In [1]:

```
import tensorflow as tf
import numpy as np
import matplotlib.pyplot as plt
import os
import cv2
from tensorflow.keras.callbacks import TensorBoard
import random
import tensorflow as tf
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Dropout, Activation, Flatten, Conv2D, MaxPoo
ling2D
import pickle
import time
from tensorflow.keras.optimizers import Adam
from tensorflow.keras.callbacks import EarlyStopping, ModelCheckpoint, ReduceLROnPlatea
u
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

```
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorflow\p
ython\framework\dtypes.py:516: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorflow\p
ython\framework\dtypes.py:517: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorflow\p
ython\framework\dtypes.py:518: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorflow\p
ython\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_quint16 = np.dtype([("quint16", np.uint16, 1)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorflow\p
ython\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_qint32 = np.dtype([("qint32", np.int32, 1)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorflow\p
ython\framework\dtypes.py:525: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorboard
\compat\tensorflow_stub\dtypes.py:541: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorboard
\compat\tensorflow_stub\dtypes.py:542: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorboard
\compat\tensorflow_stub\dtypes.py:543: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorboard
\compat\tensorflow_stub\dtypes.py:544: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorboard
\compat\tensorflow_stub\dtypes.py:545: 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)])
C:\Users\Lenovo\AppData\Roaming\Python\Python37\site-packages\tensorboard
\compat\tensorflow_stub\dtypes.py:550: 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)])
```

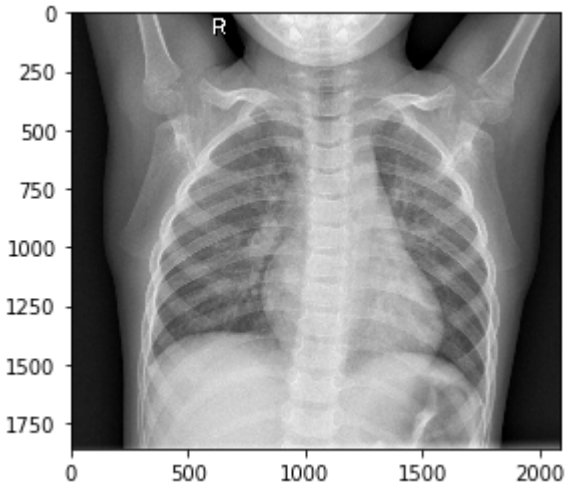
In [2]:

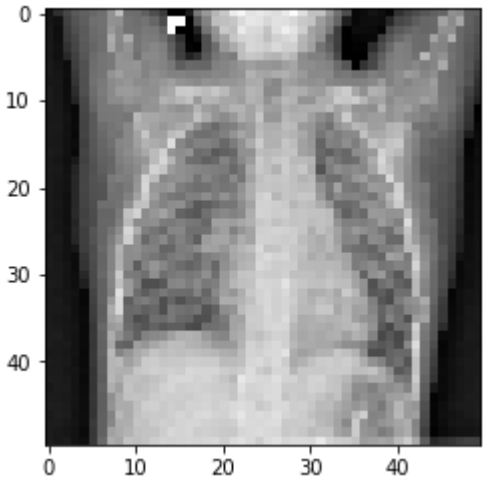
```
#Data_Dir = r'F:\Datasets\chest-xray-pneumonia\chest_xray\chest_xray\train'
Data_Dir = r'C:\Users\Lenovo\Downloads\Compressed\chest-xray-pneumonia - Copy\chest_xra
y\train'
Categories = ["NORMAL","PNEUMONIA"]

for category in Categories:
    path = os.path.join(Data_Dir, category)
    for img in os.listdir(path):
        img_array = cv2.imread(os.path.join(path,img), cv2.IMREAD_GRAYSCALE)
        plt.imshow(img_array, cmap='gray')
        plt.show()
        break
    break

#size normalization
img_size = 50

new_array = cv2.resize(img_array,(img_size,img_size))
plt.imshow(new_array, cmap='gray')
plt.show()
```





In [3]:

```
train_data = []

def create_train_data():
    for category in Categories:
        path = os.path.join(Data_Dir, category)
        class_num = Categories.index(category)
        for img in os.listdir(path):
            try:
                img_array = cv2.imread(os.path.join(path,img), cv2.IMREAD_GRAYSCALE)
                new_array = cv2.resize(img_array,(img_size,img_size))
                train_data.append([new_array, class_num])
            except Exception as e:
                pass

create_train_data()
```

In [4]:

```
random.shuffle(train_data)
X = []
Y = []
for features, labels in train_data:
    X.append(features)
    Y.append(labels)

X = np.array(X).reshape(-1, img_size, img_size, 1) # the last 1 is for grayscale, when
 doing for color change it to 3


#normalizing
X = X/255.0
```

In [5]:

```
import cv2
def pnemo_TEST():
    n = 0
    for i in os.listdir(r"C:\Users\Lenovo\Downloads\Compressed\chest-xray-pneumonia - C
opy\chest_xray\test_new\PNEUMONIA"):
        #print(i)
        predicted_class = model.predict( [  preprocess  (os.path.join(r'C:\Users\Lenovo
\Downloads\Compressed\chest-xray-pneumonia - Copy\chest_xray\test_new\PNEUMONIA', i))
] )
        #print((Categories[ int( predicted_class[0][0] ) ]))
        if Categories[ int( predicted_class[0][0] ) ] == "PNEUMONIA":
            n = n + 1

    return(n*100/200,"%")
    #print(n)

def normo_TEST():
    n = 0
    for i in os.listdir(r"C:\Users\Lenovo\Downloads\Compressed\chest-xray-pneumonia - C
opy\chest_xray\test_new\NORMAL"):
        #print(i)
        predicted_class = model.predict( [  preprocess  (os.path.join(r'C:\Users\Lenovo
\Downloads\Compressed\chest-xray-pneumonia - Copy\chest_xray\test_new\NORMAL', i))   ]
)
        #print((Categories[ int( predicted_class[0][0] ) ]))
        if Categories[ int( predicted_class[0][0] ) ] == "NORMAL":
            n = n + 1

    return(n*100/200,"%")
    #print(n)

def preprocess(path):
    img_size = 50
    img_array = cv2.imread(path, cv2.IMREAD_GRAYSCALE)
    new_array = cv2.resize(img_array, (img_size,img_size))
    return new_array.reshape(-1, img_size, img_size, 1)
```

In [6]:

```
import pandas as pd
df_result = pd.DataFrame(columns=['NN-architecture','Pnemo_test_acc','Normo_Test_acc'])
df_result
```

Out[6]:

NN-architecture	Pnemo_test_acc	Normo_Test_acc

In [7]:

```
Categories = ["NORMAL","PNEUMONIA"]

dense_layers = [1,3]
layer_sizes = [32,128]
conv_layers= [3,2]
'''
dense_layers = [1]
layer_sizes = [32]
conv_layers= [1]
'''

iteration = 0
for dense_layer in dense_layers:
    for layer_size in layer_sizes:
        for conv_layer in conv_layers:

            ID = "{}-conv-{}-nodes-{}-dense".format(conv_layer, layer_size, dense_layer
)
            print(str(iteration) + " " + ID)

           # tensorboard = TensorBoard(log_dir = 'F:\Datasets\chest_16-01-2019\{}'.form
at(ID))

            model = Sequential()

            #layer 1
            model.add(Conv2D(layer_size, (3,3), input_shape = X.shape[1:]))
            model.add(Activation("relu"))
            model.add(MaxPooling2D(pool_size = (2,2)))

            model.add(Dropout(0.1))


            #layer n (if not using for part)
            for l in range(conv_layer):
                model.add(Conv2D(layer_size, (3,3)))
                model.add(Activation("relu"))
                model.add(MaxPooling2D(pool_size = (2,2)))
                model.add(Dropout(0.1))


            #layer 3 (if not using for part)
            model.add(Flatten()) # Convert 3D feature maps to 1D
            for l in range(dense_layer):
                model.add(Dense(layer_size))
                model.add(Activation("relu"))

            model.add(Dropout(0.1))
            #output layer
            model.add(Dense(1))
            model.add(Activation('sigmoid'))


            reduce_LR_loss = ReduceLROnPlateau(monitor = 'val_loss', factor = 0.05, pat
ience = 6, verbose = 1, epsilon = 1e-4, mode='min')
            early_stop = EarlyStopping(monitor='val_loss', mode='min', patience=6)
            opti = Adam(lr=0.0001)
            model.compile(loss = 'binary_crossentropy', optimizer = opti, metrics = ['a
ccuracy'])
```

```
            #save_best = ModelCheckpoint(r'F:\Datasets\check', save_best_only = True, m
onitor='val_loss', mode='min')
            model.fit(X, Y, batch_size = 32, epochs=175,validation_split = 0.10, callba
cks=[early_stop])

            df_result.loc[iteration]=[ID]+[str(pnemo_TEST())]+[str(normo_TEST())]
            iteration = iteration + 1
            '''
            print(ID ," , ",pnemo_TEST(), " -- " ,normo_TEST()," \n ")
            pnemo_big()
            pnemo_small()
            normo()
            '''



#model = tf.keras.models.load_model('model_11.h5')
```

```
WARNING: Logging before flag parsing goes to stderr.
W0201 17:41:45.828502 16500 deprecation.py:506] From C:\Users\Lenovo\AppDa
ta\Roaming\Python\Python37\site-packages\tensorflow\python\ops\init_ops.p
y:1251: calling VarianceScaling.__init__ (from tensorflow.python.ops.init_
ops) with dtype is deprecated and will be removed in a future version.
Instructions for updating:
Call initializer instance with the dtype argument instead of passing it to
the constructor

0 3-conv-32-nodes-1-dense

W0201 17:41:46.120719 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
W0201 17:41:46.159615 16500 deprecation.py:323] From C:\Users\Lenovo\AppDa
ta\Roaming\Python\Python37\site-packages\tensorflow\python\ops\nn_impl.py:
180: add_dispatch_support.<locals>.wrapper (from tensorflow.python.ops.arr
ay_ops) is deprecated and will be removed in a future version.
Instructions for updating:
Use tf.where in 2.0, which has the same broadcast rule as np.where
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.5637
- acc: 0.7628 - val_loss: 0.5830 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.5500
- acc: 0.7644 - val_loss: 0.5699 - val_acc: 0.7510
Epoch 3/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.5408
- acc: 0.7644 - val_loss: 0.5465 - val_acc: 0.7510
Epoch 4/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.5027
- acc: 0.7642 - val_loss: 0.4794 - val_acc: 0.7510
Epoch 5/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.4168
- acc: 0.7976 - val_loss: 0.3910 - val_acc: 0.7863
Epoch 6/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.3438
- acc: 0.8433 - val_loss: 0.3173 - val_acc: 0.8900
Epoch 7/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.3084
- acc: 0.8641 - val_loss: 0.2834 - val_acc: 0.8983
Epoch 8/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2867
- acc: 0.8745 - val_loss: 0.3027 - val_acc: 0.8817
Epoch 9/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2601
- acc: 0.8929 - val_loss: 0.2559 - val_acc: 0.9046
Epoch 10/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2480
- acc: 0.8906 - val_loss: 0.2271 - val_acc: 0.9170
Epoch 11/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2359
- acc: 0.8994 - val_loss: 0.2176 - val_acc: 0.9232
Epoch 12/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2342
- acc: 0.9026 - val_loss: 0.2042 - val_acc: 0.9253
Epoch 13/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.2289
- acc: 0.9026 - val_loss: 0.2056 - val_acc: 0.9274
Epoch 14/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2210
- acc: 0.9126 - val_loss: 0.2643 - val_acc: 0.8859
Epoch 15/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2212
- acc: 0.9102 - val_loss: 0.2219 - val_acc: 0.9212
Epoch 16/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2104
- acc: 0.9169 - val_loss: 0.2623 - val_acc: 0.8880
Epoch 17/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2089
- acc: 0.9158 - val_loss: 0.2240 - val_acc: 0.9212
Epoch 18/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2049
- acc: 0.9158 - val_loss: 0.1955 - val_acc: 0.9232
Epoch 19/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1978
- acc: 0.9204 - val_loss: 0.1916 - val_acc: 0.9253
Epoch 20/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1951
- acc: 0.9218 - val_loss: 0.1796 - val_acc: 0.9295
```

```
Epoch 21/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1893
- acc: 0.9239 - val_loss: 0.1889 - val_acc: 0.9295
Epoch 22/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1855
- acc: 0.9273 - val_loss: 0.2390 - val_acc: 0.9066
Epoch 23/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2024
- acc: 0.9218 - val_loss: 0.1882 - val_acc: 0.9295
Epoch 24/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1932
- acc: 0.9211 - val_loss: 0.1718 - val_acc: 0.9357
Epoch 25/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1871
- acc: 0.9257 - val_loss: 0.1700 - val_acc: 0.9357
Epoch 26/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1840
- acc: 0.9275 - val_loss: 0.1833 - val_acc: 0.9253
Epoch 27/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1751
- acc: 0.9326 - val_loss: 0.2151 - val_acc: 0.9149
Epoch 28/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1777
- acc: 0.9296 - val_loss: 0.1958 - val_acc: 0.9232
Epoch 29/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1789
- acc: 0.9322 - val_loss: 0.1771 - val_acc: 0.9336
Epoch 30/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1661
- acc: 0.9308 - val_loss: 0.2315 - val_acc: 0.9087
Epoch 31/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1692
- acc: 0.9356 - val_loss: 0.1557 - val_acc: 0.9357
Epoch 32/175
4334/4334 [==============================] - 16s 4ms/sample - loss: 0.1610
- acc: 0.9382 - val_loss: 0.1629 - val_acc: 0.9357
Epoch 33/175
4334/4334 [==============================] - 15s 4ms/sample - loss: 0.1613
- acc: 0.9384 - val_loss: 0.2125 - val_acc: 0.9232
Epoch 34/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1591
- acc: 0.9384 - val_loss: 0.1828 - val_acc: 0.9295
Epoch 35/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1564
- acc: 0.9407 - val_loss: 0.1986 - val_acc: 0.9253
Epoch 36/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1523
- acc: 0.9432 - val_loss: 0.1385 - val_acc: 0.9419
Epoch 37/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1570
- acc: 0.9384 - val_loss: 0.1812 - val_acc: 0.9295
Epoch 38/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1497
- acc: 0.9432 - val_loss: 0.1489 - val_acc: 0.9378
Epoch 39/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1429
- acc: 0.9453 - val_loss: 0.1489 - val_acc: 0.9378
Epoch 40/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1460
- acc: 0.9435 - val_loss: 0.1488 - val_acc: 0.9378
Epoch 41/175
```

```
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1391
- acc: 0.9474 - val_loss: 0.1398 - val_acc: 0.9378
Epoch 42/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1414
- acc: 0.9479 - val_loss: 0.1344 - val_acc: 0.9481
Epoch 43/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1381
- acc: 0.9490 - val_loss: 0.1399 - val_acc: 0.9378
Epoch 44/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1381
- acc: 0.9465 - val_loss: 0.1487 - val_acc: 0.9378
Epoch 45/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1386
- acc: 0.9492 - val_loss: 0.2134 - val_acc: 0.9191
Epoch 46/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1413
- acc: 0.9467 - val_loss: 0.1302 - val_acc: 0.9481
Epoch 47/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1268
- acc: 0.9522 - val_loss: 0.1440 - val_acc: 0.9357
Epoch 48/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1315
- acc: 0.9490 - val_loss: 0.1361 - val_acc: 0.9378
Epoch 49/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1276
- acc: 0.9534 - val_loss: 0.1287 - val_acc: 0.9398
Epoch 50/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1251
- acc: 0.9509 - val_loss: 0.1221 - val_acc: 0.9481
Epoch 51/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1319
- acc: 0.9539 - val_loss: 0.1685 - val_acc: 0.9357
Epoch 52/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1271
- acc: 0.9509 - val_loss: 0.1629 - val_acc: 0.9357
Epoch 53/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1212
- acc: 0.9532 - val_loss: 0.1872 - val_acc: 0.9295
Epoch 54/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1204
- acc: 0.9525 - val_loss: 0.1142 - val_acc: 0.9544
Epoch 55/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1238
- acc: 0.9529 - val_loss: 0.1345 - val_acc: 0.9398
Epoch 56/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1201
- acc: 0.9589 - val_loss: 0.2148 - val_acc: 0.9129
Epoch 57/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1231
- acc: 0.9545 - val_loss: 0.1469 - val_acc: 0.9336
Epoch 58/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1283
- acc: 0.9515 - val_loss: 0.1006 - val_acc: 0.9647
Epoch 59/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1158
- acc: 0.9571 - val_loss: 0.1400 - val_acc: 0.9336
Epoch 60/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1149
- acc: 0.9571 - val_loss: 0.1066 - val_acc: 0.9585
Epoch 61/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1137
```

```
- acc: 0.9587 - val_loss: 0.1165 - val_acc: 0.9481
Epoch 62/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1144
- acc: 0.9603 - val_loss: 0.0977 - val_acc: 0.9647
Epoch 63/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1171
- acc: 0.9566 - val_loss: 0.1177 - val_acc: 0.9502
Epoch 64/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1079
- acc: 0.9612 - val_loss: 0.1537 - val_acc: 0.9357
Epoch 65/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1133
- acc: 0.9578 - val_loss: 0.1019 - val_acc: 0.9627
Epoch 66/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1074
- acc: 0.9605 - val_loss: 0.1565 - val_acc: 0.9336
Epoch 67/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1138
- acc: 0.9601 - val_loss: 0.1171 - val_acc: 0.9502
Epoch 68/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1085
- acc: 0.9608 - val_loss: 0.0977 - val_acc: 0.9668
1 2-conv-32-nodes-1-dense

W0201 17:57:48.056197 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.5523
- acc: 0.7644 - val_loss: 0.5670 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.5226
- acc: 0.7644 - val_loss: 0.5323 - val_acc: 0.7510
Epoch 3/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.4891
- acc: 0.7653 - val_loss: 0.4729 - val_acc: 0.7510
Epoch 4/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.4139
- acc: 0.7958 - val_loss: 0.3763 - val_acc: 0.8402
Epoch 5/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.3397
- acc: 0.8468 - val_loss: 0.3050 - val_acc: 0.8734
Epoch 6/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2974
- acc: 0.8703 - val_loss: 0.2868 - val_acc: 0.8942
Epoch 7/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2724
- acc: 0.8856 - val_loss: 0.2438 - val_acc: 0.8963
Epoch 8/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2541
- acc: 0.8952 - val_loss: 0.2562 - val_acc: 0.9046
Epoch 9/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2400
- acc: 0.9022 - val_loss: 0.2267 - val_acc: 0.9087
Epoch 10/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2245
- acc: 0.9084 - val_loss: 0.2114 - val_acc: 0.9149
Epoch 11/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2189
- acc: 0.9114 - val_loss: 0.1905 - val_acc: 0.9191
Epoch 12/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2049
- acc: 0.9197 - val_loss: 0.2097 - val_acc: 0.9232
Epoch 13/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1984
- acc: 0.9222 - val_loss: 0.1724 - val_acc: 0.9336
Epoch 14/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1834
- acc: 0.9319 - val_loss: 0.1565 - val_acc: 0.9336
Epoch 15/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1834
- acc: 0.9294 - val_loss: 0.1523 - val_acc: 0.9440
Epoch 16/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1771
- acc: 0.9322 - val_loss: 0.1727 - val_acc: 0.9315
Epoch 17/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1643
- acc: 0.9384 - val_loss: 0.1508 - val_acc: 0.9461
Epoch 18/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1641
- acc: 0.9359 - val_loss: 0.1276 - val_acc: 0.9523
Epoch 19/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1620
- acc: 0.9389 - val_loss: 0.1655 - val_acc: 0.9315
Epoch 20/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1543
- acc: 0.9439 - val_loss: 0.1568 - val_acc: 0.9378
```

```
Epoch 21/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1459
- acc: 0.9479 - val_loss: 0.1155 - val_acc: 0.9564
Epoch 22/175
4334/4334 [==============================] - 16s 4ms/sample - loss: 0.1506
- acc: 0.9465 - val_loss: 0.1122 - val_acc: 0.9647
Epoch 23/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1522
- acc: 0.9412 - val_loss: 0.1541 - val_acc: 0.9336
Epoch 24/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1438
- acc: 0.9442 - val_loss: 0.1129 - val_acc: 0.9585
Epoch 25/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1406
- acc: 0.9462 - val_loss: 0.1706 - val_acc: 0.9378
Epoch 26/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1351
- acc: 0.9467 - val_loss: 0.1010 - val_acc: 0.9668
Epoch 27/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1384
- acc: 0.9453 - val_loss: 0.1268 - val_acc: 0.9461
Epoch 28/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1310
- acc: 0.9527 - val_loss: 0.0971 - val_acc: 0.9730
Epoch 29/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1407
- acc: 0.9465 - val_loss: 0.0978 - val_acc: 0.9751
Epoch 30/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1411
- acc: 0.9499 - val_loss: 0.1453 - val_acc: 0.9440
Epoch 31/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1340
- acc: 0.9497 - val_loss: 0.1034 - val_acc: 0.9585
Epoch 32/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.1295
- acc: 0.9518 - val_loss: 0.1287 - val_acc: 0.9398
Epoch 33/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1212
- acc: 0.9543 - val_loss: 0.1156 - val_acc: 0.9461
Epoch 34/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1252
- acc: 0.9534 - val_loss: 0.1298 - val_acc: 0.9440
2 3-conv-128-nodes-1-dense


W0201 18:05:46.765043 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.555
6 - acc: 0.7589 - val_loss: 0.5698 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.409
5 - acc: 0.8073 - val_loss: 0.3256 - val_acc: 0.8527
Epoch 3/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.296
8 - acc: 0.8680 - val_loss: 0.3155 - val_acc: 0.8423
Epoch 4/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.254
1 - acc: 0.8902 - val_loss: 0.2243 - val_acc: 0.9087
Epoch 5/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.202
3 - acc: 0.9220 - val_loss: 0.1761 - val_acc: 0.9253
Epoch 6/175
4334/4334 [==============================] - 63s 15ms/sample - loss: 0.188
6 - acc: 0.9250 - val_loss: 0.2095 - val_acc: 0.9066
Epoch 7/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.180
5 - acc: 0.9333 - val_loss: 0.1673 - val_acc: 0.9357
Epoch 8/175
4334/4334 [==============================] - 63s 15ms/sample - loss: 0.155
4 - acc: 0.9365 - val_loss: 0.1525 - val_acc: 0.9398
Epoch 9/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.136
8 - acc: 0.9490 - val_loss: 0.1290 - val_acc: 0.9502
Epoch 10/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.139
3 - acc: 0.9444 - val_loss: 0.1178 - val_acc: 0.9461
Epoch 11/175
4334/4334 [==============================] - 60s 14ms/sample - loss: 0.130
1 - acc: 0.9513 - val_loss: 0.1081 - val_acc: 0.9627
Epoch 12/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.112
4 - acc: 0.9599 - val_loss: 0.1039 - val_acc: 0.9585
Epoch 13/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.108
4 - acc: 0.9605 - val_loss: 0.0994 - val_acc: 0.9606
Epoch 14/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.107
9 - acc: 0.9626 - val_loss: 0.1033 - val_acc: 0.9585
Epoch 15/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.101
5 - acc: 0.9626 - val_loss: 0.0805 - val_acc: 0.9730
Epoch 16/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.094
7 - acc: 0.9663 - val_loss: 0.0772 - val_acc: 0.9710
Epoch 17/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.088
2 - acc: 0.9679 - val_loss: 0.0694 - val_acc: 0.9730
Epoch 18/175
4334/4334 [==============================] - 60s 14ms/sample - loss: 0.089
7 - acc: 0.9695 - val_loss: 0.0700 - val_acc: 0.9730
Epoch 19/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.079
7 - acc: 0.9707 - val_loss: 0.0695 - val_acc: 0.9793
Epoch 20/175
4334/4334 [==============================] - 60s 14ms/sample - loss: 0.078
0 - acc: 0.9730 - val_loss: 0.0922 - val_acc: 0.9627
```

```
Epoch 21/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.076
4 - acc: 0.9728 - val_loss: 0.0572 - val_acc: 0.9813
Epoch 22/175
4334/4334 [==============================] - 60s 14ms/sample - loss: 0.073
2 - acc: 0.9707 - val_loss: 0.0595 - val_acc: 0.9813
Epoch 23/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.070
4 - acc: 0.9730 - val_loss: 0.0611 - val_acc: 0.9772
Epoch 24/175
4334/4334 [==============================] - 60s 14ms/sample - loss: 0.067
5 - acc: 0.9767 - val_loss: 0.0533 - val_acc: 0.9855
Epoch 25/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.069
4 - acc: 0.9755 - val_loss: 0.0507 - val_acc: 0.9855
Epoch 26/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.066
0 - acc: 0.9774 - val_loss: 0.0487 - val_acc: 0.9855
Epoch 27/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.061
2 - acc: 0.9797 - val_loss: 0.0942 - val_acc: 0.9627
Epoch 28/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.064
8 - acc: 0.9778 - val_loss: 0.0852 - val_acc: 0.9710
Epoch 29/175
4334/4334 [==============================] - 74s 17ms/sample - loss: 0.056
4 - acc: 0.9804 - val_loss: 0.0637 - val_acc: 0.9793
Epoch 30/175
4334/4334 [==============================] - 69s 16ms/sample - loss: 0.055
6 - acc: 0.9806 - val_loss: 0.0591 - val_acc: 0.9793
Epoch 31/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.056
1 - acc: 0.9788 - val_loss: 0.0796 - val_acc: 0.9710
Epoch 32/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.045
1 - acc: 0.9825 - val_loss: 0.0563 - val_acc: 0.9793
3 2-conv-128-nodes-1-dense

W0201 18:38:55.547464 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.543
2 - acc: 0.7582 - val_loss: 0.5147 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.374
9 - acc: 0.8237 - val_loss: 0.2852 - val_acc: 0.8797
Epoch 3/175
4334/4334 [==============================] - 60s 14ms/sample - loss: 0.256
4 - acc: 0.8867 - val_loss: 0.2154 - val_acc: 0.9066
Epoch 4/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.214
5 - acc: 0.9126 - val_loss: 0.1811 - val_acc: 0.9315
Epoch 5/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.177
4 - acc: 0.9324 - val_loss: 0.1602 - val_acc: 0.9398
Epoch 6/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.157
0 - acc: 0.9402 - val_loss: 0.1843 - val_acc: 0.9253
Epoch 7/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.150
0 - acc: 0.9432 - val_loss: 0.1168 - val_acc: 0.9523
Epoch 8/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.137
8 - acc: 0.9474 - val_loss: 0.1104 - val_acc: 0.9668
Epoch 9/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.123
7 - acc: 0.9555 - val_loss: 0.1021 - val_acc: 0.9689
Epoch 10/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.125
0 - acc: 0.9557 - val_loss: 0.1196 - val_acc: 0.9461
Epoch 11/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.120
3 - acc: 0.9532 - val_loss: 0.0905 - val_acc: 0.9689
Epoch 12/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.110
0 - acc: 0.9617 - val_loss: 0.0748 - val_acc: 0.9855
Epoch 13/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.107
2 - acc: 0.9615 - val_loss: 0.0901 - val_acc: 0.9647
Epoch 14/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.100
0 - acc: 0.9624 - val_loss: 0.0693 - val_acc: 0.9876
Epoch 15/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.101
4 - acc: 0.9631 - val_loss: 0.0743 - val_acc: 0.9834
Epoch 16/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.093
0 - acc: 0.9638 - val_loss: 0.0735 - val_acc: 0.9710
Epoch 17/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.093
2 - acc: 0.9663 - val_loss: 0.0658 - val_acc: 0.9730
Epoch 18/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.090
6 - acc: 0.9659 - val_loss: 0.0663 - val_acc: 0.9813
Epoch 19/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.078
3 - acc: 0.9725 - val_loss: 0.0591 - val_acc: 0.9813
Epoch 20/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.085
2 - acc: 0.9684 - val_loss: 0.0569 - val_acc: 0.9876
```

```
Epoch 21/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.077
1 - acc: 0.9730 - val_loss: 0.0560 - val_acc: 0.9834
Epoch 22/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.075
2 - acc: 0.9721 - val_loss: 0.0544 - val_acc: 0.9813
Epoch 23/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.075
8 - acc: 0.9705 - val_loss: 0.0718 - val_acc: 0.9647
Epoch 24/175
4334/4334 [==============================] - 64s 15ms/sample - loss: 0.074
8 - acc: 0.9712 - val_loss: 0.1015 - val_acc: 0.9564
Epoch 25/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.069
0 - acc: 0.9755 - val_loss: 0.0477 - val_acc: 0.9896
Epoch 26/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.072
1 - acc: 0.9742 - val_loss: 0.0569 - val_acc: 0.9751
Epoch 27/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.066
1 - acc: 0.9744 - val_loss: 0.0473 - val_acc: 0.9876
Epoch 28/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.066
8 - acc: 0.9772 - val_loss: 0.0480 - val_acc: 0.9793
Epoch 29/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.061
9 - acc: 0.9762 - val_loss: 0.0492 - val_acc: 0.9793
Epoch 30/175
4334/4334 [==============================] - 63s 15ms/sample - loss: 0.060
9 - acc: 0.9783 - val_loss: 0.0446 - val_acc: 0.9834
Epoch 31/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.058
8 - acc: 0.9799 - val_loss: 0.0650 - val_acc: 0.9689
Epoch 32/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.052
2 - acc: 0.9790 - val_loss: 0.0414 - val_acc: 0.9813
Epoch 33/175
4334/4334 [==============================] - 65s 15ms/sample - loss: 0.052
2 - acc: 0.9804 - val_loss: 0.0529 - val_acc: 0.9730
Epoch 34/175
4334/4334 [==============================] - 65s 15ms/sample - loss: 0.051
2 - acc: 0.9813 - val_loss: 0.0506 - val_acc: 0.9751
Epoch 35/175
4334/4334 [==============================] - 64s 15ms/sample - loss: 0.053
5 - acc: 0.9808 - val_loss: 0.0448 - val_acc: 0.9793
Epoch 36/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.047
6 - acc: 0.9818 - val_loss: 0.0510 - val_acc: 0.9730
Epoch 37/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.053
9 - acc: 0.9799 - val_loss: 0.0372 - val_acc: 0.9896
Epoch 38/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.051
4 - acc: 0.9813 - val_loss: 0.0434 - val_acc: 0.9772
Epoch 39/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.044
7 - acc: 0.9852 - val_loss: 0.0404 - val_acc: 0.9813
Epoch 40/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.042
5 - acc: 0.9845 - val_loss: 0.0550 - val_acc: 0.9772
Epoch 41/175
```

```
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.041
3 - acc: 0.9850 - val_loss: 0.0369 - val_acc: 0.9834
Epoch 42/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.040
0 - acc: 0.9852 - val_loss: 0.0576 - val_acc: 0.9730
Epoch 43/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.037
6 - acc: 0.9866 - val_loss: 0.0350 - val_acc: 0.9834
Epoch 44/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.039
5 - acc: 0.9834 - val_loss: 0.0355 - val_acc: 0.9917
Epoch 45/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.036
4 - acc: 0.9875 - val_loss: 0.0389 - val_acc: 0.9813
Epoch 46/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.035
7 - acc: 0.9878 - val_loss: 0.0439 - val_acc: 0.9813
Epoch 47/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.040
8 - acc: 0.9852 - val_loss: 0.0347 - val_acc: 0.9834
Epoch 48/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.035
9 - acc: 0.9880 - val_loss: 0.0346 - val_acc: 0.9813
Epoch 49/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.033
7 - acc: 0.9887 - val_loss: 0.0455 - val_acc: 0.9772
Epoch 50/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.027
9 - acc: 0.9910 - val_loss: 0.0654 - val_acc: 0.9751
Epoch 51/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.032
8 - acc: 0.9871 - val_loss: 0.0509 - val_acc: 0.9772
Epoch 52/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.027
6 - acc: 0.9905 - val_loss: 0.0370 - val_acc: 0.9813
Epoch 53/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.027
1 - acc: 0.9905 - val_loss: 0.0285 - val_acc: 0.9876
Epoch 54/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.029
5 - acc: 0.9903 - val_loss: 0.0358 - val_acc: 0.9876
Epoch 55/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.026
6 - acc: 0.9905 - val_loss: 0.0325 - val_acc: 0.9813
Epoch 56/175
4334/4334 [==============================] - 64s 15ms/sample - loss: 0.028
8 - acc: 0.9889 - val_loss: 0.0302 - val_acc: 0.9855
Epoch 57/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.023
7 - acc: 0.9908 - val_loss: 0.0523 - val_acc: 0.9751
Epoch 58/175
4334/4334 [==============================] - 65s 15ms/sample - loss: 0.023
9 - acc: 0.9919 - val_loss: 0.0334 - val_acc: 0.9855
Epoch 59/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.019
9 - acc: 0.9945 - val_loss: 0.0435 - val_acc: 0.9772
4 3-conv-32-nodes-3-dense


W0201 19:39:56.369732 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.5649
- acc: 0.7644 - val_loss: 0.5726 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.5401
- acc: 0.7644 - val_loss: 0.5604 - val_acc: 0.7510
Epoch 3/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.5093
- acc: 0.7644 - val_loss: 0.5035 - val_acc: 0.7510
Epoch 4/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.4148
- acc: 0.7762 - val_loss: 0.3704 - val_acc: 0.8133
Epoch 5/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.3517
- acc: 0.8385 - val_loss: 0.3131 - val_acc: 0.8734
Epoch 6/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.3106
- acc: 0.8611 - val_loss: 0.2734 - val_acc: 0.8983
Epoch 7/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2694
- acc: 0.8892 - val_loss: 0.2543 - val_acc: 0.9066
Epoch 8/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2469
- acc: 0.9001 - val_loss: 0.2121 - val_acc: 0.9170
Epoch 9/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2411
- acc: 0.8962 - val_loss: 0.2211 - val_acc: 0.9129
Epoch 10/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2304
- acc: 0.9063 - val_loss: 0.2554 - val_acc: 0.8921
Epoch 11/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2270
- acc: 0.9077 - val_loss: 0.1874 - val_acc: 0.9274
Epoch 12/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2162
- acc: 0.9084 - val_loss: 0.1830 - val_acc: 0.9295
Epoch 13/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2079
- acc: 0.9156 - val_loss: 0.2431 - val_acc: 0.8963
Epoch 14/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2045
- acc: 0.9169 - val_loss: 0.1892 - val_acc: 0.9253
Epoch 15/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2104
- acc: 0.9167 - val_loss: 0.1709 - val_acc: 0.9357
Epoch 16/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1959
- acc: 0.9236 - val_loss: 0.1843 - val_acc: 0.9232
Epoch 17/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1970
- acc: 0.9206 - val_loss: 0.1901 - val_acc: 0.9253
Epoch 18/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1833
- acc: 0.9271 - val_loss: 0.1633 - val_acc: 0.9440
Epoch 19/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1862
- acc: 0.9280 - val_loss: 0.1679 - val_acc: 0.9419
Epoch 20/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1855
- acc: 0.9269 - val_loss: 0.1614 - val_acc: 0.9461
```

```
Epoch 21/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1875
- acc: 0.9243 - val_loss: 0.1739 - val_acc: 0.9378
Epoch 22/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1722
- acc: 0.9317 - val_loss: 0.1587 - val_acc: 0.9419
Epoch 23/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1749
- acc: 0.9308 - val_loss: 0.1699 - val_acc: 0.9357
Epoch 24/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1680
- acc: 0.9365 - val_loss: 0.1569 - val_acc: 0.9378
Epoch 25/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1687
- acc: 0.9382 - val_loss: 0.1515 - val_acc: 0.9440
Epoch 26/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1792
- acc: 0.9292 - val_loss: 0.1445 - val_acc: 0.9523
Epoch 27/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1697
- acc: 0.9347 - val_loss: 0.1805 - val_acc: 0.9295
Epoch 28/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1591
- acc: 0.9419 - val_loss: 0.1550 - val_acc: 0.9378
Epoch 29/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1677
- acc: 0.9375 - val_loss: 0.1397 - val_acc: 0.9544
Epoch 30/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1628
- acc: 0.9391 - val_loss: 0.1802 - val_acc: 0.9315
Epoch 31/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1572
- acc: 0.9400 - val_loss: 0.2496 - val_acc: 0.8921
Epoch 32/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1593
- acc: 0.9409 - val_loss: 0.1361 - val_acc: 0.9461
Epoch 33/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1537
- acc: 0.9416 - val_loss: 0.1297 - val_acc: 0.9585
Epoch 34/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1547
- acc: 0.9425 - val_loss: 0.1284 - val_acc: 0.9544
Epoch 35/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1569
- acc: 0.9432 - val_loss: 0.1438 - val_acc: 0.9440
Epoch 36/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1480
- acc: 0.9432 - val_loss: 0.2040 - val_acc: 0.9129
Epoch 37/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1478
- acc: 0.9425 - val_loss: 0.1291 - val_acc: 0.9523
Epoch 38/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1476
- acc: 0.9444 - val_loss: 0.1287 - val_acc: 0.9502
Epoch 39/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1424
- acc: 0.9467 - val_loss: 0.1305 - val_acc: 0.9481
Epoch 40/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1491
- acc: 0.9428 - val_loss: 0.1175 - val_acc: 0.9585
Epoch 41/175
```

```
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1329
- acc: 0.9488 - val_loss: 0.1122 - val_acc: 0.9627
Epoch 42/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1415
- acc: 0.9428 - val_loss: 0.1351 - val_acc: 0.9481
Epoch 43/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1372
- acc: 0.9506 - val_loss: 0.1262 - val_acc: 0.9502
Epoch 44/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1365
- acc: 0.9460 - val_loss: 0.1162 - val_acc: 0.9502
Epoch 45/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1377
- acc: 0.9469 - val_loss: 0.1237 - val_acc: 0.9481
Epoch 46/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1296
- acc: 0.9515 - val_loss: 0.1009 - val_acc: 0.9689
Epoch 47/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1366
- acc: 0.9476 - val_loss: 0.1033 - val_acc: 0.9668
Epoch 48/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1295
- acc: 0.9527 - val_loss: 0.1155 - val_acc: 0.9523
Epoch 49/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1310
- acc: 0.9502 - val_loss: 0.1119 - val_acc: 0.9523
Epoch 50/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1289
- acc: 0.9529 - val_loss: 0.1275 - val_acc: 0.9419
Epoch 51/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1293
- acc: 0.9502 - val_loss: 0.1081 - val_acc: 0.9544
Epoch 52/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1218
- acc: 0.9564 - val_loss: 0.1323 - val_acc: 0.9398
5 2-conv-32-nodes-3-dense

W0201 19:51:54.364795 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.5741
- acc: 0.7644 - val_loss: 0.5648 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.5272
- acc: 0.7644 - val_loss: 0.5251 - val_acc: 0.7510
Epoch 3/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.4580
- acc: 0.7647 - val_loss: 0.4157 - val_acc: 0.7510
Epoch 4/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.3724
- acc: 0.8023 - val_loss: 0.3413 - val_acc: 0.8216
Epoch 5/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.3099
- acc: 0.8676 - val_loss: 0.2707 - val_acc: 0.8921
Epoch 6/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2577
- acc: 0.8890 - val_loss: 0.2307 - val_acc: 0.9025
Epoch 7/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.2374
- acc: 0.9040 - val_loss: 0.2068 - val_acc: 0.9212
Epoch 8/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2190
- acc: 0.9121 - val_loss: 0.1903 - val_acc: 0.9253
Epoch 9/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.2026
- acc: 0.9204 - val_loss: 0.1895 - val_acc: 0.9253
Epoch 10/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1883
- acc: 0.9257 - val_loss: 0.1646 - val_acc: 0.9378
Epoch 11/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1816
- acc: 0.9289 - val_loss: 0.1545 - val_acc: 0.9398
Epoch 12/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1746
- acc: 0.9308 - val_loss: 0.1452 - val_acc: 0.9419
Epoch 13/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1676
- acc: 0.9352 - val_loss: 0.1423 - val_acc: 0.9502
Epoch 14/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1610
- acc: 0.9435 - val_loss: 0.1377 - val_acc: 0.9461
Epoch 15/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1635
- acc: 0.9379 - val_loss: 0.1312 - val_acc: 0.9544
Epoch 16/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1522
- acc: 0.9444 - val_loss: 0.1258 - val_acc: 0.9523
Epoch 17/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1618
- acc: 0.9393 - val_loss: 0.1400 - val_acc: 0.9419
Epoch 18/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1501
- acc: 0.9425 - val_loss: 0.1349 - val_acc: 0.9461
Epoch 19/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1418
- acc: 0.9479 - val_loss: 0.1130 - val_acc: 0.9627
Epoch 20/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1468
- acc: 0.9435 - val_loss: 0.1224 - val_acc: 0.9481
```

```
Epoch 21/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1401
- acc: 0.9469 - val_loss: 0.1085 - val_acc: 0.9647
Epoch 22/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1385
- acc: 0.9497 - val_loss: 0.1218 - val_acc: 0.9481
Epoch 23/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1484
- acc: 0.9419 - val_loss: 0.1089 - val_acc: 0.9730
Epoch 24/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1286
- acc: 0.9509 - val_loss: 0.1007 - val_acc: 0.9710
Epoch 25/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1293
- acc: 0.9499 - val_loss: 0.1009 - val_acc: 0.9668
Epoch 26/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1277
- acc: 0.9520 - val_loss: 0.0977 - val_acc: 0.9730
Epoch 27/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1277
- acc: 0.9518 - val_loss: 0.0963 - val_acc: 0.9751
Epoch 28/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1278
- acc: 0.9499 - val_loss: 0.0920 - val_acc: 0.9710
Epoch 29/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1208
- acc: 0.9548 - val_loss: 0.0907 - val_acc: 0.9751
Epoch 30/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1182
- acc: 0.9578 - val_loss: 0.0935 - val_acc: 0.9668
Epoch 31/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1210
- acc: 0.9545 - val_loss: 0.0942 - val_acc: 0.9668
Epoch 32/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1210
- acc: 0.9529 - val_loss: 0.0867 - val_acc: 0.9772
Epoch 33/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1207
- acc: 0.9532 - val_loss: 0.0831 - val_acc: 0.9834
Epoch 34/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1143
- acc: 0.9585 - val_loss: 0.0814 - val_acc: 0.9813
Epoch 35/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1157
- acc: 0.9573 - val_loss: 0.1149 - val_acc: 0.9461
Epoch 36/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1150
- acc: 0.9536 - val_loss: 0.0790 - val_acc: 0.9813
Epoch 37/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1153
- acc: 0.9562 - val_loss: 0.0807 - val_acc: 0.9730
Epoch 38/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1100
- acc: 0.9575 - val_loss: 0.0790 - val_acc: 0.9751
Epoch 39/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1137
- acc: 0.9612 - val_loss: 0.0771 - val_acc: 0.9834
Epoch 40/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1077
- acc: 0.9635 - val_loss: 0.0766 - val_acc: 0.9834
Epoch 41/175
```

```
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1068
- acc: 0.9592 - val_loss: 0.0755 - val_acc: 0.9813
Epoch 42/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1046
- acc: 0.9587 - val_loss: 0.0742 - val_acc: 0.9834
Epoch 43/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1035
- acc: 0.9633 - val_loss: 0.0947 - val_acc: 0.9564
Epoch 44/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1004
- acc: 0.9642 - val_loss: 0.0697 - val_acc: 0.9813
Epoch 45/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1046
- acc: 0.9629 - val_loss: 0.0716 - val_acc: 0.9793
Epoch 46/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.1034
- acc: 0.9605 - val_loss: 0.0689 - val_acc: 0.9793
Epoch 47/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.1068
- acc: 0.9605 - val_loss: 0.0661 - val_acc: 0.9834
Epoch 48/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0928
- acc: 0.9668 - val_loss: 0.0850 - val_acc: 0.9585
Epoch 49/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0965
- acc: 0.9647 - val_loss: 0.0718 - val_acc: 0.9772
Epoch 50/175
4334/4334 [==============================] - 17s 4ms/sample - loss: 0.0908
- acc: 0.9675 - val_loss: 0.0734 - val_acc: 0.9772
Epoch 51/175
4334/4334 [==============================] - 17s 4ms/sample - loss: 0.0936
- acc: 0.9670 - val_loss: 0.0608 - val_acc: 0.9855
Epoch 52/175
4334/4334 [==============================] - 17s 4ms/sample - loss: 0.0939
- acc: 0.9652 - val_loss: 0.0645 - val_acc: 0.9813
Epoch 53/175
4334/4334 [==============================] - 16s 4ms/sample - loss: 0.0909
- acc: 0.9679 - val_loss: 0.0780 - val_acc: 0.9689
Epoch 54/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.0839
- acc: 0.9686 - val_loss: 0.0662 - val_acc: 0.9813
Epoch 55/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0842
- acc: 0.9698 - val_loss: 0.0632 - val_acc: 0.9793
Epoch 56/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.0866
- acc: 0.9682 - val_loss: 0.0678 - val_acc: 0.9813
Epoch 57/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0910
- acc: 0.9677 - val_loss: 0.0570 - val_acc: 0.9855
Epoch 58/175
4334/4334 [==============================] - 15s 3ms/sample - loss: 0.0829
- acc: 0.9702 - val_loss: 0.0558 - val_acc: 0.9855
Epoch 59/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0847
- acc: 0.9691 - val_loss: 0.0583 - val_acc: 0.9855
Epoch 60/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0820
- acc: 0.9721 - val_loss: 0.0593 - val_acc: 0.9834
Epoch 61/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0840
```

```
- acc: 0.9700 - val_loss: 0.0570 - val_acc: 0.9813
Epoch 62/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0880
- acc: 0.9649 - val_loss: 0.0558 - val_acc: 0.9855
Epoch 63/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0754
- acc: 0.9719 - val_loss: 0.0551 - val_acc: 0.9813
Epoch 64/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0785
- acc: 0.9721 - val_loss: 0.0550 - val_acc: 0.9813
Epoch 65/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0776
- acc: 0.9698 - val_loss: 0.0705 - val_acc: 0.9710
Epoch 66/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0767
- acc: 0.9719 - val_loss: 0.0585 - val_acc: 0.9793
Epoch 67/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0796
- acc: 0.9707 - val_loss: 0.0829 - val_acc: 0.9668
Epoch 68/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0698
- acc: 0.9765 - val_loss: 0.0523 - val_acc: 0.9813
Epoch 69/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0738
- acc: 0.9732 - val_loss: 0.0525 - val_acc: 0.9772
Epoch 70/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0778
- acc: 0.9719 - val_loss: 0.0561 - val_acc: 0.9813
Epoch 71/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0750
- acc: 0.9721 - val_loss: 0.0604 - val_acc: 0.9772
Epoch 72/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0696
- acc: 0.9751 - val_loss: 0.0483 - val_acc: 0.9813
Epoch 73/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0721
- acc: 0.9737 - val_loss: 0.0519 - val_acc: 0.9813
Epoch 74/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0687
- acc: 0.9742 - val_loss: 0.0745 - val_acc: 0.9689
Epoch 75/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0714
- acc: 0.9737 - val_loss: 0.0521 - val_acc: 0.9834
Epoch 76/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0677
- acc: 0.9742 - val_loss: 0.0500 - val_acc: 0.9813
Epoch 77/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0651
- acc: 0.9758 - val_loss: 0.0468 - val_acc: 0.9813
Epoch 78/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0647
- acc: 0.9748 - val_loss: 0.0442 - val_acc: 0.9793
Epoch 79/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0713
- acc: 0.9725 - val_loss: 0.0476 - val_acc: 0.9813
Epoch 80/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0685
- acc: 0.9725 - val_loss: 0.0503 - val_acc: 0.9813
Epoch 81/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0639
- acc: 0.9742 - val_loss: 0.0552 - val_acc: 0.9793
```

```
Epoch 82/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0629
- acc: 0.9758 - val_loss: 0.0503 - val_acc: 0.9813
Epoch 83/175
4334/4334 [==============================] - 13s 3ms/sample - loss: 0.0631
- acc: 0.9778 - val_loss: 0.0820 - val_acc: 0.9730
Epoch 84/175
4334/4334 [==============================] - 14s 3ms/sample - loss: 0.0603
- acc: 0.9792 - val_loss: 0.0512 - val_acc: 0.9793
6 3-conv-128-nodes-3-dense

W0201 20:11:26.418423 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 64s 15ms/sample - loss: 0.563
5 - acc: 0.7584 - val_loss: 0.5602 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.476
7 - acc: 0.7693 - val_loss: 0.3814 - val_acc: 0.8610
Epoch 3/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.323
4 - acc: 0.8537 - val_loss: 0.2850 - val_acc: 0.8880
Epoch 4/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.274
4 - acc: 0.8809 - val_loss: 0.2196 - val_acc: 0.9087
Epoch 5/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.208
5 - acc: 0.9156 - val_loss: 0.1723 - val_acc: 0.9398
Epoch 6/175
4334/4334 [==============================] - 68s 16ms/sample - loss: 0.186
9 - acc: 0.9255 - val_loss: 0.2418 - val_acc: 0.9046
Epoch 7/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.164
1 - acc: 0.9347 - val_loss: 0.1637 - val_acc: 0.9336
Epoch 8/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.161
3 - acc: 0.9363 - val_loss: 0.1943 - val_acc: 0.9232
Epoch 9/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.149
8 - acc: 0.9458 - val_loss: 0.1975 - val_acc: 0.9191
Epoch 10/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.130
5 - acc: 0.9506 - val_loss: 0.1063 - val_acc: 0.9627
Epoch 11/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.120
1 - acc: 0.9571 - val_loss: 0.2061 - val_acc: 0.9129
Epoch 12/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.123
9 - acc: 0.9534 - val_loss: 0.0811 - val_acc: 0.9772
Epoch 13/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.122
1 - acc: 0.9550 - val_loss: 0.0788 - val_acc: 0.9772
Epoch 14/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.104
2 - acc: 0.9619 - val_loss: 0.0716 - val_acc: 0.9793
Epoch 15/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.104
9 - acc: 0.9585 - val_loss: 0.0933 - val_acc: 0.9647
Epoch 16/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.090
8 - acc: 0.9684 - val_loss: 0.1264 - val_acc: 0.9440
Epoch 17/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.090
4 - acc: 0.9665 - val_loss: 0.0968 - val_acc: 0.9647
Epoch 18/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.084
0 - acc: 0.9698 - val_loss: 0.0727 - val_acc: 0.9772
Epoch 19/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.077
1 - acc: 0.9709 - val_loss: 0.0709 - val_acc: 0.9730
Epoch 20/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.073
1 - acc: 0.9755 - val_loss: 0.0502 - val_acc: 0.9855
```

```
Epoch 21/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.078
9 - acc: 0.9705 - val_loss: 0.0644 - val_acc: 0.9772
Epoch 22/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.069
6 - acc: 0.9739 - val_loss: 0.0562 - val_acc: 0.9813
Epoch 23/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.065
4 - acc: 0.9748 - val_loss: 0.0762 - val_acc: 0.9730
Epoch 24/175
4334/4334 [==============================] - 66s 15ms/sample - loss: 0.069
1 - acc: 0.9742 - val_loss: 0.0851 - val_acc: 0.9689
Epoch 25/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.063
3 - acc: 0.9774 - val_loss: 0.0586 - val_acc: 0.9751
Epoch 26/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.065
6 - acc: 0.9751 - val_loss: 0.0598 - val_acc: 0.9793
7 2-conv-128-nodes-3-dense

W0201 20:38:37.643264 16500 callbacks.py:1791] `epsilon` argument is depre
cated and will be removed, use `min_delta` instead.
```

```
Train on 4334 samples, validate on 482 samples
Epoch 1/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.542
9 - acc: 0.7612 - val_loss: 0.4897 - val_acc: 0.7510
Epoch 2/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.333
8 - acc: 0.8484 - val_loss: 0.2574 - val_acc: 0.9004
Epoch 3/175
4334/4334 [==============================] - 61s 14ms/sample - loss: 0.218
8 - acc: 0.9059 - val_loss: 0.2007 - val_acc: 0.9232
Epoch 4/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.183
3 - acc: 0.9289 - val_loss: 0.1400 - val_acc: 0.9378
Epoch 5/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.151
8 - acc: 0.9402 - val_loss: 0.1341 - val_acc: 0.9398
Epoch 6/175
4334/4334 [==============================] - 63s 15ms/sample - loss: 0.138
9 - acc: 0.9476 - val_loss: 0.1284 - val_acc: 0.9419
Epoch 7/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.135
5 - acc: 0.9488 - val_loss: 0.1266 - val_acc: 0.9419
Epoch 8/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.114
1 - acc: 0.9575 - val_loss: 0.0726 - val_acc: 0.9855
Epoch 9/175
4334/4334 [==============================] - 63s 15ms/sample - loss: 0.105
6 - acc: 0.9605 - val_loss: 0.0696 - val_acc: 0.9813
Epoch 10/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.099
3 - acc: 0.9624 - val_loss: 0.0630 - val_acc: 0.9855
Epoch 11/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.090
9 - acc: 0.9659 - val_loss: 0.0617 - val_acc: 0.9751
Epoch 12/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.091
6 - acc: 0.9656 - val_loss: 0.0559 - val_acc: 0.9834
Epoch 13/175
4334/4334 [==============================] - 65s 15ms/sample - loss: 0.090
5 - acc: 0.9670 - val_loss: 0.1491 - val_acc: 0.9357
Epoch 14/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.089
2 - acc: 0.9659 - val_loss: 0.0691 - val_acc: 0.9793
Epoch 15/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.077
9 - acc: 0.9709 - val_loss: 0.0556 - val_acc: 0.9772
Epoch 16/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.073
4 - acc: 0.9737 - val_loss: 0.0651 - val_acc: 0.9751
Epoch 17/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.072
1 - acc: 0.9728 - val_loss: 0.0442 - val_acc: 0.9876
Epoch 18/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.076
3 - acc: 0.9728 - val_loss: 0.0924 - val_acc: 0.9647
Epoch 19/175
4334/4334 [==============================] - 63s 15ms/sample - loss: 0.066
1 - acc: 0.9769 - val_loss: 0.0830 - val_acc: 0.9668
Epoch 20/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.068
8 - acc: 0.9751 - val_loss: 0.0548 - val_acc: 0.9793
```

```
Epoch 21/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.059
4 - acc: 0.9804 - val_loss: 0.0525 - val_acc: 0.9793
Epoch 22/175
4334/4334 [==============================] - 62s 14ms/sample - loss: 0.055
6 - acc: 0.9799 - val_loss: 0.0510 - val_acc: 0.9793
Epoch 23/175
4334/4334 [==============================] - 63s 14ms/sample - loss: 0.049
1 - acc: 0.9813 - val_loss: 0.0817 - val_acc: 0.9647
```

In [8]:

```
df_result
```

Out[8]:

	NN-architecture	Pnemo_test_acc	Normo_Test_acc
0	3-conv-32-nodes-1-dense	(84.0, '%')	(99.5, '%')
1	2-conv-32-nodes-1-dense	(97.5, '%')	(95.0, '%')
2	3-conv-128-nodes-1-dense	(86.5, '%')	(98.5, '%')
3	2-conv-128-nodes-1-dense	(98.0, '%')	(91.0, '%')
4	3-conv-32-nodes-3-dense	(84.5, '%')	(99.0, '%')
5	2-conv-32-nodes-3-dense	(93.0, '%')	(97.0, '%')
6	3-conv-128-nodes-3-dense	(76.0, '%')	(99.5, '%')
7	2-conv-128-nodes-3-dense	(98.0, '%')	(94.0, '%')

In [ ]:

```

```

In [ ]:

```

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In [ ]:

```

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In [ ]:

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