc: 0.8792 - val_loss: 0.6199 - val_acc: 0.8307

Epoch 9/25
 - 2s - loss: 0.4302 - acc: 0.8852 - val_loss: 0.5596 - val_acc: 0.8521

Epoch 10/25
 - 2s - loss: 0.4249 - acc: 0.8857 - val_loss: 0.7167 - val_acc: 0.7859

Epoch 11/25
 - 2s - loss: 0.3996 - acc: 0.8976 - val_loss: 0.5639 - val_acc: 0.8609

Epoch 12/25
 - 2s - loss: 0.3832 - acc: 0.8992 - val_loss: 0.6824 - val_acc: 0.8018

Epoch 13/25
 - 3s - loss: 0.3755 - acc: 0.9002 - val_loss: 0.6067 - val_acc: 0.8354

Epoch 14/25
 - 3s - loss: 0.3833 - acc: 0.8999 - val_loss: 0.5214 - val_acc: 0.8361

Epoch 15/25
 - 3s - loss: 0.3609 - acc: 0.9052 - val_loss: 0.4654 - val_acc: 0.8711

Epoch 16/25
 - 3s - loss: 0.3550 - acc: 0.9097 - val_loss: 0.4936 - val_acc: 0.8402

Epoch 17/25
 - 2s - loss: 0.3585 - acc: 0.9074 - val_loss: 0.4843 - val_acc: 0.8683

Epoch 18/25
 - 2s - loss: 0.3420 - acc: 0.9128 - val_loss: 0.5870 - val_acc: 0.8195

Epoch 19/25
 - 2s - loss: 0.3479 - acc: 0.9082 - val_loss: 0.4751 - val_acc: 0.8819

Epoch 20/25
 - 2s - loss: 0.3406 - acc: 0.9128 - val_loss: 0.3935 - val_acc: 0.9002

Epoch 21/25
 - 3s - loss: 0.3302 - acc: 0.9158 - val_loss: 0.5514 - val_acc: 0.8269

Epoch 22/25
 - 2s - loss: 0.3206 - acc: 0.9155 - val_loss: 0.4950 - val_acc: 0.8473

Epoch 23/25
 - 2s - loss: 0.3274 - acc: 0.9159 - val_loss: 0.5898 - val_acc: 0.8039

Epoch 24/25
 - 3s - loss: 0.3159 - acc: 0.9217 - val_loss: 0.3999 - val_acc: 0.8819

Epoch 25/25
 - 4s - loss: 0.3097 - acc: 0.9147 - val_loss: 0.4912 - val_acc: 0.8551

Train accuracy
0.9134929270946681
Test accuracy:
0.8551068883610451
_________________________________________________________________________________
Model: "sequential_65"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
```

```
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_129 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_130 (Conv1D)          (None, 118, 32)           7200
_________________________________________________________________
dropout_65 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_65 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_65 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_129 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_130 (Dense)            (None, 6)                 198
=================================================================
Total params: 48,838
Trainable params: 48,838
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 7.7590 - acc: 0.6970 - val_loss: 0.8508 - val_acc: 0.7201

Epoch 2/30
 - 2s - loss: 0.6127 - acc: 0.8186 - val_loss: 0.8213 - val_acc: 0.7472

Epoch 3/30
 - 2s - loss: 0.5406 - acc: 0.8577 - val_loss: 0.6358 - val_acc: 0.8575

Epoch 4/30
 - 2s - loss: 0.4730 - acc: 0.8791 - val_loss: 0.5657 - val_acc: 0.8778

Epoch 5/30
 - 2s - loss: 0.4632 - acc: 0.8900 - val_loss: 0.5553 - val_acc: 0.8785

Epoch 6/30
 - 2s - loss: 0.4540 - acc: 0.8936 - val_loss: 0.6776 - val_acc: 0.8127

Epoch 7/30
 - 2s - loss: 0.3963 - acc: 0.9095 - val_loss: 0.5381 - val_acc: 0.8856

Epoch 8/30
 - 2s - loss: 0.4300 - acc: 0.8949 - val_loss: 0.6712 - val_acc: 0.8666

Epoch 9/30
 - 2s - loss: 0.4219 - acc: 0.9037 - val_loss: 0.5229 - val_acc: 0.8476

Epoch 10/30
 - 2s - loss: 0.4119 - acc: 0.9017 - val_loss: 0.5000 - val_acc: 0.8507

Epoch 11/30
 - 2s - loss: 0.3800 - acc: 0.9057 - val_loss: 0.5173 - val_acc: 0.8588

Epoch 12/30
 - 3s - loss: 0.3801 - acc: 0.9057 - val_loss: 0.6481 - val_acc: 0.8188

Epoch 13/30
 - 3s - loss: 0.4158 - acc: 0.9027 - val_loss: 0.6501 - val_acc: 0.7964

Epoch 14/30
 - 2s - loss: 0.3793 - acc: 0.9115 - val_loss: 0.5686 - val_acc: 0.8354

Epoch 15/30
 - 3s - loss: 0.3929 - acc: 0.9049 - val_loss: 0.4972 - val_acc: 0.8758

Epoch 16/30
 - 3s - loss: 0.3829 - acc: 0.9087 - val_loss: 0.4975 - val_acc: 0.8833

Epoch 17/30
 - 3s - loss: 0.3801 - acc: 0.9052 - val_loss: 0.5607 - val_acc: 0.8327

Epoch 18/30
 - 3s - loss: 0.3753 - acc: 0.9138 - val_loss: 0.5428 - val_acc: 0.8324

Epoch 19/30
 - 3s - loss: 0.3849 - acc: 0.9042 - val_loss: 0.4884 - val_acc: 0.8860
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```
 - 3s - loss: 0.3649 - acc: 0.9042 - val_loss: 0.4664 - val_acc: 0.8660

Epoch 20/30
 - 3s - loss: 0.3608 - acc: 0.9123 - val_loss: 0.4499 - val_acc: 0.8911

Epoch 21/30
 - 2s - loss: 0.3866 - acc: 0.9072 - val_loss: 0.6917 - val_acc: 0.7859

Epoch 22/30
 - 3s - loss: 0.3775 - acc: 0.9095 - val_loss: 0.5529 - val_acc: 0.8775

Epoch 23/30
 - 3s - loss: 0.4104 - acc: 0.9087 - val_loss: 0.5290 - val_acc: 0.8331

Epoch 24/30
 - 3s - loss: 0.3705 - acc: 0.9075 - val_loss: 0.4617 - val_acc: 0.8853

Epoch 25/30
 - 2s - loss: 0.3663 - acc: 0.9119 - val_loss: 0.4842 - val_acc: 0.8571

Epoch 26/30
 - 2s - loss: 0.3854 - acc: 0.9047 - val_loss: 0.8975 - val_acc: 0.7038

Epoch 27/30
 - 2s - loss: 0.3844 - acc: 0.9070 - val_loss: 0.5041 - val_acc: 0.8558

Epoch 28/30
 - 2s - loss: 0.3655 - acc: 0.9063 - val_loss: 0.4249 - val_acc: 0.8819

Epoch 29/30
 - 2s - loss: 0.3655 - acc: 0.9124 - val_loss: 0.4523 - val_acc: 0.8633

Epoch 30/30
 - 3s - loss: 0.3744 - acc: 0.9017 - val_loss: 0.4896 - val_acc: 0.8483

Train accuracy
0.9121327529923831
Test accuracy:
0.848320325755005
--------------------------------------------------------------------------------
Model: "sequential_66"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_131 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_132 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_66 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_66 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_66 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_131 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_132 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 5.8378 - acc: 0.8124 - val_loss: 1.0568 - val_acc: 0.8816

Epoch 2/25
 - 1s - loss: 0.4927 - acc: 0.9142 - val_loss: 0.6544 - val_acc: 0.8687

Epoch 3/25
 - 1s - loss: 0.3326 - acc: 0.9320 - val_loss: 0.5401 - val_acc: 0.9135

Epoch 4/25
 - 2s - loss: 0.3077 - acc: 0.9300 - val_loss: 0.4820 - val_acc: 0.8996

Epoch 5/25
 - 1s - loss: 0.3042 - acc: 0.9289 - val_loss: 0.4652 - val_acc: 0.8894
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```
 - 1s - loss: 0.3042 - acc: 0.9289 - val_loss: 0.4052 - val_acc: 0.8694

Epoch 6/25
 - 2s - loss: 0.2587 - acc: 0.9402 - val_loss: 0.4745 - val_acc: 0.8578

Epoch 7/25
 - 2s - loss: 0.2548 - acc: 0.9391 - val_loss: 0.4008 - val_acc: 0.8975

Epoch 8/25
 - 1s - loss: 0.2328 - acc: 0.9421 - val_loss: 0.4216 - val_acc: 0.8816

Epoch 9/25
 - 1s - loss: 0.2459 - acc: 0.9355 - val_loss: 0.4208 - val_acc: 0.8860

Epoch 10/25
 - 1s - loss: 0.2495 - acc: 0.9344 - val_loss: 0.4288 - val_acc: 0.8751

Epoch 11/25
 - 1s - loss: 0.2308 - acc: 0.9412 - val_loss: 0.3934 - val_acc: 0.8992

Epoch 12/25
 - 1s - loss: 0.2205 - acc: 0.9425 - val_loss: 0.3471 - val_acc: 0.9070

Epoch 13/25
 - 1s - loss: 0.2386 - acc: 0.9381 - val_loss: 0.4165 - val_acc: 0.8639

Epoch 14/25
 - 1s - loss: 0.2226 - acc: 0.9400 - val_loss: 0.3681 - val_acc: 0.9077

Epoch 15/25
 - 1s - loss: 0.2286 - acc: 0.9382 - val_loss: 0.3799 - val_acc: 0.9002

Epoch 16/25
 - 1s - loss: 0.2081 - acc: 0.9438 - val_loss: 0.3445 - val_acc: 0.8799

Epoch 17/25
 - 1s - loss: 0.2061 - acc: 0.9430 - val_loss: 0.3550 - val_acc: 0.9141

Epoch 18/25
 - 1s - loss: 0.2121 - acc: 0.9438 - val_loss: 0.3511 - val_acc: 0.8867

Epoch 19/25
 - 1s - loss: 0.2312 - acc: 0.9373 - val_loss: 0.3901 - val_acc: 0.8823

Epoch 20/25
 - 1s - loss: 0.2091 - acc: 0.9441 - val_loss: 0.3539 - val_acc: 0.9091

Epoch 21/25
 - 1s - loss: 0.2004 - acc: 0.9448 - val_loss: 0.4222 - val_acc: 0.8728

Epoch 22/25
 - 1s - loss: 0.2039 - acc: 0.9449 - val_loss: 0.3423 - val_acc: 0.8945

Epoch 23/25
 - 1s - loss: 0.2035 - acc: 0.9438 - val_loss: 0.3385 - val_acc: 0.9033

Epoch 24/25
 - 1s - loss: 0.1862 - acc: 0.9484 - val_loss: 0.3349 - val_acc: 0.8819

Epoch 25/25
 - 1s - loss: 0.2039 - acc: 0.9442 - val_loss: 0.3350 - val_acc: 0.9043

Train accuracy
0.955658324265506
Test accuracy:
0.9043094672548354
_________________________________________________________________________________
Model: "sequential_67"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_133 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_134 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_67 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_67 (MaxPooling (None, 39, 32)            0
```

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max_pooling1d_67 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_67 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_133 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_134 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 2.6195 - acc: 0.8459 - val_loss: 0.8823 - val_acc: 0.8972

Epoch 2/25
 - 1s - loss: 0.4388 - acc: 0.9298 - val_loss: 0.5181 - val_acc: 0.8819

Epoch 3/25
 - 1s - loss: 0.2755 - acc: 0.9399 - val_loss: 0.4599 - val_acc: 0.8996

Epoch 4/25
 - 1s - loss: 0.2468 - acc: 0.9388 - val_loss: 0.4865 - val_acc: 0.8965

Epoch 5/25
 - 1s - loss: 0.2324 - acc: 0.9460 - val_loss: 0.3596 - val_acc: 0.9148

Epoch 6/25
 - 1s - loss: 0.2247 - acc: 0.9418 - val_loss: 0.3647 - val_acc: 0.9077

Epoch 7/25
 - 1s - loss: 0.2094 - acc: 0.9461 - val_loss: 0.3346 - val_acc: 0.9097

Epoch 8/25
 - 1s - loss: 0.1891 - acc: 0.9452 - val_loss: 0.3327 - val_acc: 0.9057

Epoch 9/25
 - 1s - loss: 0.2042 - acc: 0.9438 - val_loss: 0.3509 - val_acc: 0.9169

Epoch 10/25
 - 1s - loss: 0.2000 - acc: 0.9463 - val_loss: 0.3394 - val_acc: 0.9023

Epoch 11/25
 - 1s - loss: 0.1832 - acc: 0.9471 - val_loss: 0.3284 - val_acc: 0.9114

Epoch 12/25
 - 1s - loss: 0.1851 - acc: 0.9478 - val_loss: 0.3366 - val_acc: 0.9118

Epoch 13/25
 - 1s - loss: 0.1920 - acc: 0.9464 - val_loss: 0.2926 - val_acc: 0.9060

Epoch 14/25
 - 1s - loss: 0.1727 - acc: 0.9493 - val_loss: 0.3214 - val_acc: 0.9080

Epoch 15/25
 - 1s - loss: 0.2007 - acc: 0.9425 - val_loss: 0.3237 - val_acc: 0.9077

Epoch 16/25
 - 1s - loss: 0.1750 - acc: 0.9506 - val_loss: 0.3238 - val_acc: 0.8982

Epoch 17/25
 - 1s - loss: 0.1855 - acc: 0.9467 - val_loss: 0.3380 - val_acc: 0.8907

Epoch 18/25
 - 1s - loss: 0.1779 - acc: 0.9491 - val_loss: 0.3049 - val_acc: 0.9084

Epoch 19/25
 - 1s - loss: 0.1902 - acc: 0.9433 - val_loss: 0.2998 - val_acc: 0.9087

Epoch 20/25
 - 1s - loss: 0.1888 - acc: 0.9450 - val_loss: 0.3279 - val_acc: 0.9101

Epoch 21/25
 - 1s - loss: 0.1793 - acc: 0.9480 - val_loss: 0.5811 - val_acc: 0.8259

Epoch 22/25
```

```
Epoch 22/25
 - 1s - loss: 0.2009 - acc: 0.9461 - val_loss: 0.3407 - val_acc: 0.9131

Epoch 23/25
 - 1s - loss: 0.1714 - acc: 0.9512 - val_loss: 0.3255 - val_acc: 0.9165

Epoch 24/25
 - 1s - loss: 0.1748 - acc: 0.9493 - val_loss: 0.2963 - val_acc: 0.9104

Epoch 25/25
 - 1s - loss: 0.2201 - acc: 0.9418 - val_loss: 0.2923 - val_acc: 0.9050

Train accuracy
0.9575625680087051
Test accuracy:
0.9049881235154394
_________________________________________________________________
Model: "sequential_68"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_135 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_136 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_68 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_68 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_68 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_135 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_136 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 8.1539 - acc: 0.8184 - val_loss: 0.9896 - val_acc: 0.8113

Epoch 2/25
 - 2s - loss: 0.4868 - acc: 0.9022 - val_loss: 0.6708 - val_acc: 0.8683

Epoch 3/25
 - 2s - loss: 0.3711 - acc: 0.9191 - val_loss: 0.5909 - val_acc: 0.8843

Epoch 4/25
 - 2s - loss: 0.3435 - acc: 0.9204 - val_loss: 0.5560 - val_acc: 0.8711

Epoch 5/25
 - 3s - loss: 0.3103 - acc: 0.9270 - val_loss: 0.4929 - val_acc: 0.8877

Epoch 6/25
 - 3s - loss: 0.2935 - acc: 0.9304 - val_loss: 0.4555 - val_acc: 0.8873

Epoch 7/25
 - 3s - loss: 0.2779 - acc: 0.9332 - val_loss: 0.4443 - val_acc: 0.8989

Epoch 8/25
 - 3s - loss: 0.2661 - acc: 0.9354 - val_loss: 0.4791 - val_acc: 0.8707

Epoch 9/25
 - 3s - loss: 0.2612 - acc: 0.9366 - val_loss: 0.3948 - val_acc: 0.8992

Epoch 10/25
 - 2s - loss: 0.2567 - acc: 0.9353 - val_loss: 0.4591 - val_acc: 0.8578

Epoch 11/25
 - 2s - loss: 0.2444 - acc: 0.9377 - val_loss: 0.4146 - val_acc: 0.9006

Epoch 12/25
 - 3s - loss: 0.2557 - acc: 0.9346 - val_loss: 0.3873 - val_acc: 0.9023

Epoch 13/25
```

```
Epoch 13/25
 - 2s - loss: 0.2496 - acc: 0.9346 - val_loss: 0.4062 - val_acc: 0.8907

Epoch 14/25
 - 3s - loss: 0.2436 - acc: 0.9369 - val_loss: 0.3536 - val_acc: 0.9108

Epoch 15/25
 - 2s - loss: 0.2456 - acc: 0.9342 - val_loss: 0.3745 - val_acc: 0.8989

Epoch 16/25
 - 3s - loss: 0.2259 - acc: 0.9416 - val_loss: 0.3555 - val_acc: 0.9040

Epoch 17/25
 - 2s - loss: 0.2227 - acc: 0.9392 - val_loss: 0.3780 - val_acc: 0.9063

Epoch 18/25
 - 3s - loss: 0.2335 - acc: 0.9368 - val_loss: 0.3639 - val_acc: 0.9026

Epoch 19/25
 - 2s - loss: 0.2359 - acc: 0.9350 - val_loss: 0.3774 - val_acc: 0.8833

Epoch 20/25
 - 2s - loss: 0.2138 - acc: 0.9407 - val_loss: 0.3474 - val_acc: 0.8901

Epoch 21/25
 - 3s - loss: 0.2198 - acc: 0.9385 - val_loss: 0.3317 - val_acc: 0.9009

Epoch 22/25
 - 3s - loss: 0.2143 - acc: 0.9391 - val_loss: 0.3842 - val_acc: 0.8792

Epoch 23/25
 - 3s - loss: 0.2244 - acc: 0.9384 - val_loss: 0.3414 - val_acc: 0.8907

Epoch 24/25
 - 2s - loss: 0.2117 - acc: 0.9426 - val_loss: 0.4453 - val_acc: 0.8476

Epoch 25/25
 - 2s - loss: 0.2356 - acc: 0.9365 - val_loss: 0.3666 - val_acc: 0.8785

Train accuracy
0.9330794341675734
Test accuracy:
0.8785205293518833
_________________________________________________________________________________
Model: "sequential_69"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_137 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_138 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_69 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_69 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_69 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_137 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_138 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 3s - loss: 18.5003 - acc: 0.7349 - val_loss: 6.0482 - val_acc: 0.8415

Epoch 2/25
 - 1s - loss: 2.8772 - acc: 0.8874 - val_loss: 1.5719 - val_acc: 0.8056

Epoch 3/25
 - 1s - loss: 0.7900 - acc: 0.9120 - val_loss: 0.8394 - val_acc: 0.8782
```

```
Epoch 4/25
 - 1s - loss: 0.4305 - acc: 0.9266 - val_loss: 0.6593 - val_acc: 0.8785

Epoch 5/25
 - 1s - loss: 0.3717 - acc: 0.9203 - val_loss: 0.5951 - val_acc: 0.8860

Epoch 6/25
 - 1s - loss: 0.3408 - acc: 0.9286 - val_loss: 0.5943 - val_acc: 0.8704

Epoch 7/25
 - 1s - loss: 0.3302 - acc: 0.9256 - val_loss: 0.5720 - val_acc: 0.8772

Epoch 8/25
 - 1s - loss: 0.3122 - acc: 0.9280 - val_loss: 0.5699 - val_acc: 0.8768

Epoch 9/25
 - 1s - loss: 0.2877 - acc: 0.9340 - val_loss: 0.4952 - val_acc: 0.8856

Epoch 10/25
 - 1s - loss: 0.2789 - acc: 0.9353 - val_loss: 0.4790 - val_acc: 0.8884

Epoch 11/25
 - 1s - loss: 0.2864 - acc: 0.9329 - val_loss: 0.4617 - val_acc: 0.8850

Epoch 12/25
 - 1s - loss: 0.2628 - acc: 0.9365 - val_loss: 0.4580 - val_acc: 0.8836

Epoch 13/25
 - 1s - loss: 0.2893 - acc: 0.9271 - val_loss: 0.4625 - val_acc: 0.8717

Epoch 14/25
 - 1s - loss: 0.2525 - acc: 0.9404 - val_loss: 0.4662 - val_acc: 0.9050

Epoch 15/25
 - 1s - loss: 0.2489 - acc: 0.9365 - val_loss: 0.4657 - val_acc: 0.8819

Epoch 16/25
 - 1s - loss: 0.2475 - acc: 0.9396 - val_loss: 0.4127 - val_acc: 0.8884

Epoch 17/25
 - 1s - loss: 0.2429 - acc: 0.9414 - val_loss: 0.4170 - val_acc: 0.8894

Epoch 18/25
 - 1s - loss: 0.2305 - acc: 0.9412 - val_loss: 0.4391 - val_acc: 0.8789

Epoch 19/25
 - 1s - loss: 0.2483 - acc: 0.9348 - val_loss: 0.3942 - val_acc: 0.9108

Epoch 20/25
 - 1s - loss: 0.2470 - acc: 0.9381 - val_loss: 0.4574 - val_acc: 0.8785

Epoch 21/25
 - 1s - loss: 0.2459 - acc: 0.9373 - val_loss: 0.5032 - val_acc: 0.8402

Epoch 22/25
 - 1s - loss: 0.2406 - acc: 0.9412 - val_loss: 0.3835 - val_acc: 0.8996

Epoch 23/25
 - 1s - loss: 0.2107 - acc: 0.9475 - val_loss: 0.3957 - val_acc: 0.8894

Epoch 24/25
 - 1s - loss: 0.2250 - acc: 0.9433 - val_loss: 0.3699 - val_acc: 0.8951

Epoch 25/25
 - 1s - loss: 0.2311 - acc: 0.9403 - val_loss: 0.4060 - val_acc: 0.8765

Train accuracy
0.9464091403699674
Test accuracy:
0.8764845605700713
_________________________________________________________________________________
Model: "sequential_70"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_139 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
```

```
conv1d_140 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_70 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_70 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_70 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_139 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_140 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 4.8799 - acc: 0.8188 - val_loss: 0.9187 - val_acc: 0.8748

Epoch 2/25
 - 1s - loss: 0.4582 - acc: 0.9188 - val_loss: 0.5764 - val_acc: 0.8904

Epoch 3/25
 - 1s - loss: 0.3145 - acc: 0.9321 - val_loss: 0.4976 - val_acc: 0.9033

Epoch 4/25
 - 1s - loss: 0.2903 - acc: 0.9321 - val_loss: 0.5007 - val_acc: 0.8867

Epoch 5/25
 - 1s - loss: 0.2661 - acc: 0.9384 - val_loss: 0.4018 - val_acc: 0.9080

Epoch 6/25
 - 1s - loss: 0.2374 - acc: 0.9431 - val_loss: 0.4767 - val_acc: 0.8541

Epoch 7/25
 - 1s - loss: 0.2590 - acc: 0.9380 - val_loss: 0.3745 - val_acc: 0.9030

Epoch 8/25
 - 1s - loss: 0.2306 - acc: 0.9392 - val_loss: 0.4245 - val_acc: 0.8914

Epoch 9/25
 - 1s - loss: 0.2248 - acc: 0.9434 - val_loss: 0.3694 - val_acc: 0.8989

Epoch 10/25
 - 1s - loss: 0.2231 - acc: 0.9404 - val_loss: 0.4541 - val_acc: 0.8711

Epoch 11/25
 - 1s - loss: 0.2258 - acc: 0.9418 - val_loss: 0.3753 - val_acc: 0.9077

Epoch 12/25
 - 1s - loss: 0.2024 - acc: 0.9457 - val_loss: 0.3500 - val_acc: 0.9026

Epoch 13/25
 - 1s - loss: 0.2172 - acc: 0.9408 - val_loss: 0.3476 - val_acc: 0.9023

Epoch 14/25
 - 1s - loss: 0.2180 - acc: 0.9421 - val_loss: 0.3438 - val_acc: 0.9213

Epoch 15/25
 - 1s - loss: 0.2199 - acc: 0.9400 - val_loss: 0.4039 - val_acc: 0.8755

Epoch 16/25
 - 1s - loss: 0.2035 - acc: 0.9449 - val_loss: 0.3585 - val_acc: 0.8907

Epoch 17/25
 - 1s - loss: 0.1955 - acc: 0.9455 - val_loss: 0.3732 - val_acc: 0.9050

Epoch 18/25
 - 1s - loss: 0.1923 - acc: 0.9476 - val_loss: 0.3329 - val_acc: 0.8901

Epoch 19/25
 - 1s - loss: 0.2028 - acc: 0.9411 - val_loss: 0.3318 - val_acc: 0.9016

Epoch 20/25
 - 1s - loss: 0.2038 - acc: 0.9421 - val_loss: 0.3896 - val_acc: 0.8839
```

```
Epoch 21/25
 - 1s - loss: 0.2066 - acc: 0.9421 - val_loss: 0.3811 - val_acc: 0.8860

Epoch 22/25
 - 1s - loss: 0.2018 - acc: 0.9456 - val_loss: 0.3615 - val_acc: 0.8907

Epoch 23/25
 - 1s - loss: 0.2000 - acc: 0.9456 - val_loss: 0.3532 - val_acc: 0.8965

Epoch 24/25
 - 1s - loss: 0.1971 - acc: 0.9467 - val_loss: 0.3482 - val_acc: 0.8829

Epoch 25/25
 - 1s - loss: 0.2127 - acc: 0.9430 - val_loss: 0.3077 - val_acc: 0.9002

Train accuracy
0.9567464635473341
Test accuracy:
0.9002375296912114
_________________________________________________________________
Model: "sequential_71"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_141 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_142 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_71 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_71 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_71 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_141 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_142 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 2.3893 - acc: 0.8220 - val_loss: 0.7025 - val_acc: 0.8653

Epoch 2/25
 - 3s - loss: 0.4189 - acc: 0.9238 - val_loss: 0.6157 - val_acc: 0.8381

Epoch 3/25
 - 3s - loss: 0.3103 - acc: 0.9365 - val_loss: 0.4670 - val_acc: 0.8806

Epoch 4/25
 - 3s - loss: 0.2818 - acc: 0.9354 - val_loss: 0.3926 - val_acc: 0.9019

Epoch 5/25
 - 3s - loss: 0.2407 - acc: 0.9407 - val_loss: 0.3653 - val_acc: 0.9002

Epoch 6/25
 - 3s - loss: 0.2335 - acc: 0.9389 - val_loss: 0.4138 - val_acc: 0.8799

Epoch 7/25
 - 3s - loss: 0.2081 - acc: 0.9452 - val_loss: 0.3409 - val_acc: 0.9121

Epoch 8/25
 - 2s - loss: 0.2210 - acc: 0.9410 - val_loss: 0.3828 - val_acc: 0.8962

Epoch 9/25
 - 2s - loss: 0.2126 - acc: 0.9438 - val_loss: 0.3903 - val_acc: 0.8806

Epoch 10/25
 - 2s - loss: 0.2170 - acc: 0.9437 - val_loss: 0.3602 - val_acc: 0.8884

Epoch 11/25
 - 3s - loss: 0.1934 - acc: 0.9460 - val_loss: 0.3877 - val_acc: 0.8894
```

```
Epoch 12/25
 - 3s - loss: 0.2136 - acc: 0.9434 - val_loss: 0.3130 - val_acc: 0.9084

Epoch 13/25
 - 2s - loss: 0.1919 - acc: 0.9461 - val_loss: 0.3323 - val_acc: 0.9026

Epoch 14/25
 - 3s - loss: 0.2146 - acc: 0.9415 - val_loss: 0.3592 - val_acc: 0.9023

Epoch 15/25
 - 3s - loss: 0.1889 - acc: 0.9463 - val_loss: 0.3362 - val_acc: 0.8843

Epoch 16/25
 - 3s - loss: 0.1785 - acc: 0.9483 - val_loss: 0.3113 - val_acc: 0.9060

Epoch 17/25
 - 3s - loss: 0.1919 - acc: 0.9459 - val_loss: 0.3788 - val_acc: 0.9002

Epoch 18/25
 - 3s - loss: 0.1894 - acc: 0.9468 - val_loss: 0.3077 - val_acc: 0.8992

Epoch 19/25
 - 3s - loss: 0.1807 - acc: 0.9480 - val_loss: 0.3522 - val_acc: 0.8945

Epoch 20/25
 - 3s - loss: 0.1938 - acc: 0.9450 - val_loss: 0.3440 - val_acc: 0.8795

Epoch 21/25
 - 3s - loss: 0.1814 - acc: 0.9476 - val_loss: 0.3452 - val_acc: 0.8965

Epoch 22/25
 - 3s - loss: 0.1828 - acc: 0.9493 - val_loss: 0.3514 - val_acc: 0.8989

Epoch 23/25
 - 3s - loss: 0.1673 - acc: 0.9518 - val_loss: 0.3563 - val_acc: 0.9002

Epoch 24/25
 - 3s - loss: 0.1768 - acc: 0.9499 - val_loss: 0.3591 - val_acc: 0.9026

Epoch 25/25
 - 3s - loss: 0.1885 - acc: 0.9489 - val_loss: 0.3237 - val_acc: 0.8955

Train accuracy
0.93430359085963
Test accuracy:
0.8954869358669834
_________________________________________________________________
Model: "sequential_72"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_143 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_144 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_72 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_72 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_72 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_143 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_144 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 4.7619 - acc: 0.8347 - val_loss: 0.7638 - val_acc: 0.8636

Epoch 2/25
 - 3s - loss: 0.4124 - acc: 0.9113 - val_loss: 0.6144 - val_acc: 0.8711
```

```
Epoch 3/25
 - 3s - loss: 0.3235 - acc: 0.9272 - val_loss: 0.5310 - val_acc: 0.8795

Epoch 4/25
 - 3s - loss: 0.2957 - acc: 0.9312 - val_loss: 0.5133 - val_acc: 0.8568

Epoch 5/25
 - 3s - loss: 0.2798 - acc: 0.9291 - val_loss: 0.4389 - val_acc: 0.8958

Epoch 6/25
 - 3s - loss: 0.2535 - acc: 0.9368 - val_loss: 0.4405 - val_acc: 0.8707

Epoch 7/25
 - 3s - loss: 0.2507 - acc: 0.9355 - val_loss: 0.3945 - val_acc: 0.9077

Epoch 8/25
 - 3s - loss: 0.2468 - acc: 0.9361 - val_loss: 0.5419 - val_acc: 0.8208

Epoch 9/25
 - 3s - loss: 0.2396 - acc: 0.9399 - val_loss: 0.4055 - val_acc: 0.8795

Epoch 10/25
 - 3s - loss: 0.2274 - acc: 0.9391 - val_loss: 0.8754 - val_acc: 0.7526

Epoch 11/25
 - 2s - loss: 0.2384 - acc: 0.9400 - val_loss: 0.3667 - val_acc: 0.8904

Epoch 12/25
 - 3s - loss: 0.2296 - acc: 0.9357 - val_loss: 0.3635 - val_acc: 0.8941

Epoch 13/25
 - 3s - loss: 0.2199 - acc: 0.9377 - val_loss: 0.3741 - val_acc: 0.8863

Epoch 14/25
 - 3s - loss: 0.2205 - acc: 0.9419 - val_loss: 0.3713 - val_acc: 0.9087

Epoch 15/25
 - 3s - loss: 0.2086 - acc: 0.9422 - val_loss: 0.3941 - val_acc: 0.8901

Epoch 16/25
 - 3s - loss: 0.2128 - acc: 0.9423 - val_loss: 0.3376 - val_acc: 0.8880

Epoch 17/25
 - 3s - loss: 0.2118 - acc: 0.9403 - val_loss: 0.3501 - val_acc: 0.8972

Epoch 18/25
 - 3s - loss: 0.2094 - acc: 0.9438 - val_loss: 0.3001 - val_acc: 0.9077

Epoch 19/25
 - 3s - loss: 0.2100 - acc: 0.9402 - val_loss: 0.3376 - val_acc: 0.9053

Epoch 20/25
 - 3s - loss: 0.1973 - acc: 0.9425 - val_loss: 0.3196 - val_acc: 0.9040

Epoch 21/25
 - 3s - loss: 0.1966 - acc: 0.9438 - val_loss: 0.4422 - val_acc: 0.8347

Epoch 22/25
 - 3s - loss: 0.2068 - acc: 0.9407 - val_loss: 0.3375 - val_acc: 0.8924

Epoch 23/25
 - 3s - loss: 0.1990 - acc: 0.9434 - val_loss: 0.3122 - val_acc: 0.8996

Epoch 24/25
 - 3s - loss: 0.1944 - acc: 0.9453 - val_loss: 0.5109 - val_acc: 0.8252

Epoch 25/25
 - 2s - loss: 0.2066 - acc: 0.9423 - val_loss: 0.3904 - val_acc: 0.8527

Train accuracy
0.9333514689880305
Test accuracy:
0.8527315914489311
_________________________________________________________________________________
Model: "sequential_73"
_________________________________________________________________
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_145 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_146 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_73 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_73 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_73 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_145 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_146 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 7.6623 - acc: 0.8383 - val_loss: 0.9030 - val_acc: 0.8914

Epoch 2/25
 - 1s - loss: 0.4838 - acc: 0.9200 - val_loss: 0.5771 - val_acc: 0.8782

Epoch 3/25
 - 1s - loss: 0.3468 - acc: 0.9317 - val_loss: 0.5375 - val_acc: 0.8873

Epoch 4/25
 - 1s - loss: 0.3050 - acc: 0.9314 - val_loss: 0.4530 - val_acc: 0.9046

Epoch 5/25
 - 1s - loss: 0.2579 - acc: 0.9373 - val_loss: 0.3922 - val_acc: 0.9053

Epoch 6/25
 - 1s - loss: 0.2374 - acc: 0.9419 - val_loss: 0.4096 - val_acc: 0.8802

Epoch 7/25
 - 1s - loss: 0.2364 - acc: 0.9431 - val_loss: 0.3561 - val_acc: 0.9067

Epoch 8/25
 - 1s - loss: 0.2260 - acc: 0.9412 - val_loss: 0.3673 - val_acc: 0.9138

Epoch 9/25
 - 1s - loss: 0.2137 - acc: 0.9457 - val_loss: 0.3442 - val_acc: 0.9128

Epoch 10/25
 - 1s - loss: 0.2224 - acc: 0.9381 - val_loss: 0.3623 - val_acc: 0.8887

Epoch 11/25
 - 1s - loss: 0.2144 - acc: 0.9419 - val_loss: 0.3540 - val_acc: 0.9050

Epoch 12/25
 - 1s - loss: 0.1904 - acc: 0.9484 - val_loss: 0.3097 - val_acc: 0.9063

Epoch 13/25
 - 1s - loss: 0.2387 - acc: 0.9397 - val_loss: 0.3997 - val_acc: 0.8914

Epoch 14/25
 - 1s - loss: 0.1919 - acc: 0.9499 - val_loss: 0.3183 - val_acc: 0.9192

Epoch 15/25
 - 1s - loss: 0.1962 - acc: 0.9453 - val_loss: 0.3053 - val_acc: 0.9199

Epoch 16/25
 - 1s - loss: 0.1961 - acc: 0.9470 - val_loss: 0.2917 - val_acc: 0.9019

Epoch 17/25
 - 2s - loss: 0.1910 - acc: 0.9457 - val_loss: 0.3864 - val_acc: 0.8785

Epoch 18/25
 - 1s - loss: 0.1954 - acc: 0.9486 - val_loss: 0.3805 - val_acc: 0.8972

Epoch 19/25
```

```
 - 1s - loss: 0.2527 - acc: 0.9385 - val_loss: 0.3468 - val_acc: 0.9053

Epoch 20/25
 - 2s - loss: 0.1830 - acc: 0.9442 - val_loss: 0.3198 - val_acc: 0.9077

Epoch 21/25
 - 1s - loss: 0.1928 - acc: 0.9438 - val_loss: 0.3222 - val_acc: 0.9050

Epoch 22/25
 - 2s - loss: 0.1821 - acc: 0.9478 - val_loss: 0.3190 - val_acc: 0.9030

Epoch 23/25
 - 1s - loss: 0.1921 - acc: 0.9456 - val_loss: 0.2815 - val_acc: 0.9128

Epoch 24/25
 - 2s - loss: 0.1763 - acc: 0.9509 - val_loss: 0.2989 - val_acc: 0.8968

Epoch 25/25
 - 1s - loss: 0.1838 - acc: 0.9479 - val_loss: 0.3016 - val_acc: 0.9033

Train accuracy
0.955658324265506
Test accuracy:
0.9032914828639295
_________________________________________________________________________________
Model: "sequential_74"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_147 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_148 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_74 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_74 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_74 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_147 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_148 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 7.8564 - acc: 0.8071 - val_loss: 0.8811 - val_acc: 0.7313

Epoch 2/25
 - 3s - loss: 0.5181 - acc: 0.8764 - val_loss: 0.7541 - val_acc: 0.7961

Epoch 3/25
 - 3s - loss: 0.4656 - acc: 0.8886 - val_loss: 0.6574 - val_acc: 0.8711

Epoch 4/25
 - 3s - loss: 0.4175 - acc: 0.9038 - val_loss: 0.6200 - val_acc: 0.8558

Epoch 5/25
 - 3s - loss: 0.4157 - acc: 0.8984 - val_loss: 0.6088 - val_acc: 0.8694

Epoch 6/25
 - 3s - loss: 0.3664 - acc: 0.9163 - val_loss: 0.5332 - val_acc: 0.8510

Epoch 7/25
 - 3s - loss: 0.3523 - acc: 0.9181 - val_loss: 0.5386 - val_acc: 0.8714

Epoch 8/25
 - 3s - loss: 0.3386 - acc: 0.9206 - val_loss: 0.5466 - val_acc: 0.8873

Epoch 9/25
 - 3s - loss: 0.3097 - acc: 0.9270 - val_loss: 0.4925 - val_acc: 0.8412

Epoch 10/25
```

```
 -
 - 2s - loss: 0.3197 - acc: 0.9203 - val_loss: 0.4943 - val_acc: 0.8826

Epoch 11/25
 - 3s - loss: 0.3051 - acc: 0.9221 - val_loss: 0.4702 - val_acc: 0.8778

Epoch 12/25
 - 3s - loss: 0.3000 - acc: 0.9244 - val_loss: 0.4825 - val_acc: 0.8677

Epoch 13/25
 - 3s - loss: 0.3246 - acc: 0.9195 - val_loss: 0.4444 - val_acc: 0.8819

Epoch 14/25
 - 3s - loss: 0.2996 - acc: 0.9264 - val_loss: 0.5450 - val_acc: 0.8297

Epoch 15/25
 - 3s - loss: 0.3052 - acc: 0.9219 - val_loss: 0.5288 - val_acc: 0.8493

Epoch 16/25
 - 3s - loss: 0.3004 - acc: 0.9230 - val_loss: 0.5041 - val_acc: 0.8395

Epoch 17/25
 - 3s - loss: 0.2897 - acc: 0.9267 - val_loss: 0.4246 - val_acc: 0.8789

Epoch 18/25
 - 3s - loss: 0.2998 - acc: 0.9229 - val_loss: 0.4182 - val_acc: 0.8806

Epoch 19/25
 - 3s - loss: 0.2816 - acc: 0.9244 - val_loss: 0.4772 - val_acc: 0.8626

Epoch 20/25
 - 3s - loss: 0.2873 - acc: 0.9255 - val_loss: 0.4251 - val_acc: 0.8616

Epoch 21/25
 - 2s - loss: 0.2785 - acc: 0.9263 - val_loss: 0.4760 - val_acc: 0.8592

Epoch 22/25
 - 2s - loss: 0.2657 - acc: 0.9290 - val_loss: 0.4667 - val_acc: 0.8595

Epoch 23/25
 - 3s - loss: 0.2830 - acc: 0.9279 - val_loss: 0.4583 - val_acc: 0.8802

Epoch 24/25
 - 3s - loss: 0.2740 - acc: 0.9274 - val_loss: 0.4145 - val_acc: 0.8778

Epoch 25/25
 - 3s - loss: 0.2733 - acc: 0.9268 - val_loss: 0.4607 - val_acc: 0.8622

Train accuracy
0.9231501632208923
Test accuracy:
0.8622327790973872
--------------------------------------------------------------------------------
Model: "sequential_75"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_149 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_150 (Conv1D)          (None, 120, 32)           4512
_________________________________________________________________
dropout_75 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_75 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_75 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_149 (Dense)            (None, 32)                40992
_________________________________________________________________
dense_150 (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 1/25
```

```
 - 4s - loss: 3.6924 - acc: 0.8315 - val_loss: 0.8215 - val_acc: 0.8935

Epoch 2/25
 - 1s - loss: 0.4347 - acc: 0.9204 - val_loss: 0.5769 - val_acc: 0.8860

Epoch 3/25
 - 2s - loss: 0.2753 - acc: 0.9404 - val_loss: 0.4404 - val_acc: 0.9216

Epoch 4/25
 - 2s - loss: 0.2708 - acc: 0.9335 - val_loss: 0.3755 - val_acc: 0.9260

Epoch 5/25
 - 1s - loss: 0.2365 - acc: 0.9400 - val_loss: 0.4149 - val_acc: 0.9009

Epoch 6/25
 - 1s - loss: 0.2397 - acc: 0.9397 - val_loss: 0.3893 - val_acc: 0.9019

Epoch 7/25
 - 1s - loss: 0.2317 - acc: 0.9406 - val_loss: 0.3458 - val_acc: 0.9148

Epoch 8/25
 - 1s - loss: 0.2060 - acc: 0.9445 - val_loss: 0.4148 - val_acc: 0.8633

Epoch 9/25
 - 1s - loss: 0.2478 - acc: 0.9359 - val_loss: 0.3479 - val_acc: 0.9114

Epoch 10/25
 - 1s - loss: 0.2150 - acc: 0.9414 - val_loss: 0.3715 - val_acc: 0.9033

Epoch 11/25
 - 1s - loss: 0.2091 - acc: 0.9431 - val_loss: 0.3631 - val_acc: 0.9087

Epoch 12/25
 - 1s - loss: 0.2118 - acc: 0.9410 - val_loss: 0.3358 - val_acc: 0.9077

Epoch 13/25
 - 1s - loss: 0.2568 - acc: 0.9353 - val_loss: 0.3938 - val_acc: 0.9033

Epoch 14/25
 - 1s - loss: 0.2049 - acc: 0.9494 - val_loss: 0.3327 - val_acc: 0.9094

Epoch 15/25
 - 1s - loss: 0.2186 - acc: 0.9421 - val_loss: 0.3098 - val_acc: 0.9199

Epoch 16/25
 - 1s - loss: 0.2185 - acc: 0.9393 - val_loss: 0.3394 - val_acc: 0.8907

Epoch 17/25
 - 1s - loss: 0.2191 - acc: 0.9419 - val_loss: 0.3380 - val_acc: 0.9135

Epoch 18/25
 - 1s - loss: 0.1971 - acc: 0.9456 - val_loss: 0.2943 - val_acc: 0.9125

Epoch 19/25
 - 1s - loss: 0.2576 - acc: 0.9308 - val_loss: 0.3685 - val_acc: 0.9118

Epoch 20/25
 - 1s - loss: 0.2005 - acc: 0.9442 - val_loss: 0.3373 - val_acc: 0.9046

Epoch 21/25
 - 1s - loss: 0.2031 - acc: 0.9421 - val_loss: 0.3172 - val_acc: 0.9050

Epoch 22/25
 - 1s - loss: 0.2025 - acc: 0.9440 - val_loss: 0.3317 - val_acc: 0.9043

Epoch 23/25
 - 1s - loss: 0.1932 - acc: 0.9440 - val_loss: 0.3816 - val_acc: 0.8775

Epoch 24/25
 - 1s - loss: 0.1882 - acc: 0.9452 - val_loss: 0.3051 - val_acc: 0.8985

Epoch 25/25
 - 1s - loss: 0.1995 - acc: 0.9461 - val_loss: 0.3458 - val_acc: 0.9013

Train accuracy
0.9521218715995647
Test accuracy:
```

0.9012555140821175

Model: "sequential_76"

Layer (type)	Output Shape	Param #
conv1d_151 (Conv1D)	(None, 122, 28)	1792
conv1d_152 (Conv1D)	(None, 116, 32)	6304
dropout_76 (Dropout)	(None, 116, 32)	0
max_pooling1d_76 (MaxPooling	(None, 38, 32)	0
flatten_76 (Flatten)	(None, 1216)	0
dense_151 (Dense)	(None, 32)	38944
dense_152 (Dense)	(None, 6)	198

Total params: 47,238
Trainable params: 47,238
Non-trainable params: 0

None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 39.4666 - acc: 0.7338 - val_loss: 17.1420 - val_acc: 0.8565

Epoch 2/25
 - 1s - loss: 9.0533 - acc: 0.9011 - val_loss: 4.5062 - val_acc: 0.8263

Epoch 3/25
 - 1s - loss: 2.4188 - acc: 0.9264 - val_loss: 1.6044 - val_acc: 0.8999

Epoch 4/25
 - 1s - loss: 0.8669 - acc: 0.9291 - val_loss: 0.8839 - val_acc: 0.8846

Epoch 5/25
 - 1s - loss: 0.5014 - acc: 0.9241 - val_loss: 0.6762 - val_acc: 0.9019

Epoch 6/25
 - 1s - loss: 0.3918 - acc: 0.9338 - val_loss: 0.6377 - val_acc: 0.8867

Epoch 7/25
 - 1s - loss: 0.3605 - acc: 0.9331 - val_loss: 0.5526 - val_acc: 0.9002

Epoch 8/25
 - 1s - loss: 0.3332 - acc: 0.9347 - val_loss: 0.5377 - val_acc: 0.9053

Epoch 9/25
 - 1s - loss: 0.3214 - acc: 0.9335 - val_loss: 0.5405 - val_acc: 0.8955

Epoch 10/25
 - 1s - loss: 0.3061 - acc: 0.9389 - val_loss: 0.5241 - val_acc: 0.8999

Epoch 11/25
 - 1s - loss: 0.2908 - acc: 0.9369 - val_loss: 0.4917 - val_acc: 0.9009

Epoch 12/25
 - 1s - loss: 0.2779 - acc: 0.9411 - val_loss: 0.4880 - val_acc: 0.9087

Epoch 13/25
 - 1s - loss: 0.2767 - acc: 0.9378 - val_loss: 0.4661 - val_acc: 0.9019

Epoch 14/25
 - 1s - loss: 0.2735 - acc: 0.9384 - val_loss: 0.5005 - val_acc: 0.9131

Epoch 15/25
 - 1s - loss: 0.2677 - acc: 0.9363 - val_loss: 0.4660 - val_acc: 0.8992

Epoch 16/25
 - 1s - loss: 0.2653 - acc: 0.9376 - val_loss: 0.4220 - val_acc: 0.9063

Epoch 17/25
 - 1s - loss: 0.2612 - acc: 0.9404 - val_loss: 0.4720 - val_acc: 0.8884

```
Epoch 18/25
 - 1s - loss: 0.2497 - acc: 0.9436 - val_loss: 0.4403 - val_acc: 0.8873

Epoch 19/25
 - 1s - loss: 0.2666 - acc: 0.9338 - val_loss: 0.4518 - val_acc: 0.8935

Epoch 20/25
 - 1s - loss: 0.2574 - acc: 0.9387 - val_loss: 0.4324 - val_acc: 0.9087

Epoch 21/25
 - 1s - loss: 0.2461 - acc: 0.9418 - val_loss: 0.5120 - val_acc: 0.8588

Epoch 22/25
 - 1s - loss: 0.2494 - acc: 0.9400 - val_loss: 0.4093 - val_acc: 0.8982

Epoch 23/25
 - 1s - loss: 0.2339 - acc: 0.9431 - val_loss: 0.4016 - val_acc: 0.9070

Epoch 24/25
 - 1s - loss: 0.2208 - acc: 0.9449 - val_loss: 0.3878 - val_acc: 0.9030

Epoch 25/25
 - 1s - loss: 0.2495 - acc: 0.9396 - val_loss: 0.4370 - val_acc: 0.9050

Train accuracy
0.9506256800870512
Test accuracy:
0.9049881235154394
_________________________________________________________________
Model: "sequential_77"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_153 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_154 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_77 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_77 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_77 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_153 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_154 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 9.6015 - acc: 0.7859 - val_loss: 1.7506 - val_acc: 0.8392

Epoch 2/25
 - 3s - loss: 0.6982 - acc: 0.9100 - val_loss: 0.7313 - val_acc: 0.8721

Epoch 3/25
 - 3s - loss: 0.3814 - acc: 0.9225 - val_loss: 0.6289 - val_acc: 0.8724

Epoch 4/25
 - 2s - loss: 0.3452 - acc: 0.9233 - val_loss: 0.6243 - val_acc: 0.8568

Epoch 5/25
 - 3s - loss: 0.3169 - acc: 0.9267 - val_loss: 0.5115 - val_acc: 0.8839

Epoch 6/25
 - 3s - loss: 0.2783 - acc: 0.9344 - val_loss: 0.4847 - val_acc: 0.8778

Epoch 7/25
 - 3s - loss: 0.2687 - acc: 0.9376 - val_loss: 0.4476 - val_acc: 0.9033

Epoch 8/25
 - 3s - loss: 0.2563 - acc: 0.9361 - val_loss: 0.4890 - val_acc: 0.8741
```

```
Epoch 9/25
 - 3s - loss: 0.2483 - acc: 0.9382 - val_loss: 0.4157 - val_acc: 0.8911

Epoch 10/25
 - 3s - loss: 0.2422 - acc: 0.9369 - val_loss: 0.4337 - val_acc: 0.8785

Epoch 11/25
 - 3s - loss: 0.2278 - acc: 0.9399 - val_loss: 0.3856 - val_acc: 0.9097

Epoch 12/25
 - 3s - loss: 0.2332 - acc: 0.9389 - val_loss: 0.4106 - val_acc: 0.8843

Epoch 13/25
 - 3s - loss: 0.2288 - acc: 0.9368 - val_loss: 0.3907 - val_acc: 0.8935

Epoch 14/25
 - 3s - loss: 0.2172 - acc: 0.9436 - val_loss: 0.3632 - val_acc: 0.9067

Epoch 15/25
 - 3s - loss: 0.2247 - acc: 0.9385 - val_loss: 0.3940 - val_acc: 0.8904

Epoch 16/25
 - 3s - loss: 0.2110 - acc: 0.9438 - val_loss: 0.3592 - val_acc: 0.8975

Epoch 17/25
 - 3s - loss: 0.2200 - acc: 0.9406 - val_loss: 0.3579 - val_acc: 0.9104

Epoch 18/25
 - 3s - loss: 0.2108 - acc: 0.9433 - val_loss: 0.3749 - val_acc: 0.8931

Epoch 19/25
 - 3s - loss: 0.2259 - acc: 0.9358 - val_loss: 0.4025 - val_acc: 0.8965

Epoch 20/25
 - 3s - loss: 0.2002 - acc: 0.9418 - val_loss: 0.3629 - val_acc: 0.8965

Epoch 21/25
 - 3s - loss: 0.2024 - acc: 0.9418 - val_loss: 0.3772 - val_acc: 0.8704

Epoch 22/25
 - 3s - loss: 0.1957 - acc: 0.9436 - val_loss: 0.4193 - val_acc: 0.8785

Epoch 23/25
 - 3s - loss: 0.1949 - acc: 0.9449 - val_loss: 0.3472 - val_acc: 0.8873

Epoch 24/25
 - 3s - loss: 0.1963 - acc: 0.9440 - val_loss: 0.3149 - val_acc: 0.9002

Epoch 25/25
 - 3s - loss: 0.1933 - acc: 0.9431 - val_loss: 0.3453 - val_acc: 0.8870

Train accuracy
0.9378400435255713
Test accuracy:
0.8870037326094333
--------------------------------------------------------------------------------
Model: "sequential_78"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_155 (Conv1D)          (None, 126, 42)           1176
_________________________________________________________________
conv1d_156 (Conv1D)          (None, 120, 24)           7080
_________________________________________________________________
dropout_78 (Dropout)         (None, 120, 24)           0
_________________________________________________________________
max_pooling1d_78 (MaxPooling (None, 40, 24)            0
_________________________________________________________________
flatten_78 (Flatten)         (None, 960)               0
_________________________________________________________________
dense_155 (Dense)            (None, 32)                30752
_________________________________________________________________
dense_156 (Dense)            (None, 6)                 198
=================================================================
Total params: 39,206
Trainable params: 39,206
Non-trainable params: 0
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Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 6s - loss: 13.2612 - acc: 0.8017 - val_loss: 0.8342 - val_acc: 0.7967

Epoch 2/35
 - 3s - loss: 0.5285 - acc: 0.8739 - val_loss: 0.7232 - val_acc: 0.7801

Epoch 3/35
 - 3s - loss: 0.4390 - acc: 0.8962 - val_loss: 0.6250 - val_acc: 0.8938

Epoch 4/35
 - 3s - loss: 0.4137 - acc: 0.8988 - val_loss: 0.7034 - val_acc: 0.8242

Epoch 5/35
 - 3s - loss: 0.3845 - acc: 0.9063 - val_loss: 0.4982 - val_acc: 0.8941

Epoch 6/35
 - 3s - loss: 0.3614 - acc: 0.9061 - val_loss: 0.5182 - val_acc: 0.8476

Epoch 7/35
 - 3s - loss: 0.3490 - acc: 0.9155 - val_loss: 0.4636 - val_acc: 0.8734

Epoch 8/35
 - 3s - loss: 0.3421 - acc: 0.9115 - val_loss: 0.4647 - val_acc: 0.8846

Epoch 9/35
 - 3s - loss: 0.3368 - acc: 0.9134 - val_loss: 0.4665 - val_acc: 0.8446

Epoch 10/35
 - 3s - loss: 0.3346 - acc: 0.9158 - val_loss: 0.6647 - val_acc: 0.7458

Epoch 11/35
 - 3s - loss: 0.3238 - acc: 0.9151 - val_loss: 0.4443 - val_acc: 0.8738

Epoch 12/35
 - 3s - loss: 0.3141 - acc: 0.9197 - val_loss: 0.4298 - val_acc: 0.8751

Epoch 13/35
 - 3s - loss: 0.3217 - acc: 0.9168 - val_loss: 0.5327 - val_acc: 0.8137

Epoch 14/35
 - 3s - loss: 0.2876 - acc: 0.9256 - val_loss: 0.4356 - val_acc: 0.8622

Epoch 15/35
 - 3s - loss: 0.3248 - acc: 0.9124 - val_loss: 0.4727 - val_acc: 0.8456

Epoch 16/35
 - 3s - loss: 0.3231 - acc: 0.9222 - val_loss: 0.4473 - val_acc: 0.8388

Epoch 17/35
 - 3s - loss: 0.3106 - acc: 0.9238 - val_loss: 0.4971 - val_acc: 0.8426

Epoch 18/35
 - 3s - loss: 0.2904 - acc: 0.9234 - val_loss: 0.4466 - val_acc: 0.8609

Epoch 19/35
 - 3s - loss: 0.3013 - acc: 0.9211 - val_loss: 0.3747 - val_acc: 0.8860

Epoch 20/35
 - 3s - loss: 0.2980 - acc: 0.9193 - val_loss: 0.4520 - val_acc: 0.8429

Epoch 21/35
 - 3s - loss: 0.2918 - acc: 0.9203 - val_loss: 0.5950 - val_acc: 0.7984

Epoch 22/35
 - 3s - loss: 0.2860 - acc: 0.9223 - val_loss: 0.4336 - val_acc: 0.8636

Epoch 23/35
 - 3s - loss: 0.2983 - acc: 0.9185 - val_loss: 0.3894 - val_acc: 0.8890

Epoch 24/35
 - 3s - loss: 0.2800 - acc: 0.9234 - val_loss: 0.4935 - val_acc: 0.8154

Epoch 25/35
 - 3s - loss: 0.2776 - acc: 0.9270 - val_loss: 0.4043 - val_acc: 0.8714
```

```
 - 3s - loss: 0.2770 - acc: 0.9270 - val_loss: 0.4045 - val_acc: 0.8714

Epoch 26/35
 - 3s - loss: 0.2877 - acc: 0.9251 - val_loss: 0.4952 - val_acc: 0.8395

Epoch 27/35
 - 3s - loss: 0.2852 - acc: 0.9275 - val_loss: 0.4569 - val_acc: 0.8541

Epoch 28/35
 - 3s - loss: 0.2813 - acc: 0.9252 - val_loss: 0.4167 - val_acc: 0.8802

Epoch 29/35
 - 3s - loss: 0.2910 - acc: 0.9263 - val_loss: 0.5191 - val_acc: 0.8286

Epoch 30/35
 - 3s - loss: 0.2981 - acc: 0.9233 - val_loss: 0.4667 - val_acc: 0.8643

Epoch 31/35
 - 3s - loss: 0.2694 - acc: 0.9279 - val_loss: 0.3944 - val_acc: 0.8880

Epoch 32/35
 - 3s - loss: 0.2752 - acc: 0.9257 - val_loss: 0.3837 - val_acc: 0.8860

Epoch 33/35
 - 4s - loss: 0.2925 - acc: 0.9263 - val_loss: 0.4409 - val_acc: 0.8707

Epoch 34/35
 - 3s - loss: 0.2788 - acc: 0.9255 - val_loss: 0.5032 - val_acc: 0.8395

Epoch 35/35
 - 3s - loss: 0.2910 - acc: 0.9274 - val_loss: 0.4683 - val_acc: 0.8412

Train accuracy
0.8642546245919478
Test accuracy:
0.8411944350186631
_________________________________________________________________________________
Model: "sequential_79"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_157 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_158 (Conv1D)          (None, 120, 16)           2256
_________________________________________________________________
dropout_79 (Dropout)         (None, 120, 16)           0
_________________________________________________________________
max_pooling1d_79 (MaxPooling (None, 60, 16)            0
_________________________________________________________________
flatten_79 (Flatten)         (None, 960)               0
_________________________________________________________________
dense_157 (Dense)            (None, 32)                30752
_________________________________________________________________
dense_158 (Dense)            (None, 6)                 198
=================================================================
Total params: 34,494
Trainable params: 34,494
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 35.3574 - acc: 0.6870 - val_loss: 7.1166 - val_acc: 0.7727

Epoch 2/25
 - 1s - loss: 1.9951 - acc: 0.8131 - val_loss: 0.9042 - val_acc: 0.7475

Epoch 3/25
 - 1s - loss: 0.5464 - acc: 0.8664 - val_loss: 0.7078 - val_acc: 0.8388

Epoch 4/25
 - 1s - loss: 0.4579 - acc: 0.8896 - val_loss: 0.7278 - val_acc: 0.8222

Epoch 5/25
 - 1s - loss: 0.4154 - acc: 0.8993 - val_loss: 0.5640 - val_acc: 0.8738

Epoch 6/25
 - 1s - loss: 0.3808 - acc: 0.9013 - val_loss: 0.7715 - val_acc: 0.7862
```

```
 - 1s - loss: 0.3696 - acc: 0.9013 - val_loss: 0.7715 - val_acc: 0.7862

Epoch 7/25
 - 1s - loss: 0.3734 - acc: 0.9036 - val_loss: 0.5536 - val_acc: 0.8578

Epoch 8/25
 - 1s - loss: 0.3548 - acc: 0.9128 - val_loss: 0.4819 - val_acc: 0.8806

Epoch 9/25
 - 1s - loss: 0.3371 - acc: 0.9174 - val_loss: 0.4868 - val_acc: 0.8694

Epoch 10/25
 - 1s - loss: 0.3330 - acc: 0.9125 - val_loss: 0.5590 - val_acc: 0.8117

Epoch 11/25
 - 1s - loss: 0.3220 - acc: 0.9181 - val_loss: 0.4908 - val_acc: 0.8697

Epoch 12/25
 - 1s - loss: 0.3156 - acc: 0.9200 - val_loss: 0.4817 - val_acc: 0.8812

Epoch 13/25
 - 1s - loss: 0.3091 - acc: 0.9191 - val_loss: 0.4257 - val_acc: 0.8789

Epoch 14/25
 - 1s - loss: 0.2990 - acc: 0.9255 - val_loss: 0.4458 - val_acc: 0.8680

Epoch 15/25
 - 2s - loss: 0.2970 - acc: 0.9241 - val_loss: 0.4396 - val_acc: 0.8765

Epoch 16/25
 - 2s - loss: 0.2934 - acc: 0.9230 - val_loss: 0.4678 - val_acc: 0.8558

Epoch 17/25
 - 2s - loss: 0.2862 - acc: 0.9257 - val_loss: 0.4156 - val_acc: 0.8860

Epoch 18/25
 - 1s - loss: 0.2834 - acc: 0.9264 - val_loss: 0.4190 - val_acc: 0.8802

Epoch 19/25
 - 1s - loss: 0.2838 - acc: 0.9236 - val_loss: 0.4120 - val_acc: 0.8870

Epoch 20/25
 - 2s - loss: 0.2798 - acc: 0.9255 - val_loss: 0.4055 - val_acc: 0.8775

Epoch 21/25
 - 1s - loss: 0.2766 - acc: 0.9293 - val_loss: 0.4044 - val_acc: 0.8877

Epoch 22/25
 - 2s - loss: 0.2733 - acc: 0.9252 - val_loss: 0.3641 - val_acc: 0.8935

Epoch 23/25
 - 1s - loss: 0.2735 - acc: 0.9283 - val_loss: 0.3895 - val_acc: 0.9036

Epoch 24/25
 - 1s - loss: 0.2704 - acc: 0.9283 - val_loss: 0.4126 - val_acc: 0.8714

Epoch 25/25
 - 1s - loss: 0.2727 - acc: 0.9268 - val_loss: 0.4156 - val_acc: 0.8809

Train accuracy
0.9250544068992332
Test accuracy:
0.8808958262639973
_________________________________________________________________
Model: "sequential_80"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_159 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_160 (Conv1D)          (None, 118, 32)           7200
_________________________________________________________________
dropout_80 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_80 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_80 (Flatten)         (None, 1248)              0
```

```
_________________________________________________________________
dense_159 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_160 (Dense)            (None, 6)                 198
=================================================================
Total params: 48,838
Trainable params: 48,838
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 42.2921 - acc: 0.7033 - val_loss: 3.1586 - val_acc: 0.7530

Epoch 2/25
 - 3s - loss: 1.0666 - acc: 0.8458 - val_loss: 0.9455 - val_acc: 0.7282

Epoch 3/25
 - 3s - loss: 0.5546 - acc: 0.8760 - val_loss: 0.7361 - val_acc: 0.8558

Epoch 4/25
 - 3s - loss: 0.5059 - acc: 0.8772 - val_loss: 0.7999 - val_acc: 0.8005

Epoch 5/25
 - 3s - loss: 0.4669 - acc: 0.8860 - val_loss: 0.6731 - val_acc: 0.8666

Epoch 6/25
 - 3s - loss: 0.4292 - acc: 0.8951 - val_loss: 0.6864 - val_acc: 0.8300

Epoch 7/25
 - 3s - loss: 0.4161 - acc: 0.8898 - val_loss: 0.6180 - val_acc: 0.8616

Epoch 8/25
 - 2s - loss: 0.4023 - acc: 0.8980 - val_loss: 0.6489 - val_acc: 0.8320

Epoch 9/25
 - 3s - loss: 0.3962 - acc: 0.8966 - val_loss: 0.5968 - val_acc: 0.8341

Epoch 10/25
 - 3s - loss: 0.3957 - acc: 0.8965 - val_loss: 0.7965 - val_acc: 0.7333

Epoch 11/25
 - 3s - loss: 0.3747 - acc: 0.9018 - val_loss: 0.5697 - val_acc: 0.8629

Epoch 12/25
 - 4s - loss: 0.3717 - acc: 0.9002 - val_loss: 0.6370 - val_acc: 0.8480

Epoch 13/25
 - 4s - loss: 0.3705 - acc: 0.8983 - val_loss: 0.5593 - val_acc: 0.8303

Epoch 14/25
 - 3s - loss: 0.3499 - acc: 0.9060 - val_loss: 0.5394 - val_acc: 0.8619

Epoch 15/25
 - 3s - loss: 0.3551 - acc: 0.9025 - val_loss: 0.5648 - val_acc: 0.8463

Epoch 16/25
 - 3s - loss: 0.3500 - acc: 0.9044 - val_loss: 0.5376 - val_acc: 0.8673

Epoch 17/25
 - 3s - loss: 0.3321 - acc: 0.9138 - val_loss: 0.5654 - val_acc: 0.8585

Epoch 18/25
 - 3s - loss: 0.3415 - acc: 0.9087 - val_loss: 0.5215 - val_acc: 0.8707

Epoch 19/25
 - 3s - loss: 0.3410 - acc: 0.9083 - val_loss: 0.5479 - val_acc: 0.8619

Epoch 20/25
 - 3s - loss: 0.3414 - acc: 0.9075 - val_loss: 0.5075 - val_acc: 0.8636

Epoch 21/25
 - 3s - loss: 0.3334 - acc: 0.9072 - val_loss: 0.5932 - val_acc: 0.8412

Epoch 22/25
 - 3s - loss: 0.3220 - acc: 0.9120 - val_loss: 0.5341 - val_acc: 0.8354

Epoch 23/25
```

```
Epoch 23/25
 - 3s - loss: 0.3255 - acc: 0.9113 - val_loss: 0.4999 - val_acc: 0.8602

Epoch 24/25
 - 3s - loss: 0.3089 - acc: 0.9189 - val_loss: 0.5374 - val_acc: 0.8222

Epoch 25/25
 - 3s - loss: 0.3277 - acc: 0.9128 - val_loss: 0.5029 - val_acc: 0.8772

Train accuracy
0.9298150163220892
Test accuracy:
0.8771632168306752
_________________________________________________________________
Model: "sequential_81"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_161 (Conv1D)          (None, 122, 28)           1792
_________________________________________________________________
conv1d_162 (Conv1D)          (None, 120, 32)           2720
_________________________________________________________________
dropout_81 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_81 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_81 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_161 (Dense)            (None, 64)                81984
_________________________________________________________________
dense_162 (Dense)            (None, 6)                 390
=================================================================
Total params: 86,886
Trainable params: 86,886
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 5s - loss: 15.6158 - acc: 0.7890 - val_loss: 1.8979 - val_acc: 0.8670

Epoch 2/30
 - 1s - loss: 0.7217 - acc: 0.9033 - val_loss: 0.7447 - val_acc: 0.8690

Epoch 3/30
 - 1s - loss: 0.4194 - acc: 0.9147 - val_loss: 0.6503 - val_acc: 0.8850

Epoch 4/30
 - 1s - loss: 0.3822 - acc: 0.9208 - val_loss: 0.5956 - val_acc: 0.8884

Epoch 5/30
 - 2s - loss: 0.3433 - acc: 0.9283 - val_loss: 0.5467 - val_acc: 0.9006

Epoch 6/30
 - 1s - loss: 0.3113 - acc: 0.9316 - val_loss: 0.5893 - val_acc: 0.8453

Epoch 7/30
 - 1s - loss: 0.2977 - acc: 0.9344 - val_loss: 0.4979 - val_acc: 0.8945

Epoch 8/30
 - 1s - loss: 0.2767 - acc: 0.9350 - val_loss: 0.6519 - val_acc: 0.7631

Epoch 9/30
 - 1s - loss: 0.2841 - acc: 0.9329 - val_loss: 0.4882 - val_acc: 0.8778

Epoch 10/30
 - 2s - loss: 0.2614 - acc: 0.9353 - val_loss: 0.5267 - val_acc: 0.8290

Epoch 11/30
 - 1s - loss: 0.2626 - acc: 0.9363 - val_loss: 0.4448 - val_acc: 0.8992

Epoch 12/30
 - 1s - loss: 0.2491 - acc: 0.9366 - val_loss: 0.4716 - val_acc: 0.8761

Epoch 13/30
 - 2s - loss: 0.2641 - acc: 0.9309 - val_loss: 0.5058 - val_acc: 0.8663

Epoch 14/30
```

```
Epoch 14/30
 - 1s - loss: 0.2619 - acc: 0.9342 - val_loss: 0.4656 - val_acc: 0.8928

Epoch 15/30
 - 2s - loss: 0.2478 - acc: 0.9374 - val_loss: 0.4215 - val_acc: 0.9040

Epoch 16/30
 - 1s - loss: 0.2349 - acc: 0.9396 - val_loss: 0.4825 - val_acc: 0.8314

Epoch 17/30
 - 1s - loss: 0.2604 - acc: 0.9350 - val_loss: 0.4373 - val_acc: 0.8972

Epoch 18/30
 - 1s - loss: 0.2219 - acc: 0.9460 - val_loss: 0.4749 - val_acc: 0.8392

Epoch 19/30
 - 1s - loss: 0.2365 - acc: 0.9359 - val_loss: 0.4058 - val_acc: 0.8975

Epoch 20/30
 - 1s - loss: 0.2244 - acc: 0.9421 - val_loss: 0.3745 - val_acc: 0.8992

Epoch 21/30
 - 1s - loss: 0.2360 - acc: 0.9354 - val_loss: 0.4349 - val_acc: 0.8884

Epoch 22/30
 - 2s - loss: 0.2210 - acc: 0.9422 - val_loss: 0.4168 - val_acc: 0.8772

Epoch 23/30
 - 2s - loss: 0.2346 - acc: 0.9410 - val_loss: 0.3651 - val_acc: 0.8965

Epoch 24/30
 - 1s - loss: 0.2087 - acc: 0.9463 - val_loss: 0.3833 - val_acc: 0.8921

Epoch 25/30
 - 1s - loss: 0.2316 - acc: 0.9385 - val_loss: 0.3784 - val_acc: 0.9026

Epoch 26/30
 - 2s - loss: 0.2378 - acc: 0.9362 - val_loss: 0.4302 - val_acc: 0.8792

Epoch 27/30
 - 1s - loss: 0.2217 - acc: 0.9423 - val_loss: 0.3633 - val_acc: 0.8985

Epoch 28/30
 - 2s - loss: 0.2153 - acc: 0.9444 - val_loss: 0.3720 - val_acc: 0.8907

Epoch 29/30
 - 1s - loss: 0.2075 - acc: 0.9433 - val_loss: 0.4282 - val_acc: 0.8938

Epoch 30/30
 - 2s - loss: 0.2101 - acc: 0.9444 - val_loss: 0.3711 - val_acc: 0.8660

Train accuracy
0.9428726877040261
Test accuracy:
0.8659653885307091
_________________________________________________________________
Model: "sequential_82"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_163 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_164 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_82 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_82 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_82 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_163 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_164 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
```

```
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 2.9607 - acc: 0.8375 - val_loss: 0.6771 - val_acc: 0.8863

Epoch 2/25
 - 3s - loss: 0.3714 - acc: 0.9222 - val_loss: 0.5267 - val_acc: 0.8992

Epoch 3/25
 - 3s - loss: 0.2889 - acc: 0.9354 - val_loss: 0.4541 - val_acc: 0.9101

Epoch 4/25
 - 3s - loss: 0.2913 - acc: 0.9298 - val_loss: 0.4265 - val_acc: 0.9165

Epoch 5/25
 - 3s - loss: 0.2459 - acc: 0.9382 - val_loss: 0.3868 - val_acc: 0.9026

Epoch 6/25
 - 3s - loss: 0.2432 - acc: 0.9376 - val_loss: 0.4211 - val_acc: 0.8778

Epoch 7/25
 - 3s - loss: 0.2359 - acc: 0.9403 - val_loss: 0.3534 - val_acc: 0.9141

Epoch 8/25
 - 3s - loss: 0.2195 - acc: 0.9399 - val_loss: 0.4187 - val_acc: 0.8880

Epoch 9/25
 - 4s - loss: 0.2179 - acc: 0.9416 - val_loss: 0.4344 - val_acc: 0.8524

Epoch 10/25
 - 3s - loss: 0.2122 - acc: 0.9423 - val_loss: 0.3869 - val_acc: 0.8989

Epoch 11/25
 - 3s - loss: 0.2176 - acc: 0.9429 - val_loss: 0.3616 - val_acc: 0.8887

Epoch 12/25
 - 3s - loss: 0.2032 - acc: 0.9425 - val_loss: 0.3715 - val_acc: 0.8823

Epoch 13/25
 - 3s - loss: 0.2196 - acc: 0.9407 - val_loss: 0.3782 - val_acc: 0.8856

Epoch 14/25
 - 3s - loss: 0.2245 - acc: 0.9414 - val_loss: 0.3299 - val_acc: 0.9118

Epoch 15/25
 - 3s - loss: 0.2032 - acc: 0.9440 - val_loss: 0.3733 - val_acc: 0.9009

Epoch 16/25
 - 3s - loss: 0.2137 - acc: 0.9431 - val_loss: 0.3634 - val_acc: 0.8931

Epoch 17/25
 - 3s - loss: 0.2106 - acc: 0.9452 - val_loss: 0.3438 - val_acc: 0.9118

Epoch 18/25
 - 3s - loss: 0.2020 - acc: 0.9463 - val_loss: 0.3471 - val_acc: 0.9023

Epoch 19/25
 - 3s - loss: 0.2153 - acc: 0.9399 - val_loss: 0.4471 - val_acc: 0.8846

Epoch 20/25
 - 3s - loss: 0.2052 - acc: 0.9444 - val_loss: 0.3911 - val_acc: 0.8968

Epoch 21/25
 - 3s - loss: 0.2048 - acc: 0.9422 - val_loss: 0.3610 - val_acc: 0.8935

Epoch 22/25
 - 3s - loss: 0.1847 - acc: 0.9495 - val_loss: 0.3570 - val_acc: 0.9006

Epoch 23/25
 - 3s - loss: 0.2224 - acc: 0.9400 - val_loss: 0.3830 - val_acc: 0.8989

Epoch 24/25
 - 3s - loss: 0.1921 - acc: 0.9487 - val_loss: 0.4300 - val_acc: 0.8602

Epoch 25/25
 - 3s - loss: 0.2011 - acc: 0.9457 - val_loss: 0.4085 - val_acc: 0.8792
```

```
Train accuracy
0.9522578890097932
Test accuracy:
0.8791991856124872
--------------------------------------------------------------------------------
Model: "sequential_83"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_165 (Conv1D)          (None, 126, 42)           1176
_________________________________________________________________
conv1d_166 (Conv1D)          (None, 120, 32)           9440
_________________________________________________________________
dropout_83 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_83 (MaxPooling (None, 60, 32)            0
_________________________________________________________________
flatten_83 (Flatten)         (None, 1920)              0
_________________________________________________________________
dense_165 (Dense)            (None, 32)                61472
_________________________________________________________________
dense_166 (Dense)            (None, 6)                 198
=================================================================
Total params: 72,286
Trainable params: 72,286
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 4s - loss: 17.0453 - acc: 0.8192 - val_loss: 4.5626 - val_acc: 0.8982

Epoch 2/25
 - 1s - loss: 1.5980 - acc: 0.9149 - val_loss: 0.9759 - val_acc: 0.7825

Epoch 3/25
 - 1s - loss: 0.4285 - acc: 0.9192 - val_loss: 0.4357 - val_acc: 0.8982

Epoch 4/25
 - 1s - loss: 0.3252 - acc: 0.9278 - val_loss: 0.3481 - val_acc: 0.9196

Epoch 5/25
 - 1s - loss: 0.2884 - acc: 0.9310 - val_loss: 0.4158 - val_acc: 0.8843

Epoch 6/25
 - 1s - loss: 0.2802 - acc: 0.9343 - val_loss: 0.3676 - val_acc: 0.8799

Epoch 7/25
 - 1s - loss: 0.2631 - acc: 0.9347 - val_loss: 0.4640 - val_acc: 0.8351

Epoch 8/25
 - 1s - loss: 0.2405 - acc: 0.9396 - val_loss: 0.3143 - val_acc: 0.9043

Epoch 9/25
 - 1s - loss: 0.2247 - acc: 0.9385 - val_loss: 0.3297 - val_acc: 0.8985

Epoch 10/25
 - 1s - loss: 0.2246 - acc: 0.9403 - val_loss: 0.2955 - val_acc: 0.9315

Epoch 11/25
 - 1s - loss: 0.1980 - acc: 0.9465 - val_loss: 0.2787 - val_acc: 0.9158

Epoch 12/25
 - 1s - loss: 0.2083 - acc: 0.9456 - val_loss: 0.3132 - val_acc: 0.8853

Epoch 13/25
 - 1s - loss: 0.2002 - acc: 0.9453 - val_loss: 0.2878 - val_acc: 0.9013

Epoch 14/25
 - 1s - loss: 0.1974 - acc: 0.9442 - val_loss: 0.2760 - val_acc: 0.9036

Epoch 15/25
 - 2s - loss: 0.1838 - acc: 0.9475 - val_loss: 0.3103 - val_acc: 0.9165

Epoch 16/25
 - 1s - loss: 0.1826 - acc: 0.9452 - val_loss: 0.3939 - val_acc: 0.8816
```

```
Epoch 17/25
 - 1s - loss: 0.1921 - acc: 0.9440 - val_loss: 0.3275 - val_acc: 0.9104

Epoch 18/25
 - 2s - loss: 0.1791 - acc: 0.9486 - val_loss: 0.2610 - val_acc: 0.9111

Epoch 19/25
 - 1s - loss: 0.1840 - acc: 0.9468 - val_loss: 0.2969 - val_acc: 0.9169

Epoch 20/25
 - 1s - loss: 0.1799 - acc: 0.9484 - val_loss: 0.3714 - val_acc: 0.8894

Epoch 21/25
 - 1s - loss: 0.1801 - acc: 0.9474 - val_loss: 0.2848 - val_acc: 0.9125

Epoch 22/25
 - 1s - loss: 0.1707 - acc: 0.9486 - val_loss: 0.2703 - val_acc: 0.9141

Epoch 23/25
 - 1s - loss: 0.1729 - acc: 0.9472 - val_loss: 0.2969 - val_acc: 0.9063

Epoch 24/25
 - 1s - loss: 0.1669 - acc: 0.9487 - val_loss: 0.3097 - val_acc: 0.9074

Epoch 25/25
 - 1s - loss: 0.1707 - acc: 0.9486 - val_loss: 0.6639 - val_acc: 0.7998

Train accuracy
0.8574537540805223
Test accuracy:
0.7997964031218188
--------------------------------------------------------------------------------
Model: "sequential_84"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_167 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_168 (Conv1D)          (None, 118, 24)           4728
_________________________________________________________________
dropout_84 (Dropout)         (None, 118, 24)           0
_________________________________________________________________
max_pooling1d_84 (MaxPooling (None, 39, 24)            0
_________________________________________________________________
flatten_84 (Flatten)         (None, 936)               0
_________________________________________________________________
dense_167 (Dense)            (None, 32)                29984
_________________________________________________________________
dense_168 (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 1/35
 - 6s - loss: 6.9746 - acc: 0.7701 - val_loss: 0.8723 - val_acc: 0.7601

Epoch 2/35
 - 3s - loss: 0.5637 - acc: 0.8595 - val_loss: 0.7630 - val_acc: 0.8249

Epoch 3/35
 - 5s - loss: 0.5033 - acc: 0.8789 - val_loss: 0.7268 - val_acc: 0.8473

Epoch 4/35
 - 4s - loss: 0.4379 - acc: 0.8889 - val_loss: 0.5955 - val_acc: 0.8653

Epoch 5/35
 - 4s - loss: 0.4236 - acc: 0.8930 - val_loss: 0.5811 - val_acc: 0.8592

Epoch 6/35
 - 5s - loss: 0.3891 - acc: 0.8976 - val_loss: 0.5896 - val_acc: 0.8069

Epoch 7/35
 - 5s - loss: 0.3734 - acc: 0.9038 - val_loss: 0.4902 - val_acc: 0.8755
```

```
Epoch 8/35
 - 4s - loss: 0.3833 - acc: 0.9011 - val_loss: 0.6464 - val_acc: 0.8144

Epoch 9/35
 - 5s - loss: 0.3644 - acc: 0.9066 - val_loss: 0.5098 - val_acc: 0.8442

Epoch 10/35
 - 6s - loss: 0.3668 - acc: 0.9041 - val_loss: 0.9702 - val_acc: 0.6647

Epoch 11/35
 - 5s - loss: 0.3534 - acc: 0.9083 - val_loss: 0.5161 - val_acc: 0.8480

Epoch 12/35
 - 5s - loss: 0.3345 - acc: 0.9127 - val_loss: 0.6054 - val_acc: 0.8086

Epoch 13/35
 - 4s - loss: 0.3490 - acc: 0.9100 - val_loss: 0.5177 - val_acc: 0.8388

Epoch 14/35
 - 5s - loss: 0.3286 - acc: 0.9139 - val_loss: 0.7017 - val_acc: 0.7754

Epoch 15/35
 - 4s - loss: 0.3331 - acc: 0.9151 - val_loss: 0.6043 - val_acc: 0.8103

Epoch 16/35
 - 4s - loss: 0.3301 - acc: 0.9102 - val_loss: 0.5167 - val_acc: 0.8398

Epoch 17/35
 - 5s - loss: 0.3113 - acc: 0.9203 - val_loss: 0.6316 - val_acc: 0.7774

Epoch 18/35
 - 5s - loss: 0.3209 - acc: 0.9158 - val_loss: 0.5549 - val_acc: 0.8232

Epoch 19/35
 - 5s - loss: 0.3342 - acc: 0.9131 - val_loss: 0.4850 - val_acc: 0.8473

Epoch 20/35
 - 6s - loss: 0.3312 - acc: 0.9159 - val_loss: 0.4899 - val_acc: 0.8426

Epoch 21/35
 - 3s - loss: 0.3368 - acc: 0.9106 - val_loss: 0.9898 - val_acc: 0.6658

Epoch 22/35
 - 5s - loss: 0.3185 - acc: 0.9168 - val_loss: 0.5893 - val_acc: 0.8215

Epoch 23/35
 - 4s - loss: 0.3129 - acc: 0.9214 - val_loss: 0.6396 - val_acc: 0.7866

Epoch 24/35
 - 3s - loss: 0.3218 - acc: 0.9173 - val_loss: 0.7919 - val_acc: 0.7394

Epoch 25/35
 - 4s - loss: 0.3238 - acc: 0.9117 - val_loss: 0.6905 - val_acc: 0.7567

Epoch 26/35
 - 4s - loss: 0.3175 - acc: 0.9165 - val_loss: 0.6381 - val_acc: 0.7815

Epoch 27/35
 - 5s - loss: 0.3152 - acc: 0.9191 - val_loss: 0.6627 - val_acc: 0.7577

Epoch 28/35
 - 5s - loss: 0.3074 - acc: 0.9211 - val_loss: 0.5216 - val_acc: 0.8310

Epoch 29/35
 - 4s - loss: 0.3249 - acc: 0.9172 - val_loss: 0.5814 - val_acc: 0.8008

Epoch 30/35
 - 5s - loss: 0.2968 - acc: 0.9252 - val_loss: 0.5573 - val_acc: 0.8208

Epoch 31/35
 - 4s - loss: 0.2991 - acc: 0.9225 - val_loss: 0.5180 - val_acc: 0.8317

Epoch 32/35
 - 5s - loss: 0.3118 - acc: 0.9149 - val_loss: 0.7197 - val_acc: 0.7621

Epoch 33/35
```

```
 - 4s - loss: 0.3020 - acc: 0.9208 - val_loss: 0.5591 - val_acc: 0.8174

Epoch 34/35
 - 5s - loss: 0.3243 - acc: 0.9117 - val_loss: 1.1446 - val_acc: 0.6746

Epoch 35/35
 - 7s - loss: 0.3052 - acc: 0.9212 - val_loss: 0.8930 - val_acc: 0.6736

Train accuracy
0.7400707290533188
Test accuracy:
0.6735663386696996
_________________________________________________________________________________
Model: "sequential_85"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_169 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_170 (Conv1D)          (None, 120, 16)           2256
_________________________________________________________________
dropout_85 (Dropout)         (None, 120, 16)           0
_________________________________________________________________
max_pooling1d_85 (MaxPooling (None, 40, 16)            0
_________________________________________________________________
flatten_85 (Flatten)         (None, 640)               0
_________________________________________________________________
dense_169 (Dense)            (None, 32)                20512
_________________________________________________________________
dense_170 (Dense)            (None, 6)                 198
=================================================================
Total params: 24,254
Trainable params: 24,254
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 8.1148 - acc: 0.7354 - val_loss: 1.0631 - val_acc: 0.8093

Epoch 2/25
 - 2s - loss: 0.5693 - acc: 0.8696 - val_loss: 0.7561 - val_acc: 0.8069

Epoch 3/25
 - 1s - loss: 0.4377 - acc: 0.8984 - val_loss: 0.6814 - val_acc: 0.8782

Epoch 4/25
 - 2s - loss: 0.4127 - acc: 0.8989 - val_loss: 0.6289 - val_acc: 0.8568

Epoch 5/25
 - 2s - loss: 0.3917 - acc: 0.9081 - val_loss: 0.6197 - val_acc: 0.8711

Epoch 6/25
 - 2s - loss: 0.3705 - acc: 0.9140 - val_loss: 0.5797 - val_acc: 0.8561

Epoch 7/25
 - 2s - loss: 0.3403 - acc: 0.9211 - val_loss: 0.5870 - val_acc: 0.8622

Epoch 8/25
 - 2s - loss: 0.3237 - acc: 0.9259 - val_loss: 0.5136 - val_acc: 0.8890

Epoch 9/25
 - 2s - loss: 0.3009 - acc: 0.9328 - val_loss: 0.4819 - val_acc: 0.8894

Epoch 10/25
 - 2s - loss: 0.2958 - acc: 0.9320 - val_loss: 0.4954 - val_acc: 0.8775

Epoch 11/25
 - 2s - loss: 0.2893 - acc: 0.9300 - val_loss: 0.4557 - val_acc: 0.8911

Epoch 12/25
 - 2s - loss: 0.2869 - acc: 0.9291 - val_loss: 0.5556 - val_acc: 0.8646

Epoch 13/25
 - 2s - loss: 0.2705 - acc: 0.9323 - val_loss: 0.5771 - val_acc: 0.8314

Epoch 14/25
```

```
 - 2s - loss: 0.2833 - acc: 0.9304 - val_loss: 0.4103 - val_acc: 0.9077

Epoch 15/25
 - 3s - loss: 0.2638 - acc: 0.9370 - val_loss: 0.5250 - val_acc: 0.8439

Epoch 16/25
 - 2s - loss: 0.2622 - acc: 0.9350 - val_loss: 0.4181 - val_acc: 0.8812

Epoch 17/25
 - 2s - loss: 0.2649 - acc: 0.9343 - val_loss: 0.4080 - val_acc: 0.8935

Epoch 18/25
 - 2s - loss: 0.2550 - acc: 0.9397 - val_loss: 0.4061 - val_acc: 0.8806

Epoch 19/25
 - 2s - loss: 0.2512 - acc: 0.9368 - val_loss: 0.4271 - val_acc: 0.8901

Epoch 20/25
 - 2s - loss: 0.2448 - acc: 0.9363 - val_loss: 0.4000 - val_acc: 0.8911

Epoch 21/25
 - 3s - loss: 0.2369 - acc: 0.9372 - val_loss: 0.5941 - val_acc: 0.8005

Epoch 22/25
 - 3s - loss: 0.2505 - acc: 0.9343 - val_loss: 0.3913 - val_acc: 0.8935

Epoch 23/25
 - 2s - loss: 0.2423 - acc: 0.9359 - val_loss: 0.3978 - val_acc: 0.8935

Epoch 24/25
 - 2s - loss: 0.2559 - acc: 0.9354 - val_loss: 0.3890 - val_acc: 0.8890

Epoch 25/25
 - 2s - loss: 0.2637 - acc: 0.9312 - val_loss: 0.3833 - val_acc: 0.8951

Train accuracy
0.9498095756256801
Test accuracy:
0.8951476077366813
--------------------------------------------------------------------------------
Model: "sequential_86"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_171 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_172 (Conv1D)          (None, 122, 32)           3104
_________________________________________________________________
dropout_86 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_86 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_86 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_171 (Dense)            (None, 64)                81984
_________________________________________________________________
dense_172 (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 1/30
 - 9s - loss: 15.3203 - acc: 0.7765 - val_loss: 1.1397 - val_acc: 0.7469

Epoch 2/30
 - 5s - loss: 0.5719 - acc: 0.8727 - val_loss: 0.8172 - val_acc: 0.7832

Epoch 3/30
 - 6s - loss: 0.4546 - acc: 0.9000 - val_loss: 0.6838 - val_acc: 0.8660

Epoch 4/30
 - 5s - loss: 0.4244 - acc: 0.8968 - val_loss: 0.6631 - val_acc: 0.8561

Epoch 5/30
```

```
 -
 - 7s - loss: 0.3962 - acc: 0.9045 - val_loss: 0.5823 - val_acc: 0.8653

Epoch 6/30
 - 4s - loss: 0.3645 - acc: 0.9147 - val_loss: 0.6468 - val_acc: 0.8127

Epoch 7/30
 - 5s - loss: 0.3407 - acc: 0.9208 - val_loss: 0.5460 - val_acc: 0.8738

Epoch 8/30
 - 6s - loss: 0.3286 - acc: 0.9217 - val_loss: 0.4988 - val_acc: 0.8829

Epoch 9/30
 - 5s - loss: 0.3184 - acc: 0.9227 - val_loss: 0.5619 - val_acc: 0.8317

Epoch 10/30
 - 6s - loss: 0.3163 - acc: 0.9232 - val_loss: 0.6013 - val_acc: 0.8307

Epoch 11/30
 - 4s - loss: 0.2944 - acc: 0.9289 - val_loss: 0.4539 - val_acc: 0.8887

Epoch 12/30
 - 6s - loss: 0.2911 - acc: 0.9282 - val_loss: 0.5941 - val_acc: 0.8157

Epoch 13/30
 - 5s - loss: 0.3066 - acc: 0.9249 - val_loss: 0.5055 - val_acc: 0.8694

Epoch 14/30
 - 4s - loss: 0.2906 - acc: 0.9270 - val_loss: 0.4335 - val_acc: 0.8979

Epoch 15/30
 - 4s - loss: 0.2960 - acc: 0.9280 - val_loss: 0.4724 - val_acc: 0.8724

Epoch 16/30
 - 6s - loss: 0.2742 - acc: 0.9321 - val_loss: 0.4658 - val_acc: 0.8646

Epoch 17/30
 - 5s - loss: 0.2720 - acc: 0.9300 - val_loss: 0.4102 - val_acc: 0.8989

Epoch 18/30
 - 4s - loss: 0.2605 - acc: 0.9344 - val_loss: 0.4616 - val_acc: 0.8649

Epoch 19/30
 - 6s - loss: 0.2789 - acc: 0.9297 - val_loss: 0.4073 - val_acc: 0.8782

Epoch 20/30
 - 6s - loss: 0.2596 - acc: 0.9317 - val_loss: 0.4466 - val_acc: 0.8839

Epoch 21/30
 - 6s - loss: 0.2573 - acc: 0.9328 - val_loss: 0.5981 - val_acc: 0.7845

Epoch 22/30
 - 6s - loss: 0.2542 - acc: 0.9358 - val_loss: 0.4512 - val_acc: 0.8636

Epoch 23/30
 - 5s - loss: 0.2482 - acc: 0.9344 - val_loss: 0.4071 - val_acc: 0.8782

Epoch 24/30
 - 5s - loss: 0.2660 - acc: 0.9283 - val_loss: 0.4172 - val_acc: 0.8806

Epoch 25/30
 - 5s - loss: 0.2438 - acc: 0.9372 - val_loss: 0.5089 - val_acc: 0.8463

Epoch 26/30
 - 5s - loss: 0.2562 - acc: 0.9325 - val_loss: 0.4036 - val_acc: 0.8812

Epoch 27/30
 - 5s - loss: 0.2408 - acc: 0.9355 - val_loss: 0.4296 - val_acc: 0.8785

Epoch 28/30
 - 5s - loss: 0.2546 - acc: 0.9346 - val_loss: 0.3710 - val_acc: 0.8958

Epoch 29/30
 - 6s - loss: 0.2367 - acc: 0.9388 - val_loss: 0.4680 - val_acc: 0.8246

Epoch 30/30
 - 5s - loss: 0.2260 - acc: 0.9384 - val_loss: 0.5485 - val_acc: 0.8252
```

```
Train accuracy
0.9090043525571273
Test accuracy:
0.825246012894469
--------------------------------------------------------------------------------
Model: "sequential_87"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_173 (Conv1D)          (None, 122, 28)           1792
_________________________________________________________________
conv1d_174 (Conv1D)          (None, 116, 32)           6304
_________________________________________________________________
dropout_87 (Dropout)         (None, 116, 32)           0
_________________________________________________________________
max_pooling1d_87 (MaxPooling (None, 38, 32)            0
_________________________________________________________________
flatten_87 (Flatten)         (None, 1216)              0
_________________________________________________________________
dense_173 (Dense)            (None, 32)                38944
_________________________________________________________________
dense_174 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,238
Trainable params: 47,238
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 7.0809 - acc: 0.7987 - val_loss: 0.7991 - val_acc: 0.8666

Epoch 2/25
 - 3s - loss: 0.4702 - acc: 0.8906 - val_loss: 1.3092 - val_acc: 0.6929

Epoch 3/25
 - 3s - loss: 0.3573 - acc: 0.9110 - val_loss: 0.5085 - val_acc: 0.8595

Epoch 4/25
 - 2s - loss: 0.3057 - acc: 0.9215 - val_loss: 0.5919 - val_acc: 0.8117

Epoch 5/25
 - 3s - loss: 0.2910 - acc: 0.9233 - val_loss: 0.4255 - val_acc: 0.8945

Epoch 6/25
 - 3s - loss: 0.2771 - acc: 0.9285 - val_loss: 0.3829 - val_acc: 0.9036

Epoch 7/25
 - 2s - loss: 0.2680 - acc: 0.9298 - val_loss: 0.3987 - val_acc: 0.8904

Epoch 8/25
 - 3s - loss: 0.2608 - acc: 0.9248 - val_loss: 0.3799 - val_acc: 0.9101

Epoch 9/25
 - 2s - loss: 0.2451 - acc: 0.9338 - val_loss: 0.4056 - val_acc: 0.8775

Epoch 10/25
 - 2s - loss: 0.2436 - acc: 0.9301 - val_loss: 0.6008 - val_acc: 0.7842

Epoch 11/25
 - 2s - loss: 0.2475 - acc: 0.9319 - val_loss: 0.4365 - val_acc: 0.8806

Epoch 12/25
 - 2s - loss: 0.2427 - acc: 0.9336 - val_loss: 0.3652 - val_acc: 0.9006

Epoch 13/25
 - 2s - loss: 0.2441 - acc: 0.9300 - val_loss: 0.3507 - val_acc: 0.8914

Epoch 14/25
 - 2s - loss: 0.2351 - acc: 0.9370 - val_loss: 0.6790 - val_acc: 0.7482

Epoch 15/25
 - 2s - loss: 0.2411 - acc: 0.9328 - val_loss: 0.3548 - val_acc: 0.8941

Epoch 16/25
 - 3s - loss: 0.2392 - acc: 0.9363 - val_loss: 0.3751 - val_acc: 0.9053
```

```
Epoch 17/25
 - 2s - loss: 0.2325 - acc: 0.9353 - val_loss: 0.3340 - val_acc: 0.9087

Epoch 18/25
 - 2s - loss: 0.2330 - acc: 0.9339 - val_loss: 0.3874 - val_acc: 0.8945

Epoch 19/25
 - 2s - loss: 0.2339 - acc: 0.9346 - val_loss: 0.3639 - val_acc: 0.9043

Epoch 20/25
 - 2s - loss: 0.2392 - acc: 0.9351 - val_loss: 0.3600 - val_acc: 0.8829

Epoch 21/25
 - 2s - loss: 0.2316 - acc: 0.9346 - val_loss: 0.3891 - val_acc: 0.8694

Epoch 22/25
 - 2s - loss: 0.2409 - acc: 0.9334 - val_loss: 0.3515 - val_acc: 0.8965

Epoch 23/25
 - 2s - loss: 0.2341 - acc: 0.9347 - val_loss: 0.3320 - val_acc: 0.9030

Epoch 24/25
 - 1s - loss: 0.2282 - acc: 0.9385 - val_loss: 0.3861 - val_acc: 0.8694

Epoch 25/25
 - 1s - loss: 0.2296 - acc: 0.9346 - val_loss: 0.3648 - val_acc: 0.8850

Train accuracy
0.9285908595651745
Test accuracy:
0.8849677638276213
_________________________________________________________________
Model: "sequential_88"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_175 (Conv1D)          (None, 124, 42)           1932
_________________________________________________________________
conv1d_176 (Conv1D)          (None, 118, 32)           9440
_________________________________________________________________
dropout_88 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_88 (MaxPooling (None, 59, 32)            0
_________________________________________________________________
flatten_88 (Flatten)         (None, 1888)              0
_________________________________________________________________
dense_175 (Dense)            (None, 32)                60448
_________________________________________________________________
dense_176 (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
 - 7s - loss: 6.3971 - acc: 0.8032 - val_loss: 0.7655 - val_acc: 0.7978

Epoch 2/25
 - 4s - loss: 0.4916 - acc: 0.8826 - val_loss: 0.6708 - val_acc: 0.8439

Epoch 3/25
 - 5s - loss: 0.4095 - acc: 0.9008 - val_loss: 0.5404 - val_acc: 0.8748

Epoch 4/25
 - 5s - loss: 0.3720 - acc: 0.9057 - val_loss: 0.6355 - val_acc: 0.8368

Epoch 5/25
 - 4s - loss: 0.3577 - acc: 0.9042 - val_loss: 0.5135 - val_acc: 0.8446

Epoch 6/25
 - 5s - loss: 0.3408 - acc: 0.9140 - val_loss: 0.5586 - val_acc: 0.8273

Epoch 7/25
 - 5s - loss: 0.3308 - acc: 0.9192 - val_loss: 0.4646 - val_acc: 0.8758
```

```
Epoch 8/25
 - 5s - loss: 0.3063 - acc: 0.9217 - val_loss: 0.5743 - val_acc: 0.8751

Epoch 9/25
 - 5s - loss: 0.3224 - acc: 0.9155 - val_loss: 0.4779 - val_acc: 0.8724

Epoch 10/25
 - 4s - loss: 0.3008 - acc: 0.9255 - val_loss: 0.4872 - val_acc: 0.8541

Epoch 11/25
 - 4s - loss: 0.2824 - acc: 0.9294 - val_loss: 0.4101 - val_acc: 0.8911

Epoch 12/25
 - 5s - loss: 0.2767 - acc: 0.9276 - val_loss: 0.4735 - val_acc: 0.8605

Epoch 13/25
 - 6s - loss: 0.2708 - acc: 0.9323 - val_loss: 0.3967 - val_acc: 0.8816

Epoch 14/25
 - 4s - loss: 0.2861 - acc: 0.9249 - val_loss: 0.4626 - val_acc: 0.8711

Epoch 15/25
 - 6s - loss: 0.2774 - acc: 0.9276 - val_loss: 0.4817 - val_acc: 0.8561

Epoch 16/25
 - 5s - loss: 0.2473 - acc: 0.9359 - val_loss: 0.4545 - val_acc: 0.8711

Epoch 17/25
 - 4s - loss: 0.2630 - acc: 0.9328 - val_loss: 0.3775 - val_acc: 0.9036

Epoch 18/25
 - 5s - loss: 0.2478 - acc: 0.9362 - val_loss: 0.3949 - val_acc: 0.8911

Epoch 19/25
 - 5s - loss: 0.2547 - acc: 0.9308 - val_loss: 0.3798 - val_acc: 0.8826

Epoch 20/25
 - 5s - loss: 0.2761 - acc: 0.9321 - val_loss: 0.3459 - val_acc: 0.8911

Epoch 21/25
 - 5s - loss: 0.2357 - acc: 0.9366 - val_loss: 0.4722 - val_acc: 0.8629

Epoch 22/25
 - 5s - loss: 0.2360 - acc: 0.9353 - val_loss: 0.3603 - val_acc: 0.8979

Epoch 23/25
 - 5s - loss: 0.2429 - acc: 0.9332 - val_loss: 0.3466 - val_acc: 0.9009

Epoch 24/25
 - 5s - loss: 0.2331 - acc: 0.9369 - val_loss: 0.3423 - val_acc: 0.8836

Epoch 25/25
 - 5s - loss: 0.2324 - acc: 0.9362 - val_loss: 0.3626 - val_acc: 0.9033

Train accuracy
0.9238302502720348
Test accuracy:
0.9032914828639295
_________________________________________________________________________________
Model: "sequential_89"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_177 (Conv1D)          (None, 126, 28)           784
_________________________________________________________________
conv1d_178 (Conv1D)          (None, 120, 24)           4728
_________________________________________________________________
dropout_89 (Dropout)         (None, 120, 24)           0
_________________________________________________________________
max_pooling1d_89 (MaxPooling (None, 40, 24)            0
_________________________________________________________________
flatten_89 (Flatten)         (None, 960)               0
_________________________________________________________________
dense_177 (Dense)            (None, 32)                30752
_________________________________________________________________
dense_178 (Dense)            (None, 6)                 198
=================================================================
```

```
Total params: 36,462
Trainable params: 36,462
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/35
 - 4s - loss: 8.0291 - acc: 0.7148 - val_loss: 2.9643 - val_acc: 0.8066

Epoch 2/35
 - 1s - loss: 1.6323 - acc: 0.8749 - val_loss: 1.2883 - val_acc: 0.7479

Epoch 3/35
 - 1s - loss: 0.7147 - acc: 0.9214 - val_loss: 0.7887 - val_acc: 0.8839

Epoch 4/35
 - 1s - loss: 0.4303 - acc: 0.9406 - val_loss: 0.5645 - val_acc: 0.8928

Epoch 5/35
 - 1s - loss: 0.3243 - acc: 0.9402 - val_loss: 0.5221 - val_acc: 0.8795

Epoch 6/35
 - 1s - loss: 0.2879 - acc: 0.9423 - val_loss: 0.4837 - val_acc: 0.8799

Epoch 7/35
 - 1s - loss: 0.2663 - acc: 0.9437 - val_loss: 0.4627 - val_acc: 0.8704

Epoch 8/35
 - 1s - loss: 0.2573 - acc: 0.9410 - val_loss: 0.4621 - val_acc: 0.8724

Epoch 9/35
 - 1s - loss: 0.2384 - acc: 0.9449 - val_loss: 0.4042 - val_acc: 0.9043

Epoch 10/35
 - 1s - loss: 0.2338 - acc: 0.9438 - val_loss: 0.3937 - val_acc: 0.9026

Epoch 11/35
 - 1s - loss: 0.2207 - acc: 0.9482 - val_loss: 0.3820 - val_acc: 0.8951

Epoch 12/35
 - 1s - loss: 0.2142 - acc: 0.9474 - val_loss: 0.4270 - val_acc: 0.8836

Epoch 13/35
 - 1s - loss: 0.2196 - acc: 0.9452 - val_loss: 0.3722 - val_acc: 0.8958

Epoch 14/35
 - 1s - loss: 0.2059 - acc: 0.9489 - val_loss: 0.3565 - val_acc: 0.9206

Epoch 15/35
 - 1s - loss: 0.1969 - acc: 0.9516 - val_loss: 0.3411 - val_acc: 0.9063

Epoch 16/35
 - 1s - loss: 0.2084 - acc: 0.9452 - val_loss: 0.3497 - val_acc: 0.8955

Epoch 17/35
 - 1s - loss: 0.1998 - acc: 0.9486 - val_loss: 0.3731 - val_acc: 0.8890

Epoch 18/35
 - 1s - loss: 0.1916 - acc: 0.9491 - val_loss: 0.3217 - val_acc: 0.9080

Epoch 19/35
 - 1s - loss: 0.2052 - acc: 0.9459 - val_loss: 0.3357 - val_acc: 0.9114

Epoch 20/35
 - 2s - loss: 0.2000 - acc: 0.9450 - val_loss: 0.3423 - val_acc: 0.9141

Epoch 21/35
 - 1s - loss: 0.1832 - acc: 0.9509 - val_loss: 0.3384 - val_acc: 0.8979

Epoch 22/35
 - 1s - loss: 0.1827 - acc: 0.9493 - val_loss: 0.3329 - val_acc: 0.9046

Epoch 23/35
 - 1s - loss: 0.1768 - acc: 0.9509 - val_loss: 0.3867 - val_acc: 0.8765

Epoch 24/35
 - 1s - loss: 0.1853 - acc: 0.9518 - val_loss: 0.2949 - val_acc: 0.9138
```

```
 - 1s - loss: 0.1695 - acc: 0.9516 - val_loss: 0.2949 - val_acc: 0.9150

Epoch 25/35
 - 1s - loss: 0.1956 - acc: 0.9459 - val_loss: 0.3162 - val_acc: 0.9192

Epoch 26/35
 - 2s - loss: 0.1759 - acc: 0.9524 - val_loss: 0.3246 - val_acc: 0.9030

Epoch 27/35
 - 1s - loss: 0.1788 - acc: 0.9504 - val_loss: 0.3064 - val_acc: 0.9169

Epoch 28/35
 - 1s - loss: 0.1744 - acc: 0.9513 - val_loss: 0.3244 - val_acc: 0.9036

Epoch 29/35
 - 1s - loss: 0.2154 - acc: 0.9422 - val_loss: 0.3114 - val_acc: 0.9294

Epoch 30/35
 - 1s - loss: 0.1835 - acc: 0.9498 - val_loss: 0.2859 - val_acc: 0.9172

Epoch 31/35
 - 1s - loss: 0.1731 - acc: 0.9509 - val_loss: 0.3129 - val_acc: 0.9175

Epoch 32/35
 - 1s - loss: 0.1739 - acc: 0.9494 - val_loss: 0.3075 - val_acc: 0.9240

Epoch 33/35
 - 1s - loss: 0.1694 - acc: 0.9529 - val_loss: 0.2943 - val_acc: 0.9155

Epoch 34/35
 - 1s - loss: 0.1722 - acc: 0.9506 - val_loss: 0.3056 - val_acc: 0.9016

Epoch 35/35
 - 1s - loss: 0.1625 - acc: 0.9536 - val_loss: 0.3256 - val_acc: 0.8836

Train accuracy
0.9329434167573449
Test accuracy:
0.8836104513064132
--------------------------------------------------------------------------------
Model: "sequential_90"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_179 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_180 (Conv1D)          (None, 120, 16)           2256
_________________________________________________________________
dropout_90 (Dropout)         (None, 120, 16)           0
_________________________________________________________________
max_pooling1d_90 (MaxPooling (None, 40, 16)            0
_________________________________________________________________
flatten_90 (Flatten)         (None, 640)               0
_________________________________________________________________
dense_179 (Dense)            (None, 64)                41024
_________________________________________________________________
dense_180 (Dense)            (None, 6)                 390
=================================================================
Total params: 44,958
Trainable params: 44,958
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 1.0034 - acc: 0.8694 - val_loss: 0.4909 - val_acc: 0.9155

Epoch 2/25
 - 4s - loss: 0.3197 - acc: 0.9391 - val_loss: 0.4312 - val_acc: 0.8928

Epoch 3/25
 - 4s - loss: 0.2573 - acc: 0.9456 - val_loss: 0.3902 - val_acc: 0.9070

Epoch 4/25
 - 4s - loss: 0.2281 - acc: 0.9457 - val_loss: 0.3645 - val_acc: 0.9152

Epoch 5/25
 - 6s - loss: 0.2055 - acc: 0.9512 - val_loss: 0.2836 - val_acc: 0.9186
```

```
 - 6s - loss: 0.2059 - acc: 0.9512 - val_loss: 0.2856 - val_acc: 0.9160

Epoch 6/25
 - 4s - loss: 0.2081 - acc: 0.9460 - val_loss: 0.3214 - val_acc: 0.9128

Epoch 7/25
 - 4s - loss: 0.1905 - acc: 0.9468 - val_loss: 0.2748 - val_acc: 0.9226

Epoch 8/25
 - 5s - loss: 0.1758 - acc: 0.9464 - val_loss: 0.3058 - val_acc: 0.9257

Epoch 9/25
 - 5s - loss: 0.1624 - acc: 0.9521 - val_loss: 0.3117 - val_acc: 0.9206

Epoch 10/25
 - 4s - loss: 0.1939 - acc: 0.9465 - val_loss: 0.3140 - val_acc: 0.9118

Epoch 11/25
 - 5s - loss: 0.1553 - acc: 0.9510 - val_loss: 0.2731 - val_acc: 0.9158

Epoch 12/25
 - 4s - loss: 0.1484 - acc: 0.9517 - val_loss: 0.3611 - val_acc: 0.8782

Epoch 13/25
 - 5s - loss: 0.1802 - acc: 0.9427 - val_loss: 0.3160 - val_acc: 0.9043

Epoch 14/25
 - 5s - loss: 0.1576 - acc: 0.9521 - val_loss: 0.4350 - val_acc: 0.8785

Epoch 15/25
 - 5s - loss: 0.1612 - acc: 0.9467 - val_loss: 0.2651 - val_acc: 0.9026

Epoch 16/25
 - 4s - loss: 0.1423 - acc: 0.9506 - val_loss: 0.2917 - val_acc: 0.8945

Epoch 17/25
 - 4s - loss: 0.1594 - acc: 0.9479 - val_loss: 0.3256 - val_acc: 0.9050

Epoch 18/25
 - 4s - loss: 0.1580 - acc: 0.9484 - val_loss: 0.3108 - val_acc: 0.8816

Epoch 19/25
 - 5s - loss: 0.1563 - acc: 0.9461 - val_loss: 0.3522 - val_acc: 0.9091

Epoch 20/25
 - 5s - loss: 0.1432 - acc: 0.9535 - val_loss: 0.3200 - val_acc: 0.9036

Epoch 21/25
 - 5s - loss: 0.1628 - acc: 0.9449 - val_loss: 0.3225 - val_acc: 0.8806

Epoch 22/25
 - 5s - loss: 0.1553 - acc: 0.9489 - val_loss: 0.2823 - val_acc: 0.9084

Epoch 23/25
 - 5s - loss: 0.1448 - acc: 0.9525 - val_loss: 0.2868 - val_acc: 0.8996

Epoch 24/25
 - 5s - loss: 0.1350 - acc: 0.9546 - val_loss: 0.3002 - val_acc: 0.9036

Epoch 25/25
 - 6s - loss: 0.1391 - acc: 0.9506 - val_loss: 0.2762 - val_acc: 0.9145

Train accuracy
0.95620239390642
Test accuracy:
0.9144893111638955
_________________________________________________________________
Model: "sequential_91"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_181 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_182 (Conv1D)          (None, 118, 32)           7200
_________________________________________________________________
dropout_91 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_91 (MaxPooling (None, 39, 32)            0
```

```
max_pooling1d_91 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_91 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_181 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_182 (Dense)            (None, 6)                 198
=================================================================
Total params: 48,838
Trainable params: 48,838
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 5s - loss: 17.3837 - acc: 0.6814 - val_loss: 1.5692 - val_acc: 0.7737

Epoch 2/25
 - 2s - loss: 0.7317 - acc: 0.8490 - val_loss: 0.7872 - val_acc: 0.8487

Epoch 3/25
 - 3s - loss: 0.5134 - acc: 0.8762 - val_loss: 0.6828 - val_acc: 0.8670

Epoch 4/25
 - 2s - loss: 0.4697 - acc: 0.8904 - val_loss: 0.6527 - val_acc: 0.8602

Epoch 5/25
 - 3s - loss: 0.4508 - acc: 0.8883 - val_loss: 0.6422 - val_acc: 0.8344

Epoch 6/25
 - 3s - loss: 0.4208 - acc: 0.8931 - val_loss: 0.6643 - val_acc: 0.8202

Epoch 7/25
 - 3s - loss: 0.4068 - acc: 0.9014 - val_loss: 0.6239 - val_acc: 0.8717

Epoch 8/25
 - 2s - loss: 0.3815 - acc: 0.9033 - val_loss: 0.5834 - val_acc: 0.8575

Epoch 9/25
 - 2s - loss: 0.4013 - acc: 0.9008 - val_loss: 0.5501 - val_acc: 0.8789

Epoch 10/25
 - 3s - loss: 0.3646 - acc: 0.9061 - val_loss: 0.8319 - val_acc: 0.7231

Epoch 11/25
 - 2s - loss: 0.3787 - acc: 0.9044 - val_loss: 0.5593 - val_acc: 0.8819

Epoch 12/25
 - 2s - loss: 0.3530 - acc: 0.9095 - val_loss: 0.6205 - val_acc: 0.8531

Epoch 13/25
 - 2s - loss: 0.3608 - acc: 0.9064 - val_loss: 0.5702 - val_acc: 0.8680

Epoch 14/25
 - 2s - loss: 0.3422 - acc: 0.9109 - val_loss: 0.6098 - val_acc: 0.8314

Epoch 15/25
 - 2s - loss: 0.3470 - acc: 0.9094 - val_loss: 0.5509 - val_acc: 0.8785

Epoch 16/25
 - 2s - loss: 0.3282 - acc: 0.9170 - val_loss: 0.5285 - val_acc: 0.8802

Epoch 17/25
 - 2s - loss: 0.3207 - acc: 0.9211 - val_loss: 0.5648 - val_acc: 0.8758

Epoch 18/25
 - 2s - loss: 0.3133 - acc: 0.9225 - val_loss: 0.5203 - val_acc: 0.8806

Epoch 19/25
 - 3s - loss: 0.3090 - acc: 0.9219 - val_loss: 0.6076 - val_acc: 0.8548

Epoch 20/25
 - 3s - loss: 0.3137 - acc: 0.9180 - val_loss: 0.5346 - val_acc: 0.8717

Epoch 21/25
 - 2s - loss: 0.3228 - acc: 0.9177 - val_loss: 0.6388 - val_acc: 0.8375

Epoch 22/25
```

```
Epoch 22/25
 - 3s - loss: 0.3032 - acc: 0.9261 - val_loss: 0.5000 - val_acc: 0.8802

Epoch 23/25
 - 2s - loss: 0.2943 - acc: 0.9287 - val_loss: 0.5093 - val_acc: 0.8812

Epoch 24/25
 - 2s - loss: 0.2963 - acc: 0.9266 - val_loss: 0.5324 - val_acc: 0.8660

Epoch 25/25
 - 2s - loss: 0.3002 - acc: 0.9267 - val_loss: 0.5425 - val_acc: 0.8663

Train accuracy
0.9468171926006529
Test accuracy:
0.8663047166610112
_________________________________________________________________
Model: "sequential_92"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_183 (Conv1D)          (None, 122, 28)           1792
_________________________________________________________________
conv1d_184 (Conv1D)          (None, 120, 32)           2720
_________________________________________________________________
dropout_92 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_92 (MaxPooling (None, 60, 32)            0
_________________________________________________________________
flatten_92 (Flatten)         (None, 1920)              0
_________________________________________________________________
dense_183 (Dense)            (None, 32)                61472
_________________________________________________________________
dense_184 (Dense)            (None, 6)                 198
=================================================================
Total params: 66,182
Trainable params: 66,182
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 7s - loss: 17.9936 - acc: 0.7618 - val_loss: 0.9107 - val_acc: 0.7160

Epoch 2/30
 - 5s - loss: 0.5262 - acc: 0.8671 - val_loss: 0.7925 - val_acc: 0.7184

Epoch 3/30
 - 4s - loss: 0.4546 - acc: 0.8785 - val_loss: 0.5696 - val_acc: 0.8755

Epoch 4/30
 - 4s - loss: 0.4123 - acc: 0.8921 - val_loss: 0.5409 - val_acc: 0.8816

Epoch 5/30
 - 5s - loss: 0.3803 - acc: 0.9023 - val_loss: 0.6506 - val_acc: 0.8039

Epoch 6/30
 - 4s - loss: 0.3640 - acc: 0.9061 - val_loss: 0.6511 - val_acc: 0.7974

Epoch 7/30
 - 5s - loss: 0.3457 - acc: 0.9131 - val_loss: 0.5529 - val_acc: 0.8415

Epoch 8/30
 - 4s - loss: 0.3400 - acc: 0.9135 - val_loss: 0.7279 - val_acc: 0.7560

Epoch 9/30
 - 4s - loss: 0.3273 - acc: 0.9178 - val_loss: 0.4594 - val_acc: 0.8924

Epoch 10/30
 - 4s - loss: 0.3191 - acc: 0.9195 - val_loss: 0.4788 - val_acc: 0.8884

Epoch 11/30
 - 4s - loss: 0.3099 - acc: 0.9233 - val_loss: 0.5930 - val_acc: 0.8483

Epoch 12/30
 - 4s - loss: 0.3139 - acc: 0.9174 - val_loss: 0.5342 - val_acc: 0.8537

Epoch 13/30
```

```
Epoch 13/30
 - 4s - loss: 0.3057 - acc: 0.9203 - val_loss: 0.4669 - val_acc: 0.8904

Epoch 14/30
 - 5s - loss: 0.3084 - acc: 0.9233 - val_loss: 0.4503 - val_acc: 0.8639

Epoch 15/30
 - 4s - loss: 0.3089 - acc: 0.9233 - val_loss: 0.4762 - val_acc: 0.8728

Epoch 16/30
 - 4s - loss: 0.3077 - acc: 0.9229 - val_loss: 0.4000 - val_acc: 0.8843

Epoch 17/30
 - 4s - loss: 0.3076 - acc: 0.9168 - val_loss: 0.3874 - val_acc: 0.8873

Epoch 18/30
 - 4s - loss: 0.3081 - acc: 0.9196 - val_loss: 0.5207 - val_acc: 0.8721

Epoch 19/30
 - 5s - loss: 0.3008 - acc: 0.9211 - val_loss: 0.3888 - val_acc: 0.8833

Epoch 20/30
 - 5s - loss: 0.3046 - acc: 0.9226 - val_loss: 0.3892 - val_acc: 0.8873

Epoch 21/30
 - 4s - loss: 0.2951 - acc: 0.9217 - val_loss: 0.5215 - val_acc: 0.8429

Epoch 22/30
 - 4s - loss: 0.3039 - acc: 0.9221 - val_loss: 0.6260 - val_acc: 0.7937

Epoch 23/30
 - 4s - loss: 0.2959 - acc: 0.9233 - val_loss: 0.4172 - val_acc: 0.9026

Epoch 24/30
 - 4s - loss: 0.2997 - acc: 0.9218 - val_loss: 0.4884 - val_acc: 0.8985

Epoch 25/30
 - 4s - loss: 0.3081 - acc: 0.9233 - val_loss: 0.7665 - val_acc: 0.7815

Epoch 26/30
 - 4s - loss: 0.3000 - acc: 0.9256 - val_loss: 0.5151 - val_acc: 0.8548

Epoch 27/30
 - 4s - loss: 0.2993 - acc: 0.9244 - val_loss: 0.6419 - val_acc: 0.8493

Epoch 28/30
 - 4s - loss: 0.3010 - acc: 0.9214 - val_loss: 0.4717 - val_acc: 0.9077

Epoch 29/30
 - 4s - loss: 0.3057 - acc: 0.9229 - val_loss: 0.3671 - val_acc: 0.9023

Epoch 30/30
 - 4s - loss: 0.2931 - acc: 0.9215 - val_loss: 0.4502 - val_acc: 0.8931

Train accuracy
0.9405603917301415
Test accuracy:
0.8931116389548693
_________________________________________________________________________________________
Model: "sequential_93"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_185 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_186 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_93 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_93 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_93 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_185 (Dense)            (None, 32)                39968
_________________________________________________________________
dense_186 (Dense)            (None, 6)                 198
=================================================================
```

```
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 8s - loss: 16.2075 - acc: 0.7704 - val_loss: 2.0287 - val_acc: 0.7988

Epoch 2/25
 - 4s - loss: 0.8131 - acc: 0.8781 - val_loss: 0.8320 - val_acc: 0.8300

Epoch 3/25
 - 5s - loss: 0.4629 - acc: 0.8992 - val_loss: 0.7092 - val_acc: 0.8666

Epoch 4/25
 - 5s - loss: 0.4347 - acc: 0.8970 - val_loss: 0.7730 - val_acc: 0.8005

Epoch 5/25
 - 6s - loss: 0.4048 - acc: 0.9013 - val_loss: 0.6632 - val_acc: 0.8663

Epoch 6/25
 - 5s - loss: 0.3675 - acc: 0.9110 - val_loss: 0.6214 - val_acc: 0.8561

Epoch 7/25
 - 5s - loss: 0.3455 - acc: 0.9195 - val_loss: 0.6199 - val_acc: 0.8361

Epoch 8/25
 - 6s - loss: 0.3399 - acc: 0.9183 - val_loss: 0.5894 - val_acc: 0.8765

Epoch 9/25
 - 5s - loss: 0.3314 - acc: 0.9223 - val_loss: 0.5409 - val_acc: 0.8592

Epoch 10/25
 - 4s - loss: 0.3187 - acc: 0.9240 - val_loss: 0.5929 - val_acc: 0.8602

Epoch 11/25
 - 6s - loss: 0.2877 - acc: 0.9338 - val_loss: 0.5000 - val_acc: 0.8843

Epoch 12/25
 - 4s - loss: 0.2977 - acc: 0.9279 - val_loss: 0.5281 - val_acc: 0.8656

Epoch 13/25
 - 5s - loss: 0.2774 - acc: 0.9336 - val_loss: 0.4859 - val_acc: 0.8755

Epoch 14/25
 - 5s - loss: 0.2666 - acc: 0.9369 - val_loss: 0.4604 - val_acc: 0.8877

Epoch 15/25
 - 4s - loss: 0.2628 - acc: 0.9350 - val_loss: 0.4896 - val_acc: 0.8765

Epoch 16/25
 - 4s - loss: 0.2518 - acc: 0.9389 - val_loss: 0.4408 - val_acc: 0.8843

Epoch 17/25
 - 4s - loss: 0.2565 - acc: 0.9346 - val_loss: 0.4440 - val_acc: 0.8924

Epoch 18/25
 - 4s - loss: 0.2617 - acc: 0.9329 - val_loss: 0.4225 - val_acc: 0.8928

Epoch 19/25
 - 6s - loss: 0.2544 - acc: 0.9357 - val_loss: 0.4427 - val_acc: 0.8816

Epoch 20/25
 - 4s - loss: 0.2486 - acc: 0.9378 - val_loss: 0.3935 - val_acc: 0.8890

Epoch 21/25
 - 5s - loss: 0.2309 - acc: 0.9399 - val_loss: 0.5691 - val_acc: 0.8124

Epoch 22/25
 - 4s - loss: 0.2361 - acc: 0.9392 - val_loss: 0.3892 - val_acc: 0.8887

Epoch 23/25
 - 4s - loss: 0.2306 - acc: 0.9393 - val_loss: 0.3762 - val_acc: 0.8982

Epoch 24/25
 - 3s - loss: 0.2214 - acc: 0.9412 - val_loss: 0.3729 - val_acc: 0.8985
```

```
Epoch 25/25
 - 3s - loss: 0.2209 - acc: 0.9400 - val_loss: 0.4340 - val_acc: 0.8782

Train accuracy
0.9125408052230686
Test accuracy:
0.8781812012215813
_________________________________________________________________________________
Model: "sequential_94"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_187 (Conv1D)          (None, 126, 42)           1176
_________________________________________________________________
conv1d_188 (Conv1D)          (None, 120, 24)           7080
_________________________________________________________________
dropout_94 (Dropout)         (None, 120, 24)           0
_________________________________________________________________
max_pooling1d_94 (MaxPooling (None, 40, 24)            0
_________________________________________________________________
flatten_94 (Flatten)         (None, 960)               0
_________________________________________________________________
dense_187 (Dense)            (None, 64)                61504
_________________________________________________________________
dense_188 (Dense)            (None, 6)                 390
=================================================================
Total params: 70,150
Trainable params: 70,150
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 9.0635 - acc: 0.8132 - val_loss: 2.2214 - val_acc: 0.8789

Epoch 2/25
 - 2s - loss: 0.8984 - acc: 0.9215 - val_loss: 0.6550 - val_acc: 0.8816

Epoch 3/25
 - 1s - loss: 0.3472 - acc: 0.9304 - val_loss: 0.5273 - val_acc: 0.8958

Epoch 4/25
 - 2s - loss: 0.3166 - acc: 0.9270 - val_loss: 0.4651 - val_acc: 0.8989

Epoch 5/25
 - 2s - loss: 0.2810 - acc: 0.9334 - val_loss: 0.4339 - val_acc: 0.9033

Epoch 6/25
 - 2s - loss: 0.2557 - acc: 0.9380 - val_loss: 0.4443 - val_acc: 0.8734

Epoch 7/25
 - 2s - loss: 0.2648 - acc: 0.9338 - val_loss: 0.3914 - val_acc: 0.9002

Epoch 8/25
 - 2s - loss: 0.2389 - acc: 0.9376 - val_loss: 0.4619 - val_acc: 0.8839

Epoch 9/25
 - 1s - loss: 0.2558 - acc: 0.9339 - val_loss: 0.3868 - val_acc: 0.8972

Epoch 10/25
 - 2s - loss: 0.2330 - acc: 0.9378 - val_loss: 0.4533 - val_acc: 0.8856

Epoch 11/25
 - 2s - loss: 0.2339 - acc: 0.9393 - val_loss: 0.4107 - val_acc: 0.8751

Epoch 12/25
 - 2s - loss: 0.2160 - acc: 0.9406 - val_loss: 0.3941 - val_acc: 0.8951

Epoch 13/25
 - 2s - loss: 0.2142 - acc: 0.9402 - val_loss: 0.4789 - val_acc: 0.8605

Epoch 14/25
 - 2s - loss: 0.2069 - acc: 0.9459 - val_loss: 0.3932 - val_acc: 0.8897

Epoch 15/25
 - 2s - loss: 0.2068 - acc: 0.9418 - val_loss: 0.4487 - val_acc: 0.8578
```

```
Epoch 16/25
 - 2s - loss: 0.2023 - acc: 0.9434 - val_loss: 0.4406 - val_acc: 0.8694

Epoch 17/25
 - 2s - loss: 0.2118 - acc: 0.9416 - val_loss: 0.3921 - val_acc: 0.8741

Epoch 18/25
 - 2s - loss: 0.2107 - acc: 0.9412 - val_loss: 0.3631 - val_acc: 0.8904

Epoch 19/25
 - 2s - loss: 0.2130 - acc: 0.9387 - val_loss: 0.4484 - val_acc: 0.8510

Epoch 20/25
 - 2s - loss: 0.2060 - acc: 0.9391 - val_loss: 0.3510 - val_acc: 0.9013

Epoch 21/25
 - 2s - loss: 0.1897 - acc: 0.9452 - val_loss: 0.3933 - val_acc: 0.8646

Epoch 22/25
 - 1s - loss: 0.2061 - acc: 0.9416 - val_loss: 0.3408 - val_acc: 0.8941

Epoch 23/25
 - 2s - loss: 0.1932 - acc: 0.9459 - val_loss: 0.3851 - val_acc: 0.8728

Epoch 24/25
 - 2s - loss: 0.2115 - acc: 0.9403 - val_loss: 0.3505 - val_acc: 0.8731

Epoch 25/25
 - 2s - loss: 0.1997 - acc: 0.9449 - val_loss: 0.4012 - val_acc: 0.8612

Train accuracy
0.9460010881392819
Test accuracy:
0.8612147947064812
--------------------------------------------------------------------------------
Model: "sequential_95"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_189 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_190 (Conv1D)          (None, 118, 16)           3152
_________________________________________________________________
dropout_95 (Dropout)         (None, 118, 16)           0
_________________________________________________________________
max_pooling1d_95 (MaxPooling (None, 39, 16)            0
_________________________________________________________________
flatten_95 (Flatten)         (None, 624)               0
_________________________________________________________________
dense_189 (Dense)            (None, 32)                20000
_________________________________________________________________
dense_190 (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 1/35
 - 4s - loss: 15.2587 - acc: 0.7191 - val_loss: 2.2029 - val_acc: 0.7526

Epoch 2/35
 - 1s - loss: 0.9020 - acc: 0.8455 - val_loss: 0.8349 - val_acc: 0.7988

Epoch 3/35
 - 1s - loss: 0.4984 - acc: 0.8819 - val_loss: 0.7388 - val_acc: 0.8507

Epoch 4/35
 - 1s - loss: 0.4690 - acc: 0.8917 - val_loss: 0.6548 - val_acc: 0.8592

Epoch 5/35
 - 1s - loss: 0.4258 - acc: 0.8988 - val_loss: 0.6398 - val_acc: 0.8551

Epoch 6/35
 - 1s - loss: 0.3695 - acc: 0.9125 - val_loss: 0.6578 - val_acc: 0.8107
```

```
Epoch 7/35
 - 1s - loss: 0.4127 - acc: 0.9023 - val_loss: 0.5996 - val_acc: 0.8687

Epoch 8/35
 - 1s - loss: 0.3713 - acc: 0.9075 - val_loss: 0.6393 - val_acc: 0.8449

Epoch 9/35
 - 1s - loss: 0.3717 - acc: 0.9161 - val_loss: 0.5409 - val_acc: 0.8755

Epoch 10/35
 - 1s - loss: 0.3255 - acc: 0.9295 - val_loss: 0.5251 - val_acc: 0.8785

Epoch 11/35
 - 1s - loss: 0.3180 - acc: 0.9241 - val_loss: 0.5331 - val_acc: 0.8785

Epoch 12/35
 - 1s - loss: 0.3138 - acc: 0.9249 - val_loss: 0.6305 - val_acc: 0.8215

Epoch 13/35
 - 1s - loss: 0.3207 - acc: 0.9215 - val_loss: 0.5125 - val_acc: 0.8707

Epoch 14/35
 - 1s - loss: 0.3427 - acc: 0.9199 - val_loss: 0.5505 - val_acc: 0.8531

Epoch 15/35
 - 1s - loss: 0.2972 - acc: 0.9295 - val_loss: 0.4861 - val_acc: 0.8775

Epoch 16/35
 - 1s - loss: 0.2922 - acc: 0.9280 - val_loss: 0.4810 - val_acc: 0.8748

Epoch 17/35
 - 1s - loss: 0.3096 - acc: 0.9253 - val_loss: 0.5829 - val_acc: 0.8310

Epoch 18/35
 - 1s - loss: 0.3080 - acc: 0.9232 - val_loss: 0.5780 - val_acc: 0.8371

Epoch 19/35
 - 1s - loss: 0.3028 - acc: 0.9295 - val_loss: 0.4745 - val_acc: 0.8945

Epoch 20/35
 - 1s - loss: 0.2893 - acc: 0.9304 - val_loss: 0.4333 - val_acc: 0.8979

Epoch 21/35
 - 1s - loss: 0.2689 - acc: 0.9350 - val_loss: 0.5102 - val_acc: 0.8565

Epoch 22/35
 - 1s - loss: 0.2850 - acc: 0.9293 - val_loss: 0.4212 - val_acc: 0.9013

Epoch 23/35
 - 1s - loss: 0.2635 - acc: 0.9340 - val_loss: 0.4286 - val_acc: 0.8867

Epoch 24/35
 - 1s - loss: 0.3149 - acc: 0.9223 - val_loss: 0.4385 - val_acc: 0.8873

Epoch 25/35
 - 1s - loss: 0.3143 - acc: 0.9257 - val_loss: 0.4781 - val_acc: 0.8843

Epoch 26/35
 - 1s - loss: 0.2668 - acc: 0.9350 - val_loss: 0.4226 - val_acc: 0.8992

Epoch 27/35
 - 1s - loss: 0.2707 - acc: 0.9321 - val_loss: 0.4337 - val_acc: 0.8867

Epoch 28/35
 - 1s - loss: 0.2861 - acc: 0.9325 - val_loss: 0.4779 - val_acc: 0.8734

Epoch 29/35
 - 1s - loss: 0.2595 - acc: 0.9373 - val_loss: 0.4278 - val_acc: 0.9043

Epoch 30/35
 - 1s - loss: 0.2578 - acc: 0.9357 - val_loss: 0.5141 - val_acc: 0.8446

Epoch 31/35
 - 1s - loss: 0.3065 - acc: 0.9274 - val_loss: 0.4421 - val_acc: 0.9030

Epoch 32/35
```

```
 - 1s - loss: 0.2588 - acc: 0.9350 - val_loss: 0.4639 - val_acc: 0.8768

Epoch 33/35
 - 1s - loss: 0.2735 - acc: 0.9280 - val_loss: 0.4212 - val_acc: 0.8911

Epoch 34/35
 - 1s - loss: 0.2821 - acc: 0.9301 - val_loss: 0.4320 - val_acc: 0.8806

Epoch 35/35
 - 2s - loss: 0.2624 - acc: 0.9350 - val_loss: 0.4168 - val_acc: 0.8761

Train accuracy
0.9246463547334058
Test accuracy:
0.8761452324397693
_________________________________________________________________
Model: "sequential_96"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_191 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_192 (Conv1D)          (None, 120, 32)           4512
_________________________________________________________________
dropout_96 (Dropout)         (None, 120, 32)           0
_________________________________________________________________
max_pooling1d_96 (MaxPooling (None, 40, 32)            0
_________________________________________________________________
flatten_96 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_191 (Dense)            (None, 32)                40992
_________________________________________________________________
dense_192 (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 1/25
 - 7s - loss: 27.9423 - acc: 0.7764 - val_loss: 1.2233 - val_acc: 0.7920

Epoch 2/25
 - 3s - loss: 0.6112 - acc: 0.8672 - val_loss: 0.8247 - val_acc: 0.8286

Epoch 3/25
 - 3s - loss: 0.4864 - acc: 0.8862 - val_loss: 0.6807 - val_acc: 0.8683

Epoch 4/25
 - 3s - loss: 0.4670 - acc: 0.8838 - val_loss: 0.6696 - val_acc: 0.8592

Epoch 5/25
 - 3s - loss: 0.4235 - acc: 0.8950 - val_loss: 0.5991 - val_acc: 0.8809

Epoch 6/25
 - 3s - loss: 0.4011 - acc: 0.8984 - val_loss: 0.6092 - val_acc: 0.8307

Epoch 7/25
 - 4s - loss: 0.3805 - acc: 0.9033 - val_loss: 0.5447 - val_acc: 0.8877

Epoch 8/25
 - 3s - loss: 0.3659 - acc: 0.9109 - val_loss: 0.5546 - val_acc: 0.8616

Epoch 9/25
 - 4s - loss: 0.3536 - acc: 0.9104 - val_loss: 0.5221 - val_acc: 0.8432

Epoch 10/25
 - 3s - loss: 0.3628 - acc: 0.9063 - val_loss: 0.6591 - val_acc: 0.7984

Epoch 11/25
 - 3s - loss: 0.3497 - acc: 0.9091 - val_loss: 0.5062 - val_acc: 0.8728

Epoch 12/25
 - 4s - loss: 0.3260 - acc: 0.9176 - val_loss: 0.5482 - val_acc: 0.8487

Epoch 13/25
```

```
 - 3s - loss: 0.3340 - acc: 0.9165 - val_loss: 0.4707 - val_acc: 0.8707

Epoch 14/25
 - 4s - loss: 0.3116 - acc: 0.9187 - val_loss: 0.5076 - val_acc: 0.8364

Epoch 15/25
 - 4s - loss: 0.3162 - acc: 0.9189 - val_loss: 0.5007 - val_acc: 0.8453

Epoch 16/25
 - 4s - loss: 0.3101 - acc: 0.9191 - val_loss: 0.4693 - val_acc: 0.8683

Epoch 17/25
 - 3s - loss: 0.3112 - acc: 0.9219 - val_loss: 0.4673 - val_acc: 0.8738

Epoch 18/25
 - 3s - loss: 0.3047 - acc: 0.9204 - val_loss: 0.3983 - val_acc: 0.9057

Epoch 19/25
 - 3s - loss: 0.2957 - acc: 0.9242 - val_loss: 0.4358 - val_acc: 0.8860

Epoch 20/25
 - 4s - loss: 0.2982 - acc: 0.9197 - val_loss: 0.4107 - val_acc: 0.8772

Epoch 21/25
 - 4s - loss: 0.2823 - acc: 0.9261 - val_loss: 0.4616 - val_acc: 0.8741

Epoch 22/25
 - 3s - loss: 0.2934 - acc: 0.9207 - val_loss: 0.4093 - val_acc: 0.8836

Epoch 23/25
 - 3s - loss: 0.2909 - acc: 0.9233 - val_loss: 0.4163 - val_acc: 0.8748

Epoch 24/25
 - 4s - loss: 0.2827 - acc: 0.9244 - val_loss: 0.5132 - val_acc: 0.8107

Epoch 25/25
 - 4s - loss: 0.2836 - acc: 0.9244 - val_loss: 0.4075 - val_acc: 0.8979

Train accuracy
0.940968443960827
Test accuracy:
0.8978622327790974
_________________________________________________________________________________
Model: "sequential_97"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_193 (Conv1D)          (None, 124, 32)           1472
_________________________________________________________________
conv1d_194 (Conv1D)          (None, 122, 32)           3104
_________________________________________________________________
dropout_97 (Dropout)         (None, 122, 32)           0
_________________________________________________________________
max_pooling1d_97 (MaxPooling (None, 61, 32)            0
_________________________________________________________________
flatten_97 (Flatten)         (None, 1952)              0
_________________________________________________________________
dense_193 (Dense)            (None, 32)                62496
_________________________________________________________________
dense_194 (Dense)            (None, 6)                 198
=================================================================
Total params: 67,270
Trainable params: 67,270
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/30
 - 6s - loss: 6.4504 - acc: 0.7701 - val_loss: 0.7100 - val_acc: 0.8497

Epoch 2/30
 - 2s - loss: 0.4692 - acc: 0.8849 - val_loss: 0.7363 - val_acc: 0.7489

Epoch 3/30
 - 2s - loss: 0.3670 - acc: 0.9056 - val_loss: 0.4401 - val_acc: 0.8880

Epoch 4/30
```

```
 - 2s - loss: 0.3252 - acc: 0.9144 - val_loss: 0.5241 - val_acc: 0.8510

Epoch 5/30
 - 2s - loss: 0.3172 - acc: 0.9183 - val_loss: 0.4241 - val_acc: 0.8772

Epoch 6/30
 - 2s - loss: 0.3070 - acc: 0.9229 - val_loss: 0.4870 - val_acc: 0.8442

Epoch 7/30
 - 2s - loss: 0.2937 - acc: 0.9253 - val_loss: 0.3719 - val_acc: 0.8924

Epoch 8/30
 - 2s - loss: 0.2878 - acc: 0.9279 - val_loss: 0.3706 - val_acc: 0.9002

Epoch 9/30
 - 2s - loss: 0.2956 - acc: 0.9256 - val_loss: 0.4074 - val_acc: 0.8707

Epoch 10/30
 - 2s - loss: 0.2854 - acc: 0.9261 - val_loss: 0.4936 - val_acc: 0.8734

Epoch 11/30
 - 2s - loss: 0.2724 - acc: 0.9278 - val_loss: 0.3380 - val_acc: 0.8982

Epoch 12/30
 - 2s - loss: 0.2762 - acc: 0.9253 - val_loss: 0.4090 - val_acc: 0.8911

Epoch 13/30
 - 2s - loss: 0.2700 - acc: 0.9290 - val_loss: 0.3669 - val_acc: 0.9050

Epoch 14/30
 - 2s - loss: 0.2689 - acc: 0.9316 - val_loss: 0.3938 - val_acc: 0.8890

Epoch 15/30
 - 2s - loss: 0.2694 - acc: 0.9289 - val_loss: 0.3395 - val_acc: 0.9009

Epoch 16/30
 - 1s - loss: 0.2630 - acc: 0.9282 - val_loss: 0.3602 - val_acc: 0.8884

Epoch 17/30
 - 2s - loss: 0.2733 - acc: 0.9249 - val_loss: 0.3674 - val_acc: 0.8989

Epoch 18/30
 - 2s - loss: 0.2617 - acc: 0.9306 - val_loss: 0.3159 - val_acc: 0.9057

Epoch 19/30
 - 2s - loss: 0.2549 - acc: 0.9285 - val_loss: 0.3857 - val_acc: 0.8802

Epoch 20/30
 - 2s - loss: 0.2561 - acc: 0.9294 - val_loss: 0.3472 - val_acc: 0.8941

Epoch 21/30
 - 2s - loss: 0.2690 - acc: 0.9282 - val_loss: 0.3684 - val_acc: 0.9013

Epoch 22/30
 - 2s - loss: 0.2584 - acc: 0.9323 - val_loss: 0.6031 - val_acc: 0.7917

Epoch 23/30
 - 3s - loss: 0.2557 - acc: 0.9317 - val_loss: 0.3730 - val_acc: 0.8890

Epoch 24/30
 - 2s - loss: 0.2432 - acc: 0.9336 - val_loss: 0.4310 - val_acc: 0.8371

Epoch 25/30
 - 2s - loss: 0.2523 - acc: 0.9285 - val_loss: 0.6407 - val_acc: 0.7849

Epoch 26/30
 - 2s - loss: 0.2497 - acc: 0.9316 - val_loss: 0.3478 - val_acc: 0.8911

Epoch 27/30
 - 2s - loss: 0.2501 - acc: 0.9293 - val_loss: 1.1109 - val_acc: 0.7374

Epoch 28/30
 - 1s - loss: 0.2573 - acc: 0.9314 - val_loss: 0.3865 - val_acc: 0.9016

Epoch 29/30
 - 2s - loss: 0.2384 - acc: 0.9313 - val_loss: 0.3507 - val_acc: 0.9030
```

```
Epoch 30/30
 - 2s - loss: 0.2459 - acc: 0.9280 - val_loss: 0.3429 - val_acc: 0.8897

Train accuracy
0.9454570184983678
Test accuracy:
0.8897183576518494
_________________________________________________________________________________
Model: "sequential_98"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_195 (Conv1D)          (None, 122, 28)           1792
_________________________________________________________________
conv1d_196 (Conv1D)          (None, 116, 32)           6304
_________________________________________________________________
dropout_98 (Dropout)         (None, 116, 32)           0
_________________________________________________________________
max_pooling1d_98 (MaxPooling (None, 38, 32)            0
_________________________________________________________________
flatten_98 (Flatten)         (None, 1216)              0
_________________________________________________________________
dense_195 (Dense)            (None, 32)                38944
_________________________________________________________________
dense_196 (Dense)            (None, 6)                 198
=================================================================
Total params: 47,238
Trainable params: 47,238
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 7s - loss: 5.0657 - acc: 0.8086 - val_loss: 0.7480 - val_acc: 0.8297

Epoch 2/25
 - 6s - loss: 0.4744 - acc: 0.8896 - val_loss: 0.8025 - val_acc: 0.7693

Epoch 3/25
 - 5s - loss: 0.4151 - acc: 0.9037 - val_loss: 0.6488 - val_acc: 0.8823

Epoch 4/25
 - 6s - loss: 0.3716 - acc: 0.9100 - val_loss: 0.5715 - val_acc: 0.8795

Epoch 5/25
 - 5s - loss: 0.3792 - acc: 0.9093 - val_loss: 0.5565 - val_acc: 0.8792

Epoch 6/25
 - 4s - loss: 0.3532 - acc: 0.9149 - val_loss: 0.5881 - val_acc: 0.8324

Epoch 7/25
 - 4s - loss: 0.3532 - acc: 0.9157 - val_loss: 0.5050 - val_acc: 0.8850

Epoch 8/25
 - 5s - loss: 0.3063 - acc: 0.9255 - val_loss: 0.5553 - val_acc: 0.8748

Epoch 9/25
 - 4s - loss: 0.3016 - acc: 0.9282 - val_loss: 0.4674 - val_acc: 0.8863

Epoch 10/25
 - 4s - loss: 0.3141 - acc: 0.9225 - val_loss: 0.5064 - val_acc: 0.8476

Epoch 11/25
 - 4s - loss: 0.2936 - acc: 0.9257 - val_loss: 0.4456 - val_acc: 0.8761

Epoch 12/25
 - 5s - loss: 0.3103 - acc: 0.9192 - val_loss: 0.5421 - val_acc: 0.8561

Epoch 13/25
 - 4s - loss: 0.2844 - acc: 0.9261 - val_loss: 0.4167 - val_acc: 0.8853

Epoch 14/25
 - 5s - loss: 0.2764 - acc: 0.9301 - val_loss: 0.4394 - val_acc: 0.8833

Epoch 15/25
 - 4s - loss: 0.3140 - acc: 0.9214 - val_loss: 0.5594 - val_acc: 0.8246
```

```
Epoch 16/25
 - 5s - loss: 0.2587 - acc: 0.9328 - val_loss: 0.4311 - val_acc: 0.8700

Epoch 17/25
 - 4s - loss: 0.2601 - acc: 0.9319 - val_loss: 0.4104 - val_acc: 0.8887

Epoch 18/25
 - 6s - loss: 0.2828 - acc: 0.9274 - val_loss: 0.4455 - val_acc: 0.8680

Epoch 19/25
 - 5s - loss: 0.2986 - acc: 0.9245 - val_loss: 0.5267 - val_acc: 0.8385

Epoch 20/25
 - 5s - loss: 0.2844 - acc: 0.9257 - val_loss: 0.4140 - val_acc: 0.8789

Epoch 21/25
 - 4s - loss: 0.2743 - acc: 0.9253 - val_loss: 0.6250 - val_acc: 0.7879

Epoch 22/25
 - 5s - loss: 0.2915 - acc: 0.9229 - val_loss: 0.3988 - val_acc: 0.9033

Epoch 23/25
 - 6s - loss: 0.2628 - acc: 0.9282 - val_loss: 0.4482 - val_acc: 0.8483

Epoch 24/25
 - 5s - loss: 0.2650 - acc: 0.9309 - val_loss: 0.4867 - val_acc: 0.8534

Epoch 25/25
 - 4s - loss: 0.2580 - acc: 0.9298 - val_loss: 0.4079 - val_acc: 0.8836

Train accuracy
0.9468171926006529
Test accuracy:
0.8836104513064132
_________________________________________________________________
Model: "sequential_99"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_197 (Conv1D)          (None, 124, 28)           1288
_________________________________________________________________
conv1d_198 (Conv1D)          (None, 118, 32)           6304
_________________________________________________________________
dropout_99 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_99 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_99 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_197 (Dense)            (None, 64)                79936
_________________________________________________________________
dense_198 (Dense)            (None, 6)                 390
=================================================================
Total params: 87,918
Trainable params: 87,918
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 8s - loss: 3.0070 - acc: 0.8760 - val_loss: 0.7019 - val_acc: 0.8826

Epoch 2/25
 - 5s - loss: 0.3681 - acc: 0.9309 - val_loss: 0.4392 - val_acc: 0.8931

Epoch 3/25
 - 3s - loss: 0.2470 - acc: 0.9421 - val_loss: 0.3584 - val_acc: 0.9172

Epoch 4/25
 - 4s - loss: 0.2346 - acc: 0.9416 - val_loss: 0.3739 - val_acc: 0.8884

Epoch 5/25
 - 4s - loss: 0.2282 - acc: 0.9419 - val_loss: 0.3148 - val_acc: 0.9097

Epoch 6/25
 - 5s - loss: 0.1916 - acc: 0.9455 - val_loss: 0.4211 - val_acc: 0.8768
```

```
Epoch 7/25
 - 3s - loss: 0.1932 - acc: 0.9475 - val_loss: 0.3019 - val_acc: 0.9138

Epoch 8/25
 - 4s - loss: 0.1888 - acc: 0.9440 - val_loss: 0.3788 - val_acc: 0.8823

Epoch 9/25
 - 3s - loss: 0.2020 - acc: 0.9460 - val_loss: 0.3743 - val_acc: 0.8721

Epoch 10/25
 - 3s - loss: 0.1814 - acc: 0.9484 - val_loss: 0.2901 - val_acc: 0.9118

Epoch 11/25
 - 4s - loss: 0.1650 - acc: 0.9486 - val_loss: 0.2727 - val_acc: 0.9111

Epoch 12/25
 - 5s - loss: 0.1684 - acc: 0.9464 - val_loss: 0.2780 - val_acc: 0.9077

Epoch 13/25
 - 5s - loss: 0.1764 - acc: 0.9465 - val_loss: 0.3145 - val_acc: 0.9002

Epoch 14/25
 - 5s - loss: 0.2082 - acc: 0.9441 - val_loss: 0.3499 - val_acc: 0.8931

Epoch 15/25
 - 5s - loss: 0.1649 - acc: 0.9497 - val_loss: 0.2805 - val_acc: 0.9050

Epoch 16/25
 - 5s - loss: 0.1740 - acc: 0.9453 - val_loss: 0.4533 - val_acc: 0.8371

Epoch 17/25
 - 5s - loss: 0.1709 - acc: 0.9484 - val_loss: 0.3206 - val_acc: 0.8979

Epoch 18/25
 - 6s - loss: 0.1714 - acc: 0.9490 - val_loss: 0.2825 - val_acc: 0.9084

Epoch 19/25
 - 4s - loss: 0.1752 - acc: 0.9476 - val_loss: 0.3994 - val_acc: 0.8768

Epoch 20/25
 - 5s - loss: 0.1726 - acc: 0.9464 - val_loss: 0.2833 - val_acc: 0.9030

Epoch 21/25
 - 4s - loss: 0.1727 - acc: 0.9468 - val_loss: 0.4123 - val_acc: 0.8758

Epoch 22/25
 - 5s - loss: 0.1619 - acc: 0.9502 - val_loss: 0.3062 - val_acc: 0.8924

Epoch 23/25
 - 6s - loss: 0.1626 - acc: 0.9499 - val_loss: 0.3121 - val_acc: 0.8999

Epoch 24/25
 - 5s - loss: 0.1669 - acc: 0.9465 - val_loss: 0.3077 - val_acc: 0.8985

Epoch 25/25
 - 5s - loss: 0.1598 - acc: 0.9498 - val_loss: 0.3292 - val_acc: 0.8884

Train accuracy
0.941784548422198
Test accuracy:
0.8883610451306413
_________________________________________________________________
Model: "sequential_100"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_199 (Conv1D)          (None, 126, 42)           1176
_________________________________________________________________
conv1d_200 (Conv1D)          (None, 120, 24)           7080
_________________________________________________________________
dropout_100 (Dropout)        (None, 120, 24)           0
_________________________________________________________________
max_pooling1d_100 (MaxPoolin (None, 40, 24)            0
_________________________________________________________________
flatten_100 (Flatten)        (None, 960)               0
_________________________________________________________________
dense_199 (Dense)            (None, 32)                30752
```

```
dense_199 (Dense)            (None, 32)                [illegible]
_________________________________________________________________
dense_200 (Dense)            (None, 6)                 198
=================================================================
Total params: 39,206
Trainable params: 39,206
Non-trainable params: 0
_________________________________________________________________
None
Train on 7352 samples, validate on 2947 samples
Epoch 1/25
 - 6s - loss: 23.6751 - acc: 0.8071 - val_loss: 2.4396 - val_acc: 0.8110

Epoch 2/25
 - 2s - loss: 0.8853 - acc: 0.8811 - val_loss: 0.8088 - val_acc: 0.8171

Epoch 3/25
 - 2s - loss: 0.4797 - acc: 0.8981 - val_loss: 0.7014 - val_acc: 0.8941

Epoch 4/25
 - 3s - loss: 0.4476 - acc: 0.8961 - val_loss: 0.5998 - val_acc: 0.8806

Epoch 5/25
 - 3s - loss: 0.3884 - acc: 0.9135 - val_loss: 0.5829 - val_acc: 0.8775

Epoch 6/25
 - 3s - loss: 0.3544 - acc: 0.9187 - val_loss: 0.5498 - val_acc: 0.8602

Epoch 7/25
 - 3s - loss: 0.3651 - acc: 0.9176 - val_loss: 0.5108 - val_acc: 0.8884

Epoch 8/25
 - 2s - loss: 0.3247 - acc: 0.9234 - val_loss: 0.5324 - val_acc: 0.8772

Epoch 9/25
 - 2s - loss: 0.3353 - acc: 0.9223 - val_loss: 0.5225 - val_acc: 0.8728

Epoch 10/25
 - 2s - loss: 0.3197 - acc: 0.9236 - val_loss: 0.4661 - val_acc: 0.8823

Epoch 11/25
 - 3s - loss: 0.2944 - acc: 0.9298 - val_loss: 0.4394 - val_acc: 0.9006

Epoch 12/25
 - 2s - loss: 0.2949 - acc: 0.9280 - val_loss: 0.4765 - val_acc: 0.8850

Epoch 13/25
 - 2s - loss: 0.2984 - acc: 0.9285 - val_loss: 0.4551 - val_acc: 0.8935

Epoch 14/25
 - 2s - loss: 0.2829 - acc: 0.9298 - val_loss: 0.4544 - val_acc: 0.8819

Epoch 15/25
 - 2s - loss: 0.2807 - acc: 0.9304 - val_loss: 0.5219 - val_acc: 0.8256

Epoch 16/25
 - 3s - loss: 0.2939 - acc: 0.9268 - val_loss: 0.4146 - val_acc: 0.8826

Epoch 17/25
 - 2s - loss: 0.2768 - acc: 0.9298 - val_loss: 0.4687 - val_acc: 0.8856

Epoch 18/25
 - 2s - loss: 0.2665 - acc: 0.9336 - val_loss: 0.4111 - val_acc: 0.8802

Epoch 19/25
 - 2s - loss: 0.2724 - acc: 0.9310 - val_loss: 0.4251 - val_acc: 0.8873

Epoch 20/25
 - 2s - loss: 0.2575 - acc: 0.9362 - val_loss: 0.4312 - val_acc: 0.8935

Epoch 21/25
 - 2s - loss: 0.2546 - acc: 0.9338 - val_loss: 0.5987 - val_acc: 0.8266

Epoch 22/25
 - 2s - loss: 0.2670 - acc: 0.9339 - val_loss: 0.4146 - val_acc: 0.9006

Epoch 23/25
 - 2s - loss: 0.2774 - acc: 0.9334 - val_loss: 0.4500 - val_acc: 0.8670
```

```
Epoch 24/25
 - 2s - loss: 0.2571 - acc: 0.9373 - val_loss: 0.4554 - val_acc: 0.8646

Epoch 25/25
 - 2s - loss: 0.2860 - acc: 0.9325 - val_loss: 0.4206 - val_acc: 0.8884

Train accuracy
0.941240478781284
Test accuracy:
0.8883610451306413
--------------------------------------------------------------------------------
100%|██████████| 100/100 [1:33:27<00:00, 87.90s/it, best loss: -0.9253478113335596]
```

In [16]:

```
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[16]:

```
{'Dense': 32,
 'Dropout': 0.6095799373767214,
 'batch_size': 16,
 'choiceval': 'adam',
 'filters': 28,
 'filters_1': 32,
 'kernel_size': 5,
 'kernel_size_1': 7,
 'l2': 0.0034221269319363377,
 'l2_1': 0.0026616628000093352,
 'lr': 0.0012423022336481727,
 'lr_1': 0.0007678197226683708,
 'nb_epoch': 25,
 'pool_size': 3}
```

In [17]:

```
best_run
```

Out[17]:

```
{'Dense': 0,
 'Dropout': 0.6095799373767214,
 'batch_size': 0,
 'choiceval': 0,
 'filters': 0,
 'filters_1': 2,
 'kernel_size': 1,
 'kernel_size_1': 2,
 'l2': 0.0034221269319363377,
 'l2_1': 0.0026616628000093352,
 'lr': 0.0012423022336481727,
 'lr_1': 0.0007678197226683708,
 'nb_epoch': 0,
 'pool_size': 1}
```

In [18]:

```
#best Hyper params from hyperas
eval_hyperopt_space(space, best_run)
```

Out[18]:

```
{'Dense': 32,
 'Dropout': 0.6095799373767214,
```

```
 'batch_size': 16,
 'choiceval': 'adam',
 'filters': 28,
 'filters_1': 32,
 'kernel_size': 5,
 'kernel_size_1': 7,
 'l2': 0.0034221269319363377,
 'l2_1': 0.0026616628000093352,
 'lr': 0.0012423022336481727,
 'lr_1': 0.0007678197226683708,
 'nb_epoch': 25,
 'pool_size': 3}
```

In [19]:

```
best_model.summary()
```

```
Model: "sequential_32"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv1d_63 (Conv1D)           (None, 124, 28)           1288
_________________________________________________________________
conv1d_64 (Conv1D)           (None, 118, 32)           6304
_________________________________________________________________
dropout_32 (Dropout)         (None, 118, 32)           0
_________________________________________________________________
max_pooling1d_32 (MaxPooling (None, 39, 32)            0
_________________________________________________________________
flatten_32 (Flatten)         (None, 1248)              0
_________________________________________________________________
dense_63 (Dense)             (None, 32)                39968
_________________________________________________________________
dense_64 (Dense)             (None, 6)                 198
=================================================================
Total params: 47,758
Trainable params: 47,758
Non-trainable params: 0
_________________________________________________________________
```

In [20]:

```
_,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 0.9725244831338411 test_accuracy 0.9253478113335596
```

- let's try with other approaches to further improve the accuracy

Model for classifying data into Static and Dynamic activities

In [59]:

```
## 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
            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 [60]:

```
X_train_2c, Y_train_2c, X_val_2c,  Y_val_2c = data_scaled_2class()
```

```
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:62: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
/home/ubuntu/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:80: FutureWarning: Method
.as_matrix will be removed in a future version. Use .values instead.
```

In [61]:

```
print(Y_train_2c.shape)
print(Y_val_2c.shape)
```

```
(7352, 2)
(2947, 2)
```

In [62]:

```
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=(128,9)))
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()
```

```
Model: "sequential_1"
_________________________________________________________________
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 [63]:

```
adam = keras.optimizers.Adam(lr=0.001)
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), ver
bose=1)
```

```
Train on 7352 samples, validate on 2947 samples
Epoch 1/20
7352/7352 [==============================] - 2s 210us/step - loss: 0.0567 - acc: 0.9773 -
val_loss: 0.0170 - val_acc: 0.9952
Epoch 2/20
7352/7352 [==============================] - 1s 171us/step - loss: 0.0014 - acc: 0.9996 -
val_loss: 0.0093 - val_acc: 0.9983
Epoch 3/20
```

```
7352/7352 [==============================] - 1s 172us/step - loss: 3.2860e-04 - acc: 0.9999 - val_
loss: 0.0153 - val_acc: 0.9929
Epoch 4/20
7352/7352 [==============================] - 1s 203us/step - loss: 0.0036 - acc: 0.9985 -
val_loss: 0.0529 - val_acc: 0.9854
Epoch 5/20
7352/7352 [==============================] - 1s 174us/step - loss: 6.8523e-04 - acc: 0.9997 - val_
loss: 0.0184 - val_acc: 0.9929
Epoch 6/20
7352/7352 [==============================] - 1s 172us/step - loss: 8.0575e-05 - acc: 1.0000 - val_
loss: 0.0247 - val_acc: 0.9919
Epoch 7/20
7352/7352 [==============================] - 1s 172us/step - loss: 2.1090e-05 - acc: 1.0000 - val_
loss: 0.0178 - val_acc: 0.9936
Epoch 8/20
7352/7352 [==============================] - 1s 174us/step - loss: 9.9189e-06 - acc: 1.0000 - val_
loss: 0.0271 - val_acc: 0.9929
Epoch 9/20
7352/7352 [==============================] - 1s 173us/step - loss: 3.2925e-06 - acc: 1.0000 - val_
loss: 0.0289 - val_acc: 0.9929
Epoch 10/20
7352/7352 [==============================] - 1s 176us/step - loss: 2.1333e-06 - acc: 1.0000 - val_
loss: 0.0302 - val_acc: 0.9929
Epoch 11/20
7352/7352 [==============================] - 1s 176us/step - loss: 2.3668e-06 - acc: 1.0000 - val_
loss: 0.0348 - val_acc: 0.9902
Epoch 12/20
7352/7352 [==============================] - 1s 176us/step - loss: 1.0749e-06 - acc: 1.0000 - val_
loss: 0.0367 - val_acc: 0.9895
Epoch 13/20
7352/7352 [==============================] - 1s 203us/step - loss: 1.7047e-06 - acc: 1.0000 - val_
loss: 0.0396 - val_acc: 0.9895
Epoch 14/20
7352/7352 [==============================] - 1s 199us/step - loss: 8.8037e-07 - acc: 1.0000 - val_
loss: 0.0417 - val_acc: 0.9891
Epoch 15/20
7352/7352 [==============================] - 1s 172us/step - loss: 1.1893e-06 - acc: 1.0000 - val_
loss: 0.0434 - val_acc: 0.9898
Epoch 16/20
7352/7352 [==============================] - 1s 170us/step - loss: 5.5106e-07 - acc: 1.0000 - val_
loss: 0.0466 - val_acc: 0.9891
Epoch 17/20
7352/7352 [==============================] - 1s 180us/step - loss: 6.0218e-07 - acc: 1.0000 - val_
loss: 0.0492 - val_acc: 0.9891
Epoch 18/20
7352/7352 [==============================] - 2s 211us/step - loss: 6.4661e-07 - acc: 1.0000 - val_
loss: 0.0515 - val_acc: 0.9895
Epoch 19/20
7352/7352 [==============================] - 1s 192us/step - loss: 8.7034e-07 - acc: 1.0000 - val_
loss: 0.0672 - val_acc: 0.9885
Epoch 20/20
7352/7352 [==============================] - 1s 177us/step - loss: 3.6312e-07 - acc: 1.0000 - val_
loss: 0.0637 - val_acc: 0.9888
```

Out[63]:

```
<keras.callbacks.History at 0x7fd2a05a2898>
```

In [64]:

```
_,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 0.9888021717000339
```

So the CNN is modelled to classify data into static and dynamic activities,the accuracy significantly improved to 98.8

In [65]:

```
##saving model
model.save('model_scaled_2class.h5')
```

In [67]:

```
from prettytable import PrettyTable
x= PrettyTable()
x.field_names= ["Model","Val accuracy(%)"]

x.add_row(["Single Layer LSTM Model with dropout",90.1])
x.add_row(["3 Layers LSTM Model with Dropout",88.06])
x.add_row(["2 Layer LSTM Model with Dropout and Batch Normalization",92.06])
x.add_row([" LSTM Model with hyperparameter tuning",93.3])
x.add_row([" CNN Model with hyperparameter tuning",92.53])
x.add_row([" CNN Model for classifying data into Static and Dynamic",98.8])
print(x)
```

```
+-----------------------------------------------------------+-----------------+
|                           Model                           | Val accuracy(%) |
+-----------------------------------------------------------+-----------------+
|           Single Layer LSTM Model with dropout            |       90.1      |
|             3 Layers LSTM Model with Dropout              |      88.06      |
| 2 Layer LSTM Model with Dropout and Batch Normalization   |      92.06      |
|           LSTM Model with hyperparameter tuning           |       93.3      |
|           CNN Model with hyperparameter tuning            |      92.53      |
|  CNN Model for classifying data into Static and Dynamic   |       98.8      |
+-----------------------------------------------------------+-----------------+
```