CNN Hyperparameters tuning using Hyperas and Hyperopt

In [1]:
```
from hyperopt import Trials, STATUS_OK, tpe
from hyperas import optim
from hyperas.distributions import choice, uniform
from sklearn.model_selection import train_test_split
from keras.models import Sequential
from keras.layers import Conv2D, MaxPooling2D
from keras.layers import Activation, Dropout, Flatten, Dense
import cv2
from random import shuffle
import numpy as np
from PIL import Image
import os
import matplotlib.pyplot as plt
from keras.models import Sequential
from keras.layers import *
from keras.optimizers import *
from keras.utils import np_utils
import seaborn as sns
from keras.initializers import RandomNormal
import time
from sklearn.model_selection import train_test_split
from keras.models import load_model
from keras.preprocessing import image
from keras.callbacks import EarlyStopping
import keras
%matplotlib inline
```

```
Using TensorFlow backend.
```

In [2]:
```
# keras.__version__
```

In [9]:

```
def data():
    train_data = 'D:/Office/MS/finding_sign_on_form/keras_model/train_data/'
    test_data = 'D:/Office/MS/finding_sign_on_form/keras_model/test_data/'
    def one_hot_label(img):
        label = img[0]
        if label == 'h':
            ohl = np.array([1,0])
        elif label == 'l' or 'p':
            ohl = np.array([0,1])
        return ohl

    def train_data_with_label():
        train_images = []
        train_data_imgs = [file for file in os.listdir(train_data) if file.endswith(".jpg") or file.endswith(".JPG")]
        for i in train_data_imgs:
            path = os.path.join(train_data, i)
            img = cv2.imread(path, cv2.IMREAD_GRAYSCALE)
            img = cv2.resize(img, (100, 32))
            img = cv2.threshold(img, 0, 255, cv2.THRESH_OTSU)[1]
            train_images.append([np.array(img), one_hot_label(i)])
        shuffle(train_images)
        return train_images

    def test_data_with_label():
        test_images = []
        test_data_imgs = [file for file in os.listdir(test_data) if file.endswith(".jpg") or file.endswith(".JPG")]
        for i in test_data_imgs:
            path = os.path.join(test_data, i)
            img = cv2.imread(path, cv2.IMREAD_GRAYSCALE)
            img = cv2.resize(img, (100, 32))
            img = cv2.threshold(img, 0, 255, cv2.THRESH_OTSU)[1]
            test_images.append([np.array(img), one_hot_label(i)])
        shuffle(test_images)
        return test_images
    training_images = train_data_with_label()
```

```
    testing_images = test_data_with_label()

    tr_img_data = np.array([i[0] for i in training_images]).reshape(-1,
100,32,1)
    tr_lbl_data = np.array([i[1] for i in training_images])

    tst_img_data = np.array([i[0] for i in testing_images]).reshape(-1,
100,32,1)
    tst_lbl_data = np.array([i[1] for i in testing_images])
    X_train = tr_img_data.astype('float32')
    y_train = tr_lbl_data
    X_val = tst_img_data.astype('float32')
    y_val = tst_lbl_data
    X_train /= 255
    X_val /= 255
    return X_train, y_train, X_val, y_val
```

In [12]:

```
def model(X_train, y_train, X_val, y_val):
    model = Sequential()
    model_choice = {{choice(['one', 'two', 'three', 'four'])}}
    if model_choice == 'one':
        model.add(Conv2D(filters=80, kernel_size=5, strides=1, padding=
'valid', activation='relu', input_shape=(100,32,1)))
        model.add(MaxPool2D(pool_size=3, strides=2))

        model.add(Conv2D(filters=50, kernel_size=3, strides=1, padding=
'valid', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))
        model.add(Dropout({{uniform(0, 1)}}))

        model.add(Conv2D(filters=32, kernel_size=3, strides=1, padding=
'valid', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))

    elif model_choice == 'two':
        model.add(Conv2D(filters=80, kernel_size=5, strides=1, padding=
'same', activation='relu', input_shape=(100,32,1)))
        model.add(MaxPool2D(pool_size=3, strides=2))
```

```
        model.add(Conv2D(filters=50, kernel_size=3, strides=1, padding=
'same', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))
        model.add(Dropout({{uniform(0, 1)}}))

        model.add(Conv2D(filters=32, kernel_size=3, strides=1, padding=
'same', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))

    elif model_choice == 'three':
        model.add(Conv2D(filters=32, kernel_size=5, strides=1, padding=
'valid', activation='relu', input_shape=(100,32,1)))
        model.add(MaxPool2D(pool_size=3, strides=2))

        model.add(Conv2D(filters=50, kernel_size=3, strides=1, padding=
'valid', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))
        model.add(Dropout({{uniform(0, 1)}}))

        model.add(Conv2D(filters=80, kernel_size=3, strides=1, padding=
'valid', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))
    elif model_choice == 'four':
        model.add(Conv2D(filters=32, kernel_size=5, strides=1, padding=
'same', activation='relu', input_shape=(100,32,1)))
        model.add(MaxPool2D(pool_size=3, strides=2))
        model.add(Dropout({{uniform(0, 1)}}))

        model.add(Conv2D(filters=50, kernel_size=3, strides=1, padding=
'same', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))
        model.add(Dropout({{uniform(0, 1)}}))

        model.add(Conv2D(filters=80, kernel_size=3, strides=1, padding=
'same', activation='relu'))
        model.add(MaxPool2D(pool_size=2, strides=2))

    model.add(Flatten())
    model.add(Dense({{choice([256, 512,1024])}}, activation='relu'))
```

```
    model.add(BatchNormalization())
    model.add(Dropout({{uniform(0, 1)}}))
    choiceval = {{choice(['one', 'two'])}}
    if choiceval == 'two':
        model.add(Dense({{choice([256, 512,1024])}}, activation='relu'
))
        model.add(BatchNormalization())
        model.add(Dropout({{uniform(0, 1)}}))

    model.add(Dense(2, activation='softmax'))

    adam = keras.optimizers.Adam(lr=0.001)

    model.compile(loss='categorical_crossentropy', metrics=['accuracy'
],
                  optimizer=adam)
    model.fit(X_train, y_train,
              batch_size=64,
              nb_epoch=15,
              verbose=2,
              validation_data=(X_val, y_val))
    score, acc = model.evaluate(X_val, y_val, verbose=0)
    print('Val accuracy:', acc)
    return {'loss': -acc, 'status': STATUS_OK, 'model': model}
```

In [13]:

```
X_train,y_train,X_val,y_val = data()
# print(len(X_train), len(Y_train), len(X_val), len(Y_val))
best_run, best_model = optim.minimize(model=model,
                                      data=data,
                                      algo=tpe.suggest,
                                      max_evals=30,
                                      trials=Trials(),
                                      notebook_name='CNN_hyperparameter
s')
```

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

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 sklearn.model_selection import train_test_split
except:
    pass

try:
    from keras.models import Sequential
except:
    pass

try:
    from keras.layers import Conv2D, MaxPooling2D
except:
    pass

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

try:
    import cv2
except:
    pass
```

```
try:
    from random import shuffle
except:
    pass

try:
    import numpy as np
except:
    pass

try:
    from PIL import Image
except:
    pass

try:
    import os
except:
    pass

try:
    import matplotlib.pyplot as plt
except:
    pass

try:
    from keras.models import Sequential
except:
    pass

try:
    from keras.layers import *
except:
    pass

try:
    from keras.optimizers import *
except:
    pass
```

```
try:
    from keras.utils import np_utils
except:
    pass

try:
    import seaborn as sns
except:
    pass

try:
    from keras.initializers import RandomNormal
except:
    pass

try:
    import time
except:
    pass

try:
    from sklearn.model_selection import train_test_split
except:
    pass

try:
    from keras.models import load_model
except:
    pass

try:
    from keras.preprocessing import image
except:
    pass

try:
    from keras.callbacks import EarlyStopping
except:
```

```
    pass

try:
    import keras
except:
    pass

>>> Hyperas search space:

def get_space():
    return {
        'model_choice': hp.choice('model_choice', ['one', 'two', 'thre
e', 'four']),
        'Dropout': hp.uniform('Dropout', 0, 1),
        'Dropout_1': hp.uniform('Dropout_1', 0, 1),
        'Dropout_2': hp.uniform('Dropout_2', 0, 1),
        'Dropout_3': hp.uniform('Dropout_3', 0, 1),
        'Dropout_4': hp.uniform('Dropout_4', 0, 1),
        'Dense': hp.choice('Dense', [256, 512,1024]),
        'Dropout_5': hp.uniform('Dropout_5', 0, 1),
        'choiceval': hp.choice('choiceval', ['one', 'two']),
        'Dense_1': hp.choice('Dense_1', [256, 512,1024]),
        'Dropout_6': hp.uniform('Dropout_6', 0, 1),
    }

>>> Data
   1:
   2: train_data = 'D:/Office/MS/finding_sign_on_form/keras_model/train
_data/'
   3: test_data = 'D:/Office/MS/finding_sign_on_form/keras_model/test_d
ata/'
   4: def one_hot_label(img):
   5:     label = img[0]
   6:     if label == 'h':
   7:         ohl = np.array([1,0])
   8:     elif label == 'l' or 'p':
   9:         ohl = np.array([0,1])
  10:     return ohl
  11:
```

```
def train_data_with_label():
    train_images = []
    train_data_imgs = [file for file in os.listdir(train_data) if file.endswith(".jpg") or file.endswith(".JPG")]
    for i in train_data_imgs:
        path = os.path.join(train_data, i)
        img = cv2.imread(path, cv2.IMREAD_GRAYSCALE)
        img = cv2.resize(img, (100, 32))
        img = cv2.threshold(img, 0, 255, cv2.THRESH_OTSU)[1]
        train_images.append([np.array(img), one_hot_label(i)])
    shuffle(train_images)
    return train_images

def test_data_with_label():
    test_images = []
    test_data_imgs = [file for file in os.listdir(test_data) if file.endswith(".jpg") or file.endswith(".JPG")]
    for i in test_data_imgs:
        path = os.path.join(test_data, i)
        img = cv2.imread(path, cv2.IMREAD_GRAYSCALE)
        img = cv2.resize(img, (100, 32))
        img = cv2.threshold(img, 0, 255, cv2.THRESH_OTSU)[1]
        test_images.append([np.array(img), one_hot_label(i)])
    shuffle(test_images)
    return test_images
training_images = train_data_with_label()
testing_images = test_data_with_label()

tr_img_data = np.array([i[0] for i in training_images]).reshape(-1,100,32,1)
tr_lbl_data = np.array([i[1] for i in training_images])

tst_img_data = np.array([i[0] for i in testing_images]).reshape(-1,100,32,1)
tst_lbl_data = np.array([i[1] for i in testing_images])
X_train = tr_img_data.astype('float32')
y_train = tr_lbl_data
X_val = tst_img_data.astype('float32')
y_val = tst_lbl_data
```

```
  47: X_train /= 255
  48: X_val /= 255
  49:
  50:
  51:
>>> Resulting replaced keras model:

   1: def keras_fmin_fnct(space):
   2:
   3:     model = Sequential()
   4:     model_choice = space['model_choice']
   5:     if model_choice == 'one':
   6:         model.add(Conv2D(filters=80, kernel_size=5, strides=1, pa
dding='valid', activation='relu', input_shape=(100,32,1)))
   7:         model.add(MaxPool2D(pool_size=3, strides=2))
   8:
   9:         model.add(Conv2D(filters=50, kernel_size=3, strides=1, pa
dding='valid', activation='relu'))
  10:         model.add(MaxPool2D(pool_size=2, strides=2))
  11:         model.add(Dropout(space['Dropout']))
  12:
  13:         model.add(Conv2D(filters=32, kernel_size=3, strides=1, pa
dding='valid', activation='relu'))
  14:         model.add(MaxPool2D(pool_size=2, strides=2))
  15:
  16:     elif model_choice == 'two':
  17:         model.add(Conv2D(filters=80, kernel_size=5, strides=1, pa
dding='same', activation='relu', input_shape=(100,32,1)))
  18:         model.add(MaxPool2D(pool_size=3, strides=2))
  19:
  20:         model.add(Conv2D(filters=50, kernel_size=3, strides=1, pa
dding='same', activation='relu'))
  21:         model.add(MaxPool2D(pool_size=2, strides=2))
  22:         model.add(Dropout(space['Dropout_1']))
  23:
  24:         model.add(Conv2D(filters=32, kernel_size=3, strides=1, pa
dding='same', activation='relu'))
  25:         model.add(MaxPool2D(pool_size=2, strides=2))
  26:
```

```
  27:     elif model_choice == 'three':
  28:         model.add(Conv2D(filters=32, kernel_size=5, strides=1, pa
dding='valid', activation='relu', input_shape=(100,32,1)))
  29:         model.add(MaxPool2D(pool_size=3, strides=2))
  30:
  31:         model.add(Conv2D(filters=50, kernel_size=3, strides=1, pa
dding='valid', activation='relu'))
  32:         model.add(MaxPool2D(pool_size=2, strides=2))
  33:         model.add(Dropout(space['Dropout_2']))
  34:
  35:         model.add(Conv2D(filters=80, kernel_size=3, strides=1, pa
dding='valid', activation='relu'))
  36:         model.add(MaxPool2D(pool_size=2, strides=2))
  37:     elif model_choice == 'four':
  38:         model.add(Conv2D(filters=32, kernel_size=5, strides=1, pa
dding='same', activation='relu', input_shape=(100,32,1)))
  39:         model.add(MaxPool2D(pool_size=3, strides=2))
  40:         model.add(Dropout(space['Dropout_3']))
  41:
  42:         model.add(Conv2D(filters=50, kernel_size=3, strides=1, pa
dding='same', activation='relu'))
  43:         model.add(MaxPool2D(pool_size=2, strides=2))
  44:         model.add(Dropout(space['Dropout_4']))
  45:
  46:         model.add(Conv2D(filters=80, kernel_size=3, strides=1, pa
dding='same', activation='relu'))
  47:         model.add(MaxPool2D(pool_size=2, strides=2))
  48:
  49:     model.add(Flatten())
  50:     model.add(Dense(space['Dense'], activation='relu'))
  51:     model.add(BatchNormalization())
  52:     model.add(Dropout(space['Dropout_5']))
  53:     choiceval = space['choiceval']
  54:     if choiceval == 'two':
  55:         model.add(Dense(space['Dense_1'], activation='relu'))
  56:         model.add(BatchNormalization())
  57:         model.add(Dropout(space['Dropout_6']))
  58:
  59:     model.add(Dense(2, activation='softmax'))
```

```
  60:
  61:     adam = keras.optimizers.Adam(lr=0.001)
  62:
  63:     model.compile(loss='categorical_crossentropy', metrics=['accu
racy'],
  64:                   optimizer=adam)
  65:     model.fit(X_train, y_train,
  66:               batch_size=64,
  67:               nb_epoch=15,
  68:               verbose=2,
  69:               validation_data=(X_val, y_val))
  70:     score, acc = model.evaluate(X_val, y_val, verbose=0)
  71:     print('Val accuracy:', acc)
  72:     return {'loss': -acc, 'status': STATUS_OK, 'model': model}
  73:
  0%|
           | 0/30 [00:00<?, ?it/s, best loss: ?]WARNING:tensorflow:From
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\tensorflow\python\f
ramework\op_def_library.py:263: colocate_with (from tensorflow.python.f
ramework.ops) is deprecated and will be removed in a future version.
Instructions for updating:
Colocations handled automatically by placer.
WARNING:tensorflow:From C:\Users\Shubham\.conda\envs\shub\lib\site-pack
ages\keras\backend\tensorflow_backend.py:3138: calling dropout (from te
nsorflow.python.ops.nn_ops) with keep_prob is deprecated and will be re
moved in a future version.
Instructions for updating:
Please use `rate` instead of `keep_prob`. Rate should be set to `rate =
1 - keep_prob`.

C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

WARNING:tensorflow:From C:\Users\Shubham\.conda\envs\shub\lib\site-pack
ages\tensorflow\python\ops\math_ops.py:3066: to_int32 (from tensorflow.
python.ops.math_ops) is deprecated and will be removed in a future vers

ion.
```

```
Instructions for updating:
Use tf.cast instead.
Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 0.3670 - acc: 0.8746 - val_loss: 0.1561 - val_acc: 0.9460


Epoch 2/15

 - 3s - loss: 0.1841 - acc: 0.9347 - val_loss: 0.5253 - val_acc: 0.8225


Epoch 3/15

 - 3s - loss: 0.1409 - acc: 0.9516 - val_loss: 4.3585 - val_acc: 0.5640


Epoch 4/15

 - 3s - loss: 0.1083 - acc: 0.9589 - val_loss: 0.0095 - val_acc: 0.9980


Epoch 5/15

 - 3s - loss: 0.1015 - acc: 0.9644 - val_loss: 0.1100 - val_acc: 0.9520


Epoch 6/15

 - 3s - loss: 0.0751 - acc: 0.9713 - val_loss: 0.0886 - val_acc: 0.9640


Epoch 7/15

 - 3s - loss: 0.0694 - acc: 0.9766 - val_loss: 0.1430 - val_acc: 0.9335
```

```
Epoch 8/15
 - 3s - loss: 0.0630 - acc: 0.9779 - val_loss: 0.0083 - val_acc: 0.9975

Epoch 9/15
 - 3s - loss: 0.0558 - acc: 0.9798 - val_loss: 0.0070 - val_acc: 0.9970

Epoch 10/15
 - 3s - loss: 0.0566 - acc: 0.9793 - val_loss: 0.7172 - val_acc: 0.7865

Epoch 11/15
 - 3s - loss: 0.0481 - acc: 0.9821 - val_loss: 2.2968 - val_acc: 0.6630

Epoch 12/15
 - 3s - loss: 0.0452 - acc: 0.9833 - val_loss: 0.0105 - val_acc: 0.9970

Epoch 13/15
 - 3s - loss: 0.0366 - acc: 0.9854 - val_loss: 0.0689 - val_acc: 0.9770

Epoch 14/15
 - 3s - loss: 0.0467 - acc: 0.9843 - val_loss: 0.0164 - val_acc: 0.9930

Epoch 15/15
 - 3s - loss: 0.0354 - acc: 0.9869 - val_loss: 0.0224 - val_acc: 0.9950
```

```
Val accuracy:

0.995

  3%|▉                                                                                 |
1/30 [00:51<25:03, 51.83s/it, best loss: -0.995]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 6s - loss: 0.5224 - acc: 0.8145 - val_loss: 0.2436 - val_acc: 0.8750


Epoch 2/15

 - 4s - loss: 0.2214 - acc: 0.9125 - val_loss: 0.1257 - val_acc: 0.9420


Epoch 3/15

 - 4s - loss: 0.1642 - acc: 0.9369 - val_loss: 0.2347 - val_acc: 0.8895


Epoch 4/15

 - 4s - loss: 0.1440 - acc: 0.9469 - val_loss: 0.0293 - val_acc: 0.9910


Epoch 5/15

 - 4s - loss: 0.1287 - acc: 0.9543 - val_loss: 0.2152 - val_acc: 0.9085
```

```
Epoch 6/15
 - 4s - loss: 0.1181 - acc: 0.9567 - val_loss: 0.0459 - val_acc: 0.9840

Epoch 7/15
 - 4s - loss: 0.1128 - acc: 0.9573 - val_loss: 0.0619 - val_acc: 0.9745

Epoch 8/15
 - 4s - loss: 0.1115 - acc: 0.9576 - val_loss: 0.0695 - val_acc: 0.9740

Epoch 9/15
 - 4s - loss: 0.1089 - acc: 0.9598 - val_loss: 0.1891 - val_acc: 0.9190

Epoch 10/15
 - 4s - loss: 0.0909 - acc: 0.9666 - val_loss: 0.0228 - val_acc: 0.9910

Epoch 11/15
 - 4s - loss: 0.0896 - acc: 0.9692 - val_loss: 0.0177 - val_acc: 0.9960

Epoch 12/15
 - 4s - loss: 0.0855 - acc: 0.9674 - val_loss: 0.2601 - val_acc: 0.8865

Epoch 13/15

 - 4s - loss: 0.0737 - acc: 0.9730 - val_loss: 0.0214 - val_acc: 0.9910
```

```
Epoch 14/15

 - 4s - loss: 0.0727 - acc: 0.9738 - val_loss: 0.1403 - val_acc: 0.9365


Epoch 15/15

 - 4s - loss: 0.0651 - acc: 0.9739 - val_loss: 0.1317 - val_acc: 0.9485


Val accuracy:

0.9485

  7%|███                                                                |
2/30 [01:56<25:55, 55.57s/it, best loss: -0.995]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '


Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 7s - loss: 1.4662 - acc: 0.7085 - val_loss: 0.7022 - val_acc: 0.7275


Epoch 2/15

 - 5s - loss: 0.3588 - acc: 0.8759 - val_loss: 0.0526 - val_acc: 0.9865


Epoch 3/15


 - 5s - loss: 0.2629 - acc: 0.9068 - val_loss: 0.9644 - val_acc: 0.6680
```

```
Epoch 4/15
 - 5s - loss: 0.2257 - acc: 0.9139 - val_loss: 0.9826 - val_acc: 0.6475

Epoch 5/15
 - 5s - loss: 0.2072 - acc: 0.9234 - val_loss: 0.5616 - val_acc: 0.7570

Epoch 6/15
 - 5s - loss: 0.1943 - acc: 0.9318 - val_loss: 0.4981 - val_acc: 0.7825

Epoch 7/15
 - 5s - loss: 0.1829 - acc: 0.9324 - val_loss: 0.2814 - val_acc: 0.8700

Epoch 8/15
 - 5s - loss: 0.1629 - acc: 0.9422 - val_loss: 0.6226 - val_acc: 0.7340

Epoch 9/15
 - 5s - loss: 0.1627 - acc: 0.9417 - val_loss: 1.4311 - val_acc: 0.5855

Epoch 10/15
 - 5s - loss: 0.1669 - acc: 0.9428 - val_loss: 1.7162 - val_acc: 0.5655

Epoch 11/15
```

```
 - 5s - loss: 0.1498 - acc: 0.9474 - val_loss: 0.4882 - val_acc: 0.8310

Epoch 12/15
 - 5s - loss: 0.1346 - acc: 0.9534 - val_loss: 0.2082 - val_acc: 0.9200

Epoch 13/15
 - 5s - loss: 0.1376 - acc: 0.9523 - val_loss: 0.3351 - val_acc: 0.8710

Epoch 14/15
 - 5s - loss: 0.1292 - acc: 0.9535 - val_loss: 0.3440 - val_acc: 0.8700

Epoch 15/15
 - 5s - loss: 0.1197 - acc: 0.9597 - val_loss: 0.4872 - val_acc: 0.8035

Val accuracy:
0.8035
 10%|██████                                                            |
3/30 [03:15<28:12, 62.69s/it, best loss: -0.995]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples
Epoch 1/15
```

```
 - 7s - loss: 0.6580 - acc: 0.7383 - val_loss: 8.0590 - val_acc: 0.5000

Epoch 2/15
 - 4s - loss: 0.2496 - acc: 0.9036 - val_loss: 4.8961 - val_acc: 0.5000

Epoch 3/15
 - 4s - loss: 0.2278 - acc: 0.9143 - val_loss: 5.7888 - val_acc: 0.5000

Epoch 4/15
 - 4s - loss: 0.1990 - acc: 0.9265 - val_loss: 4.3103 - val_acc: 0.5000

Epoch 5/15
 - 4s - loss: 0.1872 - acc: 0.9298 - val_loss: 2.7967 - val_acc: 0.5000

Epoch 6/15
 - 4s - loss: 0.1745 - acc: 0.9354 - val_loss: 4.2535 - val_acc: 0.5000

Epoch 7/15
 - 4s - loss: 0.1546 - acc: 0.9427 - val_loss: 4.5156 - val_acc: 0.5000

Epoch 8/15
 - 4s - loss: 0.1645 - acc: 0.9367 - val_loss: 2.6733 - val_acc: 0.5000

Epoch 9/15
```

```
 - 4s - loss: 0.1566 - acc: 0.9408 - val_loss: 3.9970 - val_acc: 0.5000

Epoch 10/15
 - 4s - loss: 0.1493 - acc: 0.9445 - val_loss: 3.2504 - val_acc: 0.5000

Epoch 11/15
 - 4s - loss: 0.1549 - acc: 0.9449 - val_loss: 4.1111 - val_acc: 0.5000

Epoch 12/15
 - 4s - loss: 0.1464 - acc: 0.9471 - val_loss: 3.3220 - val_acc: 0.5000

Epoch 13/15
 - 4s - loss: 0.1468 - acc: 0.9430 - val_loss: 3.4957 - val_acc: 0.5000

Epoch 14/15
 - 5s - loss: 0.1438 - acc: 0.9462 - val_loss: 3.4631 - val_acc: 0.5000

Epoch 15/15
 - 5s - loss: 0.1390 - acc: 0.9496 - val_loss: 2.6425 - val_acc: 0.5000

Val accuracy:
0.5
```

```
 13%|████████                                                        |
4/30 [04:25<28:06, 64.85s/it, best loss: -0.995]
```

```
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '
```

```
Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 6s - loss: 0.2271 - acc: 0.9128 - val_loss: 0.8482 - val_acc: 0.6965


Epoch 2/15

 - 4s - loss: 0.1126 - acc: 0.9591 - val_loss: 1.5258 - val_acc: 0.5885


Epoch 3/15

 - 4s - loss: 0.1004 - acc: 0.9662 - val_loss: 0.1889 - val_acc: 0.9230


Epoch 4/15

 - 5s - loss: 0.0901 - acc: 0.9666 - val_loss: 0.2342 - val_acc: 0.9020


Epoch 5/15

 - 4s - loss: 0.0817 - acc: 0.9713 - val_loss: 1.0329 - val_acc: 0.6555


Epoch 6/15

 - 4s - loss: 0.0742 - acc: 0.9737 - val_loss: 0.8500 - val_acc: 0.6575
```

```
Epoch 7/15
 - 4s - loss: 0.0635 - acc: 0.9793 - val_loss: 0.7896 - val_acc: 0.7295

Epoch 8/15
 - 4s - loss: 0.0555 - acc: 0.9798 - val_loss: 0.9553 - val_acc: 0.6670

Epoch 9/15
 - 4s - loss: 0.0556 - acc: 0.9791 - val_loss: 0.7285 - val_acc: 0.7120

Epoch 10/15
 - 4s - loss: 0.0481 - acc: 0.9828 - val_loss: 1.1231 - val_acc: 0.6610

Epoch 11/15
 - 4s - loss: 0.0452 - acc: 0.9838 - val_loss: 0.1752 - val_acc: 0.9235

Epoch 12/15
 - 4s - loss: 0.0420 - acc: 0.9837 - val_loss: 0.4748 - val_acc: 0.8345

Epoch 13/15
 - 4s - loss: 0.0369 - acc: 0.9860 - val_loss: 0.4087 - val_acc: 0.8565

Epoch 14/15
 - 4s - loss: 0.0394 - acc: 0.9860 - val_loss: 0.2443 - val_acc: 0.9015
```

```
Epoch 15/15

 - 4s - loss: 0.0323 - acc: 0.9874 - val_loss: 0.4086 - val_acc: 0.8335


Val accuracy:

0.8335

 17%|██████████                                                      |
5/30 [05:27<26:43, 64.15s/it, best loss: -0.995]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 5s - loss: 0.3810 - acc: 0.8794 - val_loss: 0.3288 - val_acc: 0.8860


Epoch 2/15

 - 3s - loss: 0.1667 - acc: 0.9422 - val_loss: 0.7043 - val_acc: 0.7740


Epoch 3/15

 - 3s - loss: 0.1300 - acc: 0.9541 - val_loss: 0.5006 - val_acc: 0.7910


Epoch 4/15

 - 3s - loss: 0.1093 - acc: 0.9607 - val_loss: 0.0301 - val_acc: 0.9890
```

```
Epoch 5/15
 - 3s - loss: 0.0968 - acc: 0.9671 - val_loss: 0.1554 - val_acc: 0.9330

Epoch 6/15
 - 3s - loss: 0.0861 - acc: 0.9697 - val_loss: 0.0125 - val_acc: 0.9950

Epoch 7/15
 - 3s - loss: 0.0852 - acc: 0.9688 - val_loss: 0.6173 - val_acc: 0.7705

Epoch 8/15
 - 3s - loss: 0.0697 - acc: 0.9769 - val_loss: 0.0695 - val_acc: 0.9720

Epoch 9/15
 - 3s - loss: 0.0630 - acc: 0.9774 - val_loss: 0.0121 - val_acc: 0.9960

Epoch 10/15
 - 3s - loss: 0.0585 - acc: 0.9794 - val_loss: 0.0465 - val_acc: 0.9845

Epoch 11/15
 - 3s - loss: 0.0563 - acc: 0.9787 - val_loss: 0.0090 - val_acc: 0.9965

Epoch 12/15
 - 3s - loss: 0.0460 - acc: 0.9852 - val_loss: 0.0268 - val_acc: 0.9895
```

```
Epoch 13/15

 - 3s - loss: 0.0515 - acc: 0.9810 - val_loss: 0.1934 - val_acc: 0.9315


Epoch 14/15

 - 4s - loss: 0.0400 - acc: 0.9856 - val_loss: 0.0926 - val_acc: 0.9710


Epoch 15/15

 - 4s - loss: 0.0460 - acc: 0.9828 - val_loss: 0.0045 - val_acc: 0.9990


Val accuracy:

0.999

 20%|██████████                                                |
6/30 [06:21<24:22, 60.95s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 7s - loss: 0.2561 - acc: 0.9088 - val_loss: 0.4795 - val_acc: 0.8330


Epoch 2/15

 - 4s - loss: 0.1104 - acc: 0.9609 - val_loss: 0.7196 - val_acc: 0.7620
```

```
Epoch 3/15
 - 4s - loss: 0.0871 - acc: 0.9698 - val_loss: 1.4407 - val_acc: 0.6145

Epoch 4/15
 - 4s - loss: 0.0817 - acc: 0.9720 - val_loss: 0.1648 - val_acc: 0.9350

Epoch 5/15
 - 4s - loss: 0.0654 - acc: 0.9762 - val_loss: 0.1469 - val_acc: 0.9405

Epoch 6/15
 - 4s - loss: 0.0654 - acc: 0.9765 - val_loss: 0.7288 - val_acc: 0.7725

Epoch 7/15
 - 4s - loss: 0.0575 - acc: 0.9791 - val_loss: 0.1772 - val_acc: 0.9265

Epoch 8/15
 - 4s - loss: 0.0504 - acc: 0.9810 - val_loss: 0.3132 - val_acc: 0.8795

Epoch 9/15
 - 4s - loss: 0.0504 - acc: 0.9821 - val_loss: 0.1378 - val_acc: 0.9500

Epoch 10/15
```

```
 - 4s - loss: 0.0416 - acc: 0.9850 - val_loss: 0.2893 - val_acc: 0.8920


Epoch 11/15

 - 4s - loss: 0.0451 - acc: 0.9827 - val_loss: 0.1435 - val_acc: 0.9380


Epoch 12/15

 - 5s - loss: 0.0370 - acc: 0.9864 - val_loss: 0.3451 - val_acc: 0.8695


Epoch 13/15

 - 5s - loss: 0.0411 - acc: 0.9836 - val_loss: 0.2169 - val_acc: 0.9105


Epoch 14/15

 - 4s - loss: 0.0381 - acc: 0.9852 - val_loss: 0.7203 - val_acc: 0.7975


Epoch 15/15

 - 4s - loss: 0.0355 - acc: 0.9868 - val_loss: 0.2170 - val_acc: 0.8975


Val accuracy:

0.8975

 23%|███████████████                                                 |
7/30 [07:28<24:07, 62.92s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '
```

```
Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 5s - loss: 0.2502 - acc: 0.9020 - val_loss: 0.0401 - val_acc: 0.9880


Epoch 2/15

 - 3s - loss: 0.1298 - acc: 0.9523 - val_loss: 0.0422 - val_acc: 0.9860


Epoch 3/15

 - 3s - loss: 0.1036 - acc: 0.9638 - val_loss: 0.0350 - val_acc: 0.9890


Epoch 4/15

 - 3s - loss: 0.0906 - acc: 0.9665 - val_loss: 0.0888 - val_acc: 0.9695


Epoch 5/15

 - 3s - loss: 0.0789 - acc: 0.9695 - val_loss: 0.0265 - val_acc: 0.9935


Epoch 6/15

 - 3s - loss: 0.0673 - acc: 0.9751 - val_loss: 0.7908 - val_acc: 0.7640


Epoch 7/15

 - 3s - loss: 0.0594 - acc: 0.9791 - val_loss: 0.0747 - val_acc: 0.9695


Epoch 8/15
```

```
 - 3s - loss: 0.0581 - acc: 0.9783 - val_loss: 0.0647 - val_acc: 0.9755

Epoch 9/15
 - 3s - loss: 0.0539 - acc: 0.9805 - val_loss: 0.0405 - val_acc: 0.9850

Epoch 10/15
 - 3s - loss: 0.0393 - acc: 0.9852 - val_loss: 0.0273 - val_acc: 0.9905

Epoch 11/15
 - 3s - loss: 0.0445 - acc: 0.9839 - val_loss: 0.0078 - val_acc: 0.9960

Epoch 12/15
 - 3s - loss: 0.0277 - acc: 0.9902 - val_loss: 0.0127 - val_acc: 0.9955

Epoch 13/15
 - 3s - loss: 0.0279 - acc: 0.9896 - val_loss: 0.0154 - val_acc: 0.9950

Epoch 14/15
 - 3s - loss: 0.0251 - acc: 0.9905 - val_loss: 0.1509 - val_acc: 0.9380

Epoch 15/15
 - 3s - loss: 0.0272 - acc: 0.9900 - val_loss: 0.4049 - val_acc: 0.8820

Val accuracy:
```

```
val accuracy:


0.882

 27%|███████████████                                                 |
8/30 [08:15<21:16, 58.02s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 7s - loss: 1.3103 - acc: 0.7335 - val_loss: 8.0590 - val_acc: 0.5000


Epoch 2/15

 - 5s - loss: 0.4185 - acc: 0.8890 - val_loss: 4.1750 - val_acc: 0.5065


Epoch 3/15

 - 5s - loss: 0.2614 - acc: 0.9180 - val_loss: 1.6858 - val_acc: 0.6000


Epoch 4/15

 - 5s - loss: 0.2345 - acc: 0.9227 - val_loss: 0.5797 - val_acc: 0.7445


Epoch 5/15

 - 5s - loss: 0.1985 - acc: 0.9300 - val_loss: 1.0570 - val_acc: 0.6545
```

```
Epoch 6/15
 - 5s - loss: 0.1822 - acc: 0.9337 - val_loss: 0.8553 - val_acc: 0.6775

Epoch 7/15
 - 5s - loss: 0.1678 - acc: 0.9386 - val_loss: 0.7697 - val_acc: 0.6875

Epoch 8/15
 - 5s - loss: 0.1575 - acc: 0.9436 - val_loss: 0.7877 - val_acc: 0.6960

Epoch 9/15
 - 5s - loss: 0.1603 - acc: 0.9419 - val_loss: 0.7248 - val_acc: 0.7045

Epoch 10/15
 - 5s - loss: 0.1470 - acc: 0.9483 - val_loss: 0.3662 - val_acc: 0.8255

Epoch 11/15
 - 5s - loss: 0.1475 - acc: 0.9468 - val_loss: 0.7474 - val_acc: 0.6995

Epoch 12/15
 - 5s - loss: 0.1427 - acc: 0.9495 - val_loss: 0.6887 - val_acc: 0.7300

Epoch 13/15
 - 5s - loss: 0.1338 - acc: 0.9528 - val_loss: 0.4738 - val_acc: 0.7710
```

```
Epoch 14/15

 - 5s - loss: 0.1421 - acc: 0.9487 - val_loss: 0.3531 - val_acc: 0.8625

Epoch 15/15

 - 5s - loss: 0.1330 - acc: 0.9521 - val_loss: 0.3259 - val_acc: 0.8715

Val accuracy:

0.8715

 30%|███████████████                                                 |
9/30 [09:28<21:55, 62.64s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 0.2818 - acc: 0.8977 - val_loss: 2.0044 - val_acc: 0.5195

Epoch 2/15

 - 5s - loss: 0.1209 - acc: 0.9555 - val_loss: 1.3279 - val_acc: 0.5715

Epoch 3/15

 - 5s - loss: 0.1051 - acc: 0.9603 - val_loss: 0.2896 - val_acc: 0.8540
```

```
Epoch 4/15
 - 5s - loss: 0.0970 - acc: 0.9644 - val_loss: 0.6798 - val_acc: 0.6825

Epoch 5/15
 - 5s - loss: 0.0975 - acc: 0.9633 - val_loss: 0.9110 - val_acc: 0.6230

Epoch 6/15
 - 5s - loss: 0.0888 - acc: 0.9690 - val_loss: 1.0263 - val_acc: 0.5865

Epoch 7/15
 - 5s - loss: 0.0819 - acc: 0.9712 - val_loss: 0.5939 - val_acc: 0.7745

Epoch 8/15
 - 5s - loss: 0.0869 - acc: 0.9686 - val_loss: 1.3153 - val_acc: 0.5720

Epoch 9/15
 - 5s - loss: 0.0747 - acc: 0.9713 - val_loss: 1.1475 - val_acc: 0.5995

Epoch 10/15
 - 5s - loss: 0.0725 - acc: 0.9729 - val_loss: 0.8345 - val_acc: 0.6805

Epoch 11/15
 - 5s - loss: 0.0669 - acc: 0.9752 - val_loss: 0.7929 - val_acc: 0.6765
```

```
Epoch 12/15

 - 5s - loss: 0.0746 - acc: 0.9737 - val_loss: 0.6531 - val_acc: 0.6720


Epoch 13/15

 - 5s - loss: 0.0668 - acc: 0.9775 - val_loss: 1.2109 - val_acc: 0.5865


Epoch 14/15

 - 5s - loss: 0.0599 - acc: 0.9803 - val_loss: 1.3013 - val_acc: 0.5600


Epoch 15/15

 - 5s - loss: 0.0630 - acc: 0.9761 - val_loss: 0.9825 - val_acc: 0.6585


Val accuracy:

0.6585

 33%|███████████████████                                                | 1
0/30 [10:51<22:50, 68.52s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '


Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 7s - loss: 0.2936 - acc: 0.8889 - val_loss: 0.4956 - val_acc: 0.8750
```

```
Epoch 2/15
 - 4s - loss: 0.1425 - acc: 0.9453 - val_loss: 0.8847 - val_acc: 0.7820

Epoch 3/15
 - 4s - loss: 0.1112 - acc: 0.9606 - val_loss: 0.8764 - val_acc: 0.7805

Epoch 4/15
 - 4s - loss: 0.1071 - acc: 0.9609 - val_loss: 0.2723 - val_acc: 0.8990

Epoch 5/15
 - 4s - loss: 0.0846 - acc: 0.9697 - val_loss: 0.3148 - val_acc: 0.8795

Epoch 6/15
 - 4s - loss: 0.0920 - acc: 0.9678 - val_loss: 0.5265 - val_acc: 0.7865

Epoch 7/15
 - 4s - loss: 0.0772 - acc: 0.9724 - val_loss: 0.3884 - val_acc: 0.8285

Epoch 8/15
 - 4s - loss: 0.0767 - acc: 0.9724 - val_loss: 0.0963 - val_acc: 0.9690

Epoch 9/15
 - 4s - loss: 0.0655 - acc: 0.9766 - val_loss: 0.1232 - val_acc: 0.9390
```

```
Epoch 10/15
 - 4s - loss: 0.0576 - acc: 0.9794 - val_loss: 0.0598 - val_acc: 0.9770

Epoch 11/15
 - 4s - loss: 0.0614 - acc: 0.9778 - val_loss: 0.0711 - val_acc: 0.9730

Epoch 12/15
 - 4s - loss: 0.0501 - acc: 0.9824 - val_loss: 0.4645 - val_acc: 0.8180

Epoch 13/15
 - 4s - loss: 0.0554 - acc: 0.9785 - val_loss: 0.2492 - val_acc: 0.8990

Epoch 14/15
 - 4s - loss: 0.0425 - acc: 0.9850 - val_loss: 0.0506 - val_acc: 0.9880

Epoch 15/15
 - 4s - loss: 0.0503 - acc: 0.9824 - val_loss: 0.0846 - val_acc: 0.9690

Val accuracy:

0.969

 37%|████████████████████                                              | 1
1/30 [11:53<21:07, 66.69s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
```

```
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 1.2220 - acc: 0.7028 - val_loss: 2.7461 - val_acc: 0.5050


Epoch 2/15

 - 5s - loss: 0.2916 - acc: 0.8982 - val_loss: 1.4565 - val_acc: 0.5860


Epoch 3/15

 - 5s - loss: 0.2006 - acc: 0.9275 - val_loss: 2.0259 - val_acc: 0.5355


Epoch 4/15

 - 5s - loss: 0.1850 - acc: 0.9336 - val_loss: 1.3249 - val_acc: 0.5900


Epoch 5/15

 - 5s - loss: 0.1670 - acc: 0.9376 - val_loss: 1.9234 - val_acc: 0.5365


Epoch 6/15

 - 5s - loss: 0.1439 - acc: 0.9472 - val_loss: 2.7221 - val_acc: 0.5130


Epoch 7/15

 - 5s - loss: 0.1422 - acc: 0.9494 - val_loss: 2.1094 - val_acc: 0.5420
```

```
Epoch 8/15
 - 5s - loss: 0.1403 - acc: 0.9491 - val_loss: 1.7130 - val_acc: 0.5470

Epoch 9/15
 - 5s - loss: 0.1279 - acc: 0.9552 - val_loss: 0.7468 - val_acc: 0.7320

Epoch 10/15
 - 5s - loss: 0.1189 - acc: 0.9562 - val_loss: 1.3925 - val_acc: 0.5975

Epoch 11/15
 - 5s - loss: 0.1167 - acc: 0.9600 - val_loss: 1.9742 - val_acc: 0.5560

Epoch 12/15
 - 5s - loss: 0.1016 - acc: 0.9635 - val_loss: 3.2056 - val_acc: 0.5055

Epoch 13/15
 - 5s - loss: 0.1037 - acc: 0.9639 - val_loss: 0.6160 - val_acc: 0.7675

Epoch 14/15
 - 5s - loss: 0.1083 - acc: 0.9611 - val_loss: 2.3813 - val_acc: 0.5045

Epoch 15/15
```

```
 - 5s - loss: 0.0976 - acc: 0.9638 - val_loss: 0.7049 - val_acc: 0.7405


Val accuracy:

0.7405

 40%|████████████████████                                              | 1
2/30 [13:13<21:13, 70.78s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 1.3617 - acc: 0.5193 - val_loss: 0.7136 - val_acc: 0.5000


Epoch 2/15

 - 4s - loss: 0.8813 - acc: 0.5421 - val_loss: 0.7043 - val_acc: 0.5000


Epoch 3/15

 - 4s - loss: 0.7678 - acc: 0.5348 - val_loss: 0.6992 - val_acc: 0.5000


Epoch 4/15

 - 4s - loss: 0.7332 - acc: 0.5497 - val_loss: 0.6937 - val_acc: 0.5000


Epoch 5/15
```

```
 - 4s - loss: 0.7307 - acc: 0.5572 - val_loss: 0.7228 - val_acc: 0.5000


Epoch 6/15
 - 4s - loss: 0.7294 - acc: 0.5592 - val_loss: 0.7307 - val_acc: 0.5000

Epoch 7/15
 - 4s - loss: 0.7339 - acc: 0.5553 - val_loss: 0.7819 - val_acc: 0.5000

Epoch 8/15
 - 4s - loss: 0.7263 - acc: 0.5676 - val_loss: 0.7324 - val_acc: 0.5000

Epoch 9/15
 - 4s - loss: 0.7263 - acc: 0.5711 - val_loss: 0.7699 - val_acc: 0.5000

Epoch 10/15
 - 4s - loss: 0.7216 - acc: 0.5683 - val_loss: 0.6969 - val_acc: 0.5000

Epoch 11/15
 - 4s - loss: 0.7228 - acc: 0.5684 - val_loss: 0.8125 - val_acc: 0.5000

Epoch 12/15
 - 4s - loss: 0.7180 - acc: 0.5764 - val_loss: 0.8249 - val_acc: 0.5000

Epoch 13/15
```

```
 - 4s - loss: 0.7177 - acc: 0.5745 - val_loss: 0.8220 - val_acc: 0.5000

Epoch 14/15
 - 4s - loss: 0.7283 - acc: 0.5756 - val_loss: 0.7036 - val_acc: 0.5000

Epoch 15/15
 - 4s - loss: 0.7199 - acc: 0.5732 - val_loss: 0.7313 - val_acc: 0.5000

Val accuracy:
0.5
 43%|████████████████████████                                  | 1
3/30 [14:21<19:47, 69.84s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples
Epoch 1/15
 - 8s - loss: 0.4551 - acc: 0.8468 - val_loss: 0.1248 - val_acc: 0.9455

Epoch 2/15
 - 5s - loss: 0.1925 - acc: 0.9298 - val_loss: 0.0934 - val_acc: 0.9645

Epoch 3/15
```

```
Epoch 3/15
 - 5s - loss: 0.1611 - acc: 0.9426 - val_loss: 0.0188 - val_acc: 0.9940

Epoch 4/15
 - 5s - loss: 0.1454 - acc: 0.9462 - val_loss: 0.4259 - val_acc: 0.8095

Epoch 5/15
 - 5s - loss: 0.1304 - acc: 0.9521 - val_loss: 0.0570 - val_acc: 0.9760

Epoch 6/15
 - 5s - loss: 0.1289 - acc: 0.9513 - val_loss: 0.0200 - val_acc: 0.9975

Epoch 7/15
 - 5s - loss: 0.1076 - acc: 0.9591 - val_loss: 0.0806 - val_acc: 0.9695

Epoch 8/15
 - 5s - loss: 0.1109 - acc: 0.9593 - val_loss: 0.3398 - val_acc: 0.8550

Epoch 9/15
 - 5s - loss: 0.0983 - acc: 0.9652 - val_loss: 0.1246 - val_acc: 0.9475

Epoch 10/15
 - 5s - loss: 0.0979 - acc: 0.9634 - val_loss: 0.2109 - val_acc: 0.9150
```

```
Epoch 11/15

 - 5s - loss: 0.0898 - acc: 0.9675 - val_loss: 0.0521 - val_acc: 0.9810

Epoch 12/15

 - 5s - loss: 0.0835 - acc: 0.9697 - val_loss: 0.4330 - val_acc: 0.8480

Epoch 13/15

 - 5s - loss: 0.0886 - acc: 0.9667 - val_loss: 0.3164 - val_acc: 0.8740

Epoch 14/15

 - 5s - loss: 0.0743 - acc: 0.9721 - val_loss: 0.2087 - val_acc: 0.9140

Epoch 15/15

 - 5s - loss: 0.0760 - acc: 0.9704 - val_loss: 0.0432 - val_acc: 0.9885

Val accuracy:

0.9885

 47%|████████████████████████                                          | 1
4/30 [15:36<19:02, 71.38s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples
```

```
Epoch 1/15
 - 9s - loss: 0.2590 - acc: 0.8988 - val_loss: 0.0298 - val_acc: 0.9950

Epoch 2/15
 - 5s - loss: 0.1446 - acc: 0.9460 - val_loss: 0.0213 - val_acc: 0.9945

Epoch 3/15
 - 5s - loss: 0.1272 - acc: 0.9545 - val_loss: 1.0543 - val_acc: 0.7255

Epoch 4/15
 - 5s - loss: 0.1009 - acc: 0.9631 - val_loss: 6.1759 - val_acc: 0.5010

Epoch 5/15
 - 5s - loss: 0.0963 - acc: 0.9663 - val_loss: 1.5925 - val_acc: 0.6570

Epoch 6/15
 - 5s - loss: 0.0730 - acc: 0.9749 - val_loss: 3.6319 - val_acc: 0.5855

Epoch 7/15
 - 5s - loss: 0.0682 - acc: 0.9753 - val_loss: 0.4004 - val_acc: 0.8790

Epoch 8/15
 - 5s - loss: 0.0606 - acc: 0.9769 - val_loss: 0.0061 - val_acc: 0.9985
```

```
Epoch 9/15
 - 5s - loss: 0.0663 - acc: 0.9756 - val_loss: 0.0942 - val_acc: 0.9540

Epoch 10/15
 - 5s - loss: 0.0628 - acc: 0.9764 - val_loss: 0.3900 - val_acc: 0.8365

Epoch 11/15
 - 5s - loss: 0.0485 - acc: 0.9848 - val_loss: 0.2479 - val_acc: 0.9230

Epoch 12/15
 - 5s - loss: 0.0495 - acc: 0.9838 - val_loss: 1.5111 - val_acc: 0.6975

Epoch 13/15
 - 5s - loss: 0.0408 - acc: 0.9859 - val_loss: 1.7894 - val_acc: 0.6795

Epoch 14/15
 - 5s - loss: 0.0514 - acc: 0.9815 - val_loss: 1.6204 - val_acc: 0.6355

Epoch 15/15
 - 5s - loss: 0.0417 - acc: 0.9847 - val_loss: 3.3625 - val_acc: 0.5785

Val accuracy:
0.5785
```

```
 50%|████████████████████████████                                    | 1
5/30 [17:01<18:53, 75.55s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 9s - loss: 0.4000 - acc: 0.8416 - val_loss: 4.1126 - val_acc: 0.5010


Epoch 2/15

 - 6s - loss: 0.1875 - acc: 0.9306 - val_loss: 1.3268 - val_acc: 0.6255


Epoch 3/15

 - 6s - loss: 0.1626 - acc: 0.9431 - val_loss: 1.6415 - val_acc: 0.6005


Epoch 4/15

 - 5s - loss: 0.1516 - acc: 0.9440 - val_loss: 0.9637 - val_acc: 0.6555


Epoch 5/15

 - 5s - loss: 0.1215 - acc: 0.9550 - val_loss: 2.4368 - val_acc: 0.5265


Epoch 6/15

 - 6s - loss: 0.1130 - acc: 0.9581 - val loss: 2.9692 - val acc: 0.5145
```

```
Epoch 7/15
 - 5s - loss: 0.1185 - acc: 0.9573 - val_loss: 3.3625 - val_acc: 0.5025

Epoch 8/15
 - 6s - loss: 0.1006 - acc: 0.9626 - val_loss: 1.6841 - val_acc: 0.5585

Epoch 9/15
 - 6s - loss: 0.0920 - acc: 0.9663 - val_loss: 3.1361 - val_acc: 0.5160

Epoch 10/15
 - 5s - loss: 0.0972 - acc: 0.9636 - val_loss: 2.4555 - val_acc: 0.5170

Epoch 11/15
 - 5s - loss: 0.0883 - acc: 0.9688 - val_loss: 3.4217 - val_acc: 0.5030

Epoch 12/15
 - 5s - loss: 0.0880 - acc: 0.9698 - val_loss: 3.3206 - val_acc: 0.5040

Epoch 13/15
 - 6s - loss: 0.0773 - acc: 0.9703 - val_loss: 3.7073 - val_acc: 0.5065

Epoch 14/15
```

```
 - 5s - loss: 0.0724 - acc: 0.9726 - val_loss: 3.3733 - val_acc: 0.5035


Epoch 15/15

 - 5s - loss: 0.0777 - acc: 0.9722 - val_loss: 1.4113 - val_acc: 0.5880


Val accuracy:

0.588

 53%|████████████████████████████████                                | 1
6/30 [18:30<18:31, 79.40s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 9s - loss: 1.0063 - acc: 0.7809 - val_loss: 8.0590 - val_acc: 0.5000


Epoch 2/15

 - 5s - loss: 0.2947 - acc: 0.9216 - val_loss: 7.5722 - val_acc: 0.5000


Epoch 3/15

 - 5s - loss: 0.2286 - acc: 0.9316 - val_loss: 6.7823 - val_acc: 0.5000


Epoch 4/15
```

```
 - 5s - loss: 0.1730 - acc: 0.9428 - val_loss: 4.3539 - val_acc: 0.5005

Epoch 5/15
 - 5s - loss: 0.1495 - acc: 0.9500 - val_loss: 4.3963 - val_acc: 0.5000

Epoch 6/15
 - 5s - loss: 0.1448 - acc: 0.9530 - val_loss: 2.4414 - val_acc: 0.5240

Epoch 7/15
 - 5s - loss: 0.1314 - acc: 0.9558 - val_loss: 4.3531 - val_acc: 0.5000

Epoch 8/15
 - 5s - loss: 0.1289 - acc: 0.9552 - val_loss: 3.0470 - val_acc: 0.5010

Epoch 9/15
 - 5s - loss: 0.1212 - acc: 0.9588 - val_loss: 3.8447 - val_acc: 0.5000

Epoch 10/15
 - 5s - loss: 0.1183 - acc: 0.9597 - val_loss: 1.8610 - val_acc: 0.5180

Epoch 11/15
 - 5s - loss: 0.1109 - acc: 0.9622 - val_loss: 2.3318 - val_acc: 0.5025

Epoch 12/15
```

```
 - 5s - loss: 0.1085 - acc: 0.9603 - val_loss: 2.4480 - val_acc: 0.5030


Epoch 13/15

 - 5s - loss: 0.1067 - acc: 0.9625 - val_loss: 2.8983 - val_acc: 0.5070


Epoch 14/15

 - 5s - loss: 0.1023 - acc: 0.9638 - val_loss: 2.6534 - val_acc: 0.5085


Epoch 15/15

 - 5s - loss: 0.1071 - acc: 0.9607 - val_loss: 2.9879 - val_acc: 0.5030


Val accuracy:

0.503

 57%|████████████████████████████████                                | 1
7/30 [19:54<17:32, 80.99s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 0.2984 - acc: 0.8928 - val_loss: 4.0871 - val_acc: 0.5000


Epoch 2/15
```

```
 - 4s - loss: 0.1449 - acc: 0.9487 - val_loss: 1.7246 - val_acc: 0.5415

Epoch 3/15
 - 4s - loss: 0.1282 - acc: 0.9519 - val_loss: 1.9130 - val_acc: 0.5325

Epoch 4/15
 - 4s - loss: 0.1229 - acc: 0.9568 - val_loss: 1.8480 - val_acc: 0.5405

Epoch 5/15
 - 4s - loss: 0.1058 - acc: 0.9621 - val_loss: 2.3022 - val_acc: 0.5155

Epoch 6/15
 - 4s - loss: 0.0938 - acc: 0.9648 - val_loss: 1.7931 - val_acc: 0.5445

Epoch 7/15
 - 4s - loss: 0.0991 - acc: 0.9662 - val_loss: 1.9176 - val_acc: 0.5390

Epoch 8/15
 - 4s - loss: 0.0939 - acc: 0.9654 - val_loss: 1.7190 - val_acc: 0.5360

Epoch 9/15
 - 4s - loss: 0.0931 - acc: 0.9671 - val_loss: 1.0846 - val_acc: 0.5625
```

```
Epoch 10/15
 - 4s - loss: 0.0802 - acc: 0.9734 - val_loss: 2.3291 - val_acc: 0.5060

Epoch 11/15
 - 4s - loss: 0.0809 - acc: 0.9735 - val_loss: 2.6818 - val_acc: 0.5005

Epoch 12/15
 - 4s - loss: 0.0753 - acc: 0.9733 - val_loss: 2.3308 - val_acc: 0.5045

Epoch 13/15
 - 4s - loss: 0.0685 - acc: 0.9748 - val_loss: 3.2412 - val_acc: 0.5025

Epoch 14/15
 - 4s - loss: 0.0698 - acc: 0.9758 - val_loss: 2.5666 - val_acc: 0.5080

Epoch 15/15
 - 4s - loss: 0.0661 - acc: 0.9774 - val_loss: 2.4342 - val_acc: 0.5125

Val accuracy:

0.5125

 60%|████████████████████████████████████                                | 1
8/30 [21:05<15:33, 77.77s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
```

```
  warnings.warn('The `nb_epoch` argument in `fit` '
```

```
Train on 7783 samples, validate on 2000 samples
Epoch 1/15
 - 9s - loss: 0.4006 - acc: 0.8791 - val_loss: 0.1022 - val_acc: 0.9685

Epoch 2/15
 - 5s - loss: 0.1571 - acc: 0.9432 - val_loss: 0.0267 - val_acc: 0.9925

Epoch 3/15
 - 5s - loss: 0.1315 - acc: 0.9505 - val_loss: 0.0708 - val_acc: 0.9750

Epoch 4/15
 - 5s - loss: 0.1194 - acc: 0.9549 - val_loss: 0.0462 - val_acc: 0.9825

Epoch 5/15
 - 5s - loss: 0.1082 - acc: 0.9577 - val_loss: 0.0470 - val_acc: 0.9850

Epoch 6/15
 - 5s - loss: 0.0999 - acc: 0.9631 - val_loss: 0.0502 - val_acc: 0.9845

Epoch 7/15
 - 5s - loss: 0.0927 - acc: 0.9653 - val_loss: 0.0847 - val_acc: 0.9630
```

```
Epoch 8/15
 - 5s - loss: 0.0821 - acc: 0.9689 - val_loss: 0.0179 - val_acc: 0.9955

Epoch 9/15
 - 5s - loss: 0.0811 - acc: 0.9681 - val_loss: 0.0220 - val_acc: 0.9930

Epoch 10/15
 - 5s - loss: 0.0786 - acc: 0.9715 - val_loss: 0.1274 - val_acc: 0.9490

Epoch 11/15
 - 5s - loss: 0.0716 - acc: 0.9699 - val_loss: 0.1000 - val_acc: 0.9580

Epoch 12/15
 - 5s - loss: 0.0759 - acc: 0.9728 - val_loss: 0.3633 - val_acc: 0.8590

Epoch 13/15
 - 5s - loss: 0.0660 - acc: 0.9744 - val_loss: 0.1312 - val_acc: 0.9520

Epoch 14/15
 - 5s - loss: 0.0645 - acc: 0.9764 - val_loss: 0.0405 - val_acc: 0.9845

Epoch 15/15
 - 5s - loss: 0.0653 - acc: 0.9753 - val_loss: 0.1013 - val_acc: 0.9555
```

```
Val accuracy:

0.9555

 63%|████████████████████████████████████                                 | 1
9/30 [22:21<14:10, 77.34s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 9s - loss: 0.4220 - acc: 0.8287 - val_loss: 3.2770 - val_acc: 0.5000


Epoch 2/15

 - 5s - loss: 0.1683 - acc: 0.9343 - val_loss: 1.9154 - val_acc: 0.5000


Epoch 3/15

 - 5s - loss: 0.1347 - acc: 0.9528 - val_loss: 1.3453 - val_acc: 0.5275


Epoch 4/15

 - 5s - loss: 0.1302 - acc: 0.9514 - val_loss: 1.7066 - val_acc: 0.5100


Epoch 5/15

 - 5s - loss: 0.1214 - acc: 0.9573 - val_loss: 1.1539 - val_acc: 0.5550
```

```
Epoch 6/15
 - 5s - loss: 0.1136 - acc: 0.9581 - val_loss: 1.6457 - val_acc: 0.5025

Epoch 7/15
 - 5s - loss: 0.1090 - acc: 0.9594 - val_loss: 1.8231 - val_acc: 0.5005

Epoch 8/15
 - 5s - loss: 0.1050 - acc: 0.9636 - val_loss: 2.0573 - val_acc: 0.5000

Epoch 9/15
 - 5s - loss: 0.1073 - acc: 0.9613 - val_loss: 1.5473 - val_acc: 0.5070

Epoch 10/15
 - 5s - loss: 0.0996 - acc: 0.9649 - val_loss: 1.9798 - val_acc: 0.5000

Epoch 11/15
 - 5s - loss: 0.0971 - acc: 0.9630 - val_loss: 1.8778 - val_acc: 0.5000

Epoch 12/15
 - 5s - loss: 0.0900 - acc: 0.9666 - val_loss: 1.9165 - val_acc: 0.5000

Epoch 13/15
 - 5s - loss: 0.0925 - acc: 0.9649 - val_loss: 1.6385 - val_acc: 0.5030
```

```
Epoch 14/15

 - 5s - loss: 0.0910 - acc: 0.9680 - val_loss: 2.4258 - val_acc: 0.5000


Epoch 15/15

 - 5s - loss: 0.0862 - acc: 0.9680 - val_loss: 2.1173 - val_acc: 0.5000


Val accuracy:

0.5

 67%|████████████████████████████████████████                    | 2
0/30 [23:43<13:06, 78.62s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 0.3361 - acc: 0.8862 - val_loss: 0.6643 - val_acc: 0.8240


Epoch 2/15

 - 3s - loss: 0.1716 - acc: 0.9381 - val_loss: 0.1824 - val_acc: 0.9345


Epoch 3/15

 - 3s - loss: 0.1300 - acc: 0.9509 - val_loss: 0.0306 - val_acc: 0.9900
```

```
Epoch 4/15
 - 3s - loss: 0.1133 - acc: 0.9609 - val_loss: 0.0511 - val_acc: 0.9830

Epoch 5/15
 - 3s - loss: 0.1027 - acc: 0.9624 - val_loss: 0.0830 - val_acc: 0.9715

Epoch 6/15
 - 3s - loss: 0.0850 - acc: 0.9678 - val_loss: 0.0326 - val_acc: 0.9855

Epoch 7/15
 - 3s - loss: 0.0819 - acc: 0.9681 - val_loss: 0.0124 - val_acc: 0.9970

Epoch 8/15
 - 3s - loss: 0.0691 - acc: 0.9743 - val_loss: 0.0240 - val_acc: 0.9935

Epoch 9/15
 - 3s - loss: 0.0534 - acc: 0.9802 - val_loss: 0.0112 - val_acc: 0.9960

Epoch 10/15
 - 3s - loss: 0.0542 - acc: 0.9809 - val_loss: 0.0083 - val_acc: 0.9975

Epoch 11/15
 - 3s - loss: 0.0411 - acc: 0.9843 - val_loss: 0.0088 - val_acc: 0.9985
```

```
Epoch 12/15
 - 3s - loss: 0.0415 - acc: 0.9864 - val_loss: 0.4856 - val_acc: 0.8555

Epoch 13/15
 - 3s - loss: 0.0391 - acc: 0.9868 - val_loss: 0.4130 - val_acc: 0.8550

Epoch 14/15
 - 3s - loss: 0.0252 - acc: 0.9922 - val_loss: 0.0160 - val_acc: 0.9940

Epoch 15/15
 - 3s - loss: 0.0406 - acc: 0.9859 - val_loss: 0.0095 - val_acc: 0.9975

Val accuracy:

0.9975

 70%|███████████████████████████████████████                  | 2
1/30 [24:35<10:35, 70.66s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15
 - 8s - loss: 0.2589 - acc: 0.9072 - val_loss: 1.1156 - val_acc: 0.6800
```

```
Epoch 2/15
 - 3s - loss: 0.1439 - acc: 0.9494 - val_loss: 0.1229 - val_acc: 0.9520

Epoch 3/15
 - 3s - loss: 0.1213 - acc: 0.9561 - val_loss: 0.0582 - val_acc: 0.9795

Epoch 4/15
 - 3s - loss: 0.0935 - acc: 0.9653 - val_loss: 0.1713 - val_acc: 0.9380

Epoch 5/15
 - 3s - loss: 0.0895 - acc: 0.9676 - val_loss: 0.2973 - val_acc: 0.8945

Epoch 6/15
 - 3s - loss: 0.0687 - acc: 0.9737 - val_loss: 0.3906 - val_acc: 0.8570

Epoch 7/15
 - 3s - loss: 0.0663 - acc: 0.9751 - val_loss: 0.1774 - val_acc: 0.9345

Epoch 8/15
 - 3s - loss: 0.0539 - acc: 0.9807 - val_loss: 0.1500 - val_acc: 0.9380

Epoch 9/15
```

```
 - 3s - loss: 0.0442 - acc: 0.9845 - val_loss: 0.0061 - val_acc: 0.9980

Epoch 10/15
 - 3s - loss: 0.0388 - acc: 0.9860 - val_loss: 0.4156 - val_acc: 0.8645

Epoch 11/15
 - 3s - loss: 0.0333 - acc: 0.9890 - val_loss: 0.0438 - val_acc: 0.9850

Epoch 12/15
 - 3s - loss: 0.0267 - acc: 0.9895 - val_loss: 0.0305 - val_acc: 0.9915

Epoch 13/15
 - 3s - loss: 0.0388 - acc: 0.9855 - val_loss: 4.1173 - val_acc: 0.5490

Epoch 14/15
 - 3s - loss: 0.0301 - acc: 0.9892 - val_loss: 0.0616 - val_acc: 0.9775

Epoch 15/15
 - 3s - loss: 0.0272 - acc: 0.9904 - val_loss: 0.0164 - val_acc: 0.9945

Val accuracy:
0.9945
 73%|███████████████████████████████████████                | 2
2/30 [25:28<08:42, 65.34s/it, best loss: -0.999]
```

```
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '
```

```
Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 0.4444 - acc: 0.8561 - val_loss: 0.0722 - val_acc: 0.9745


Epoch 2/15

 - 3s - loss: 0.2250 - acc: 0.9227 - val_loss: 0.0209 - val_acc: 0.9950


Epoch 3/15

 - 3s - loss: 0.1584 - acc: 0.9433 - val_loss: 0.2897 - val_acc: 0.8885


Epoch 4/15

 - 3s - loss: 0.1344 - acc: 0.9527 - val_loss: 0.0158 - val_acc: 0.9975


Epoch 5/15

 - 3s - loss: 0.1123 - acc: 0.9626 - val_loss: 0.0600 - val_acc: 0.9750


Epoch 6/15

 - 3s - loss: 0.0883 - acc: 0.9694 - val_loss: 0.0962 - val_acc: 0.9610


Epoch 7/15
```

```
 - 3s - loss: 0.0864 - acc: 0.9708 - val_loss: 0.0115 - val_acc: 0.9975

Epoch 8/15
 - 3s - loss: 0.0793 - acc: 0.9699 - val_loss: 1.7569 - val_acc: 0.5260

Epoch 9/15
 - 3s - loss: 0.0640 - acc: 0.9779 - val_loss: 0.0200 - val_acc: 0.9920

Epoch 10/15
 - 3s - loss: 0.0654 - acc: 0.9769 - val_loss: 0.0766 - val_acc: 0.9740

Epoch 11/15
 - 3s - loss: 0.0576 - acc: 0.9776 - val_loss: 0.4542 - val_acc: 0.7995

Epoch 12/15
 - 3s - loss: 0.0578 - acc: 0.9794 - val_loss: 0.5058 - val_acc: 0.8610

Epoch 13/15
 - 3s - loss: 0.0523 - acc: 0.9816 - val_loss: 0.0056 - val_acc: 0.9970

Epoch 14/15
 - 3s - loss: 0.0423 - acc: 0.9841 - val_loss: 0.0068 - val_acc: 0.9980


Epoch 15/15
```

```
 - 3s - loss: 0.0362 - acc: 0.9866 - val_loss: 0.2544 - val_acc: 0.9300


Val accuracy:

0.93

 77%|████████████████████████████████████████████████                | 2
3/30 [26:20<07:10, 61.49s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '


Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 0.3286 - acc: 0.8756 - val_loss: 0.0799 - val_acc: 0.9700


Epoch 2/15

 - 3s - loss: 0.1579 - acc: 0.9409 - val_loss: 0.3194 - val_acc: 0.8695


Epoch 3/15

 - 3s - loss: 0.1253 - acc: 0.9534 - val_loss: 0.3346 - val_acc: 0.8705


Epoch 4/15

 - 3s - loss: 0.1092 - acc: 0.9593 - val_loss: 0.0309 - val_acc: 0.9910



Epoch 5/15
```

```
 - 3s - loss: 0.0943 - acc: 0.9638 - val_loss: 0.0218 - val_acc: 0.9930

Epoch 6/15
 - 3s - loss: 0.0790 - acc: 0.9703 - val_loss: 0.2005 - val_acc: 0.9160

Epoch 7/15
 - 3s - loss: 0.0704 - acc: 0.9734 - val_loss: 0.0715 - val_acc: 0.9755

Epoch 8/15
 - 3s - loss: 0.0620 - acc: 0.9761 - val_loss: 0.0307 - val_acc: 0.9890

Epoch 9/15
 - 3s - loss: 0.0525 - acc: 0.9793 - val_loss: 0.0330 - val_acc: 0.9875

Epoch 10/15
 - 3s - loss: 0.0463 - acc: 0.9821 - val_loss: 0.0073 - val_acc: 0.9985

Epoch 11/15
 - 3s - loss: 0.0433 - acc: 0.9850 - val_loss: 0.0237 - val_acc: 0.9895

Epoch 12/15

 - 3s - loss: 0.0370 - acc: 0.9866 - val_loss: 0.0078 - val_acc: 0.9975
```

```
Epoch 13/15

 - 3s - loss: 0.0378 - acc: 0.9874 - val_loss: 0.0898 - val_acc: 0.9685


Epoch 14/15

 - 3s - loss: 0.0392 - acc: 0.9854 - val_loss: 0.0608 - val_acc: 0.9785


Epoch 15/15

 - 3s - loss: 0.0293 - acc: 0.9884 - val_loss: 0.0090 - val_acc: 0.9975


Val accuracy:

0.9975

 80%|████████████████████████████████████████████████████              | 2
4/30 [27:13<05:53, 58.92s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 8s - loss: 0.2910 - acc: 0.8925 - val_loss: 0.1548 - val_acc: 0.9420


Epoch 2/15


 - 3s - loss: 0.1460 - acc: 0.9490 - val_loss: 0.3121 - val_acc: 0.8755
```

```
Epoch 3/15
 - 3s - loss: 0.1225 - acc: 0.9539 - val_loss: 0.1071 - val_acc: 0.9595

Epoch 4/15
 - 3s - loss: 0.1023 - acc: 0.9620 - val_loss: 0.0702 - val_acc: 0.9730

Epoch 5/15
 - 3s - loss: 0.0843 - acc: 0.9675 - val_loss: 0.4328 - val_acc: 0.8340

Epoch 6/15
 - 3s - loss: 0.0747 - acc: 0.9728 - val_loss: 0.0498 - val_acc: 0.9835

Epoch 7/15
 - 3s - loss: 0.0784 - acc: 0.9706 - val_loss: 0.2682 - val_acc: 0.8885

Epoch 8/15
 - 3s - loss: 0.0595 - acc: 0.9782 - val_loss: 0.3447 - val_acc: 0.8695

Epoch 9/15
 - 3s - loss: 0.0653 - acc: 0.9753 - val_loss: 0.0099 - val_acc: 0.9955

Epoch 10/15

 - 3s - loss: 0.0531 - acc: 0.9809 - val_loss: 0.2059 - val_acc: 0.9200
```

```
Epoch 11/15
 - 3s - loss: 0.0442 - acc: 0.9824 - val_loss: 0.0112 - val_acc: 0.9960

Epoch 12/15
 - 3s - loss: 0.0407 - acc: 0.9852 - val_loss: 0.0376 - val_acc: 0.9860

Epoch 13/15
 - 3s - loss: 0.0423 - acc: 0.9860 - val_loss: 0.0525 - val_acc: 0.9805

Epoch 14/15
 - 3s - loss: 0.0357 - acc: 0.9872 - val_loss: 0.5291 - val_acc: 0.8180

Epoch 15/15
 - 3s - loss: 0.0385 - acc: 0.9866 - val_loss: 0.1536 - val_acc: 0.9510

Val accuracy:
0.951
 83%|████████████████████████████████████████████████           | 2
5/30 [28:06<04:45, 57.18s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.


  warnings.warn('The `nb_epoch` argument in `fit` '
```

```
Train on 7783 samples, validate on 2000 samples
Epoch 1/15
 - 9s - loss: 0.4175 - acc: 0.8737 - val_loss: 0.0613 - val_acc: 0.9825

Epoch 2/15
 - 3s - loss: 0.2006 - acc: 0.9302 - val_loss: 0.1142 - val_acc: 0.9610

Epoch 3/15
 - 3s - loss: 0.1505 - acc: 0.9458 - val_loss: 0.0991 - val_acc: 0.9600

Epoch 4/15
 - 3s - loss: 0.1392 - acc: 0.9516 - val_loss: 0.0220 - val_acc: 0.9930

Epoch 5/15
 - 3s - loss: 0.1158 - acc: 0.9563 - val_loss: 0.0141 - val_acc: 0.9935

Epoch 6/15
 - 3s - loss: 0.1107 - acc: 0.9611 - val_loss: 0.0143 - val_acc: 0.9960

Epoch 7/15
 - 3s - loss: 0.0864 - acc: 0.9712 - val_loss: 0.3786 - val_acc: 0.8790

Epoch 8/15
```

```
 - 3s - loss: 0.0882 - acc: 0.9686 - val_loss: 0.1632 - val_acc: 0.9355

Epoch 9/15
 - 3s - loss: 0.0757 - acc: 0.9704 - val_loss: 0.0392 - val_acc: 0.9845

Epoch 10/15
 - 3s - loss: 0.0707 - acc: 0.9731 - val_loss: 0.1435 - val_acc: 0.9465

Epoch 11/15
 - 3s - loss: 0.0740 - acc: 0.9746 - val_loss: 0.0395 - val_acc: 0.9850

Epoch 12/15
 - 3s - loss: 0.0588 - acc: 0.9793 - val_loss: 0.0085 - val_acc: 0.9975

Epoch 13/15
 - 3s - loss: 0.0530 - acc: 0.9807 - val_loss: 0.0055 - val_acc: 0.9990

Epoch 14/15
 - 3s - loss: 0.0571 - acc: 0.9783 - val_loss: 0.1065 - val_acc: 0.9625

Epoch 15/15
 - 3s - loss: 0.0478 - acc: 0.9833 - val_loss: 0.0699 - val_acc: 0.9735

Val accuracy:
```

```
0.9735

 87%|████████████████████████████████████████████████████          | 2
6/30 [29:03<03:48, 57.19s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 9s - loss: 0.3695 - acc: 0.8617 - val_loss: 0.7373 - val_acc: 0.7585


Epoch 2/15

 - 3s - loss: 0.1626 - acc: 0.9394 - val_loss: 0.3312 - val_acc: 0.8435


Epoch 3/15

 - 3s - loss: 0.1353 - acc: 0.9491 - val_loss: 0.2553 - val_acc: 0.8805


Epoch 4/15

 - 3s - loss: 0.1126 - acc: 0.9607 - val_loss: 0.5783 - val_acc: 0.7470


Epoch 5/15

 - 3s - loss: 0.1033 - acc: 0.9625 - val_loss: 0.2626 - val_acc: 0.8775


Epoch 6/15
```

```
 - 3s - loss: 0.0938 - acc: 0.9653 - val_loss: 0.2576 - val_acc: 0.8785

Epoch 7/15
 - 3s - loss: 0.0847 - acc: 0.9704 - val_loss: 0.4337 - val_acc: 0.8090

Epoch 8/15
 - 3s - loss: 0.0791 - acc: 0.9716 - val_loss: 0.5276 - val_acc: 0.7890

Epoch 9/15
 - 3s - loss: 0.0818 - acc: 0.9689 - val_loss: 0.3604 - val_acc: 0.8555

Epoch 10/15
 - 3s - loss: 0.0662 - acc: 0.9746 - val_loss: 0.2442 - val_acc: 0.8905

Epoch 11/15
 - 3s - loss: 0.0630 - acc: 0.9779 - val_loss: 0.0684 - val_acc: 0.9765

Epoch 12/15
 - 3s - loss: 0.0702 - acc: 0.9724 - val_loss: 0.1075 - val_acc: 0.9550

Epoch 13/15
 - 3s - loss: 0.0577 - acc: 0.9780 - val_loss: 0.2383 - val_acc: 0.9010


Epoch 14/15
```

```
Epoch 14/15

 - 3s - loss: 0.0526 - acc: 0.9794 - val_loss: 1.2241 - val_acc: 0.6390


Epoch 15/15

 - 3s - loss: 0.0517 - acc: 0.9801 - val_loss: 0.1765 - val_acc: 0.9255


Val accuracy:

0.9255

 90%|████████████████████████████████████████████████████████████        | 2
7/30 [29:57<02:48, 56.15s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 9s - loss: 0.2881 - acc: 0.9098 - val_loss: 0.1584 - val_acc: 0.9455


Epoch 2/15

 - 3s - loss: 0.1394 - acc: 0.9517 - val_loss: 0.0668 - val_acc: 0.9775


Epoch 3/15

 - 3s - loss: 0.1049 - acc: 0.9607 - val_loss: 0.4621 - val_acc: 0.8320


Epoch 4/15
```

```
 - 3s - loss: 0.0920 - acc: 0.9663 - val_loss: 0.3821 - val_acc: 0.8590

Epoch 5/15
 - 3s - loss: 0.0750 - acc: 0.9717 - val_loss: 0.0525 - val_acc: 0.9805

Epoch 6/15
 - 3s - loss: 0.0762 - acc: 0.9730 - val_loss: 0.1103 - val_acc: 0.9570

Epoch 7/15
 - 3s - loss: 0.0660 - acc: 0.9751 - val_loss: 0.0738 - val_acc: 0.9720

Epoch 8/15
 - 3s - loss: 0.0491 - acc: 0.9805 - val_loss: 0.3259 - val_acc: 0.8835

Epoch 9/15
 - 3s - loss: 0.0461 - acc: 0.9839 - val_loss: 0.0159 - val_acc: 0.9955

Epoch 10/15
 - 3s - loss: 0.0463 - acc: 0.9827 - val_loss: 0.0462 - val_acc: 0.9840

Epoch 11/15
 - 3s - loss: 0.0459 - acc: 0.9837 - val_loss: 0.0153 - val_acc: 0.9955
```

```
Epoch 12/15

 - 3s - loss: 0.0474 - acc: 0.9830 - val_loss: 0.1221 - val_acc: 0.9505


Epoch 13/15

 - 3s - loss: 0.0272 - acc: 0.9900 - val_loss: 0.0231 - val_acc: 0.9890


Epoch 14/15

 - 3s - loss: 0.0397 - acc: 0.9856 - val_loss: 0.0127 - val_acc: 0.9970


Epoch 15/15

 - 3s - loss: 0.0252 - acc: 0.9914 - val_loss: 0.3837 - val_acc: 0.8775


Val accuracy:

0.8775

 93%|████████████████████████████████████████████████████████████     | 2
8/30 [30:55<01:53, 56.83s/it, best loss: -0.999]

C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:94
2: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoc
hs`.
  warnings.warn('The `nb_epoch` argument in `fit` '


Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 9s - loss: 0.4491 - acc: 0.8458 - val_loss: 0.0677 - val_acc: 0.9810
```

```
Epoch 2/15
 - 3s - loss: 0.2134 - acc: 0.9228 - val_loss: 0.0726 - val_acc: 0.9805

Epoch 3/15
 - 3s - loss: 0.1575 - acc: 0.9459 - val_loss: 0.0536 - val_acc: 0.9800

Epoch 4/15
 - 3s - loss: 0.1259 - acc: 0.9537 - val_loss: 0.0547 - val_acc: 0.9800

Epoch 5/15
 - 3s - loss: 0.1190 - acc: 0.9590 - val_loss: 0.0188 - val_acc: 0.9955

Epoch 6/15
 - 3s - loss: 0.1013 - acc: 0.9627 - val_loss: 1.5349 - val_acc: 0.6195

Epoch 7/15
 - 3s - loss: 0.0939 - acc: 0.9638 - val_loss: 0.0319 - val_acc: 0.9870

Epoch 8/15
 - 3s - loss: 0.0856 - acc: 0.9711 - val_loss: 0.1427 - val_acc: 0.9420

Epoch 9/15

 - 3s - loss: 0.0716 - acc: 0.9743 - val_loss: 0.0602 - val_acc: 0.9760
```

```
Epoch 10/15
 - 3s - loss: 0.0692 - acc: 0.9758 - val_loss: 0.0462 - val_acc: 0.9855

Epoch 11/15
 - 3s - loss: 0.0593 - acc: 0.9770 - val_loss: 0.0482 - val_acc: 0.9840

Epoch 12/15
 - 3s - loss: 0.0579 - acc: 0.9782 - val_loss: 0.0151 - val_acc: 0.9950

Epoch 13/15
 - 3s - loss: 0.0582 - acc: 0.9791 - val_loss: 0.0098 - val_acc: 0.9965

Epoch 14/15
 - 3s - loss: 0.0429 - acc: 0.9843 - val_loss: 0.0778 - val_acc: 0.9720

Epoch 15/15
 - 3s - loss: 0.0414 - acc: 0.9847 - val_loss: 0.0058 - val_acc: 0.9990

Val accuracy:
0.999
 97%|
```

```
| 29/30 [31:50<00:56, 56.06s/it, best loss: -0.999]
C:\Users\Shubham\.conda\envs\shub\lib\site-packages\keras\models.py:942: UserWarning: The `nb_epoch` argument in `fit` has been renamed `epoch
```

```
ns .
  warnings.warn('The `nb_epoch` argument in `fit` '

Train on 7783 samples, validate on 2000 samples

Epoch 1/15

 - 9s - loss: 4.2374 - acc: 0.5079 - val_loss: 0.6972 - val_acc: 0.4910


Epoch 2/15

 - 3s - loss: 2.8914 - acc: 0.5227 - val_loss: 0.5989 - val_acc: 0.7565


Epoch 3/15

 - 3s - loss: 1.3248 - acc: 0.5515 - val_loss: 0.5165 - val_acc: 0.8890


Epoch 4/15

 - 3s - loss: 0.7112 - acc: 0.6109 - val_loss: 0.6808 - val_acc: 0.5000


Epoch 5/15

 - 3s - loss: 0.6445 - acc: 0.6539 - val_loss: 0.6390 - val_acc: 0.5000


Epoch 6/15

 - 3s - loss: 0.5878 - acc: 0.6856 - val_loss: 0.4092 - val_acc: 0.7705


Epoch 7/15

 - 3s - loss: 0.5722 - acc: 0.7042 - val_loss: 0.8895 - val_acc: 0.5000
```

```
Epoch 8/15
 - 3s - loss: 0.5203 - acc: 0.7403 - val_loss: 0.7951 - val_acc: 0.5000

Epoch 9/15
 - 3s - loss: 0.4869 - acc: 0.7599 - val_loss: 1.8890 - val_acc: 0.5000

Epoch 10/15
 - 3s - loss: 0.4838 - acc: 0.7615 - val_loss: 1.5853 - val_acc: 0.5000

Epoch 11/15
 - 3s - loss: 0.4400 - acc: 0.7921 - val_loss: 1.2057 - val_acc: 0.5000

Epoch 12/15
 - 3s - loss: 0.4104 - acc: 0.8070 - val_loss: 2.0304 - val_acc: 0.5000

Epoch 13/15
 - 3s - loss: 0.4042 - acc: 0.8161 - val_loss: 1.0154 - val_acc: 0.6585

Epoch 14/15
 - 3s - loss: 0.3836 - acc: 0.8290 - val_loss: 3.3853 - val_acc: 0.5000


Epoch 15/15
 - 3s - loss: 0.3878 - acc: 0.8272 - val_loss: 0.4013 - val_acc: 0.7890
```

```
Val accuracy:

0.789

100%|██████████████████████████████████████████████████████| 3
0/30 [32:41<00:00, 54.72s/it, best loss: -0.999]
```

In [14]:
```
print(best_run)
```

```
{'Dense': 2, 'Dense_1': 2, 'Dropout': 0.5702318469279729, 'Dropout_1':
0.6264617360166798, 'Dropout_2': 0.1904090881738011, 'Dropout_3': 0.080
63845654367285, 'Dropout_4': 0.9772817488940724, 'Dropout_5': 0.6883693
507416478, 'Dropout_6': 0.527899792364496, 'choiceval': 1, 'model_choic
e': 2}
```

In [15]:
```
best_model.summary()
```

```
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_17 (Conv2D)           (None, 96, 28, 32)        832
_________________________________________________________________
max_pooling2d_16 (MaxPooling (None, 47, 13, 32)        0
_________________________________________________________________
conv2d_18 (Conv2D)           (None, 45, 11, 50)        14450
_________________________________________________________________
max_pooling2d_17 (MaxPooling (None, 22, 5, 50)         0
_________________________________________________________________
dropout_15 (Dropout)         (None, 22, 5, 50)         0
_________________________________________________________________
conv2d_19 (Conv2D)           (None, 20, 3, 80)         36080
_________________________________________________________________
max_pooling2d_18 (MaxPooling (None, 10, 1, 80)         0
_________________________________________________________________
flatten_6 (Flatten)          (None, 800)               0
_________________________________________________________________
dense_13 (Dense)             (None, 1024)              820224
```

```
_________________________________________________________________
batch_normalization_8 (Batch (None, 1024)              4096
_________________________________________________________________
dropout_16 (Dropout)         (None, 1024)              0
_________________________________________________________________
dense_14 (Dense)             (None, 1024)              1049600
_________________________________________________________________
batch_normalization_9 (Batch (None, 1024)              4096
_________________________________________________________________
dropout_17 (Dropout)         (None, 1024)              0
_________________________________________________________________
dense_15 (Dense)             (None, 2)                 2050
=================================================================
Total params: 1,931,428
Trainable params: 1,927,332
Non-trainable params: 4,096
_________________________________________________________________
```