

Convolutional Neural Network is a state of the art for image detection NN architecture. The idea is to take an image, convert it into grid of pixel data. Basic CNN structure is as follows: Convolution -> Pooling -> Convolution -> Pooling -> Fully Connected Layer -> Output. Convolution means taking the original data, and creating feature maps from it. Pooling means down-sampling, like "max-pooling," where we select a region, and then take the maximum value in that region, and that becomes the new value for the entire region. we select a window for convolution and slide it across the image and perform pooling on the way. Each convolution and pooling step is a hidden layer. After this, we have a fully connected layer, followed by the output layer. The fully connected layer is your typical neural network (multilayer perceptron) type of layer, and same with the output layer.

```
In [1]: import tensorflow as tf
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense, Dropout, Activation, Flatten
from tensorflow.keras.layers import Conv2D, MaxPooling2D
from tensorflow.keras.callbacks import TensorBoard
import time
```

```
In [2]: NAME = "play-vs-unplay-CNN-{}".format(int(time.time()))
tensorboard = TensorBoard(log_dir="logs/{}".format(NAME))
```

```
In [3]: # Assume that you have 12GB of GPU memory and want to allocate ~4GB:
#gpu_options = tf.GPUOptions(per_process_gpu_memory_fraction=0.333)

#sess = tf.Session(config=tf.ConfigProto(gpu_options=gpu_options))
```

```
In [4]: import pickle

pickle_in = open("X.pickle", "rb")
X = pickle.load(pickle_in)

pickle_in = open("y.pickle", "rb")
y = pickle.load(pickle_in)
#normalize the data
X = X/255.0
```

```
In [5]: dense_layers = [0, 1, 2]
layer_sizes = [32, 64, 128]
conv_layers = [1, 2, 3]
#dense_layers = [4, 5]
#layer_sizes = [32, 64, 128, 256, 512]
#conv_layers = [4, 5]

for dense_layer in dense_layers:
    for layer_size in layer_sizes:
        for conv_layer in conv_layers:
            NAME = "{}-conv-{}-nodes-{}-dense-{}".format(conv_layer, layer_size, dense_layer, int(time.time()))
            print(NAME)

model = Sequential()

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

for l in range(conv_layer-1):
    model.add(Conv2D(layer_size, (3, 3)))
    model.add(Activation('relu'))
    model.add(MaxPooling2D(pool_size=(2, 2)))

model.add(Flatten())

for _ in range(dense_layer):
    model.add(Dense(layer_size))
    model.add(Activation('relu'))
    #model.add(Dropout(0.2))

model.add(Dense(1))
model.add(Activation('sigmoid'))

tensorboard = TensorBoard(log_dir="logs/{}".format(NAME))
model.summary()
model.compile(loss='binary_crossentropy',
              optimizer='adam',
              metrics=['accuracy'],
              )

model.fit(X, y,
           batch_size=32,
           epochs=10,
           validation_split=0.3,
           callbacks=[tensorboard])
```

1-conv-32-nodes-0-dense-1593439973

Model: "sequential"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d (Conv2D)	(None, 98, 98, 32)	320
activation (Activation)	(None, 98, 98, 32)	0
max_pooling2d (MaxPooling2D)	(None, 49, 49, 32)	0
flatten (Flatten)	(None, 76832)	0
dense (Dense)	(None, 1)	76833
activation_1 (Activation)	(None, 1)	0
<hr/>		
Total params:	77,153	
Trainable params:	77,153	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples

Epoch 1/10

1412/1412 [=====] - 13s 9ms/sample - loss: 0.7872 - accuracy: 0.4844 - val_loss: 0.7028 - val_accuracy: 0.4851

Epoch 2/10

1412/1412 [=====] - 11s 8ms/sample - loss: 0.6919 - accuracy: 0.5255 - val_loss: 0.6902 - val_accuracy: 0.5446

Epoch 3/10

1412/1412 [=====] - 11s 8ms/sample - loss: 0.6814 - accuracy: 0.5588 - val_loss: 0.6891 - val_accuracy: 0.5396

Epoch 4/10

1412/1412 [=====] - 10s 7ms/sample - loss: 0.6649 - accuracy: 0.6395 - val_loss: 0.6961 - val_accuracy: 0.5281

Epoch 5/10

1412/1412 [=====] - 10s 7ms/sample - loss: 0.6474 - accuracy: 0.6593 - val_loss: 0.6973 - val_accuracy: 0.5231

Epoch 6/10

1412/1412 [=====] - 11s 8ms/sample - loss: 0.6225 - accuracy: 0.6707 - val_loss: 0.7065 - val_accuracy: 0.5264

Epoch 7/10

1412/1412 [=====] - 10s 7ms/sample - loss: 0.6213 - accuracy: 0.6763 - val_loss: 0.6907 - val_accuracy: 0.5429

Epoch 8/10

1412/1412 [=====] - 10s 7ms/sample - loss: 0.5986 - accuracy: 0.6926 - val_loss: 0.6908 - val_accuracy: 0.5644

Epoch 9/10

1412/1412 [=====] - 11s 7ms/sample - loss: 0.5781 - accuracy: 0.7167 - val_loss: 0.6888 - val_accuracy: 0.5677

Epoch 10/10

1412/1412 [=====] - 11s 8ms/sample - loss: 0.5614 - accuracy: 0.7174 - val_loss: 0.7126 - val_accuracy: 0.5594

2-conv-32-nodes-0-dense-1593440079

Model: "sequential_1"

Layer (type)	Output Shape	Param #
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Layer (type)	Output Shape	Param #
conv2d_1 (Conv2D)	(None, 98, 98, 32)	320
activation_2 (Activation)	(None, 98, 98, 32)	0
max_pooling2d_1 (MaxPooling2D)	(None, 49, 49, 32)	0
conv2d_2 (Conv2D)	(None, 47, 47, 32)	9248
activation_3 (Activation)	(None, 47, 47, 32)	0
max_pooling2d_2 (MaxPooling2D)	(None, 23, 23, 32)	0
flatten_1 (Flatten)	(None, 16928)	0
dense_1 (Dense)	(None, 1)	16929
activation_4 (Activation)	(None, 1)	0

Total params: 26,497

Trainable params: 26,497

Non-trainable params: 0

Train on 1412 samples, validate on 606 samples

Epoch 1/10

1412/1412 [=====] - 16s 11ms/sample - loss: 0.6944 - accuracy: 0.4908 - val_loss: 0.6929 - val_accuracy: 0.5396

Epoch 2/10

1412/1412 [=====] - 14s 10ms/sample - loss: 0.6930 - accuracy: 0.5255 - val_loss: 0.6928 - val_accuracy: 0.5198

Epoch 3/10

1412/1412 [=====] - 14s 10ms/sample - loss: 0.6919 - accuracy: 0.5212 - val_loss: 0.6902 - val_accuracy: 0.5149

Epoch 4/10

1412/1412 [=====] - 16s 12ms/sample - loss: 0.6885 - accuracy: 0.5319 - val_loss: 0.6964 - val_accuracy: 0.4983

Epoch 5/10

1412/1412 [=====] - 14s 10ms/sample - loss: 0.6789 - accuracy: 0.5602 - val_loss: 0.6815 - val_accuracy: 0.5677

Epoch 6/10

1412/1412 [=====] - 14s 10ms/sample - loss: 0.6682 - accuracy: 0.5977 - val_loss: 0.6804 - val_accuracy: 0.5611

Epoch 7/10

1412/1412 [=====] - 14s 10ms/sample - loss: 0.6583 - accuracy: 0.6211 - val_loss: 0.7173 - val_accuracy: 0.5248

Epoch 8/10

1412/1412 [=====] - 14s 10ms/sample - loss: 0.6489 - accuracy: 0.6140 - val_loss: 0.6751 - val_accuracy: 0.5842

Epoch 9/10

1412/1412 [=====] - 14s 10ms/sample - loss: 0.6495 - accuracy: 0.6140 - val_loss: 0.6810 - val_accuracy: 0.5545

Epoch 10/10

1412/1412 [=====] - 15s 11ms/sample - loss: 0.6311 - accuracy: 0.6374 - val_loss: 0.6646 - val_accuracy: 0.6056

3-conv-32-nodes-0-dense-1593440226

Model: "sequential_2"

Layer (type)	Output Shape	Param #
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=====		
conv2d_3 (Conv2D)	(None, 98, 98, 32)	320
activation_5 (Activation)	(None, 98, 98, 32)	0
max_pooling2d_3 (MaxPooling2D)	(None, 49, 49, 32)	0
conv2d_4 (Conv2D)	(None, 47, 47, 32)	9248
activation_6 (Activation)	(None, 47, 47, 32)	0
max_pooling2d_4 (MaxPooling2D)	(None, 23, 23, 32)	0
conv2d_5 (Conv2D)	(None, 21, 21, 32)	9248
activation_7 (Activation)	(None, 21, 21, 32)	0
max_pooling2d_5 (MaxPooling2D)	(None, 10, 10, 32)	0
flatten_2 (Flatten)	(None, 3200)	0
dense_2 (Dense)	(None, 1)	3201
activation_8 (Activation)	(None, 1)	0
=====		
Total params:	22,017	
Trainable params:	22,017	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 19s 13ms/sample - loss: 0.6941 -
accuracy: 0.4844 - val_loss: 0.6928 - val_accuracy: 0.5264
Epoch 2/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6930 -
accuracy: 0.5113 - val_loss: 0.6924 - val_accuracy: 0.5495
Epoch 3/10
1412/1412 [=====] - 13s 10ms/sample - loss: 0.6911 -
accuracy: 0.5120 - val_loss: 0.6922 - val_accuracy: 0.5413
Epoch 4/10
1412/1412 [=====] - 15s 11ms/sample - loss: 0.6895 -
accuracy: 0.5538 - val_loss: 0.6970 - val_accuracy: 0.4934
Epoch 5/10
1412/1412 [=====] - 15s 11ms/sample - loss: 0.6743 -
accuracy: 0.5864 - val_loss: 0.6831 - val_accuracy: 0.5545
Epoch 6/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6512 -
accuracy: 0.6261 - val_loss: 0.6631 - val_accuracy: 0.6155
Epoch 7/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6288 -
accuracy: 0.6508 - val_loss: 0.6846 - val_accuracy: 0.5644
Epoch 8/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6185 -
accuracy: 0.6615 - val_loss: 0.6411 - val_accuracy: 0.6419
Epoch 9/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6200 -
accuracy: 0.6487 - val_loss: 0.6742 - val_accuracy: 0.5363

Epoch 10/10
 1412/1412 [=====] - 14s 10ms/sample - loss: 0.6418 -
 accuracy: 0.5992 - val_loss: 0.6556 - val_accuracy: 0.6271
 1-conv-64-nodes-0-dense-1593440370
 Model: "sequential_3"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_6 (Conv2D)	(None, 98, 98, 64)	640
activation_9 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_6 (MaxPooling2D)	(None, 49, 49, 64)	0
flatten_3 (Flatten)	(None, 153664)	0
dense_3 (Dense)	(None, 1)	153665
activation_10 (Activation)	(None, 1)	0
<hr/>		
Total params:	154,305	
Trainable params:	154,305	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples
 Epoch 1/10
 1412/1412 [=====] - 20s 14ms/sample - loss: 0.7907 -
 accuracy: 0.4958 - val_loss: 0.6920 - val_accuracy: 0.5132
 Epoch 2/10
 1412/1412 [=====] - 17s 12ms/sample - loss: 0.6902 -
 accuracy: 0.5212 - val_loss: 0.6902 - val_accuracy: 0.5264
 Epoch 3/10
 1412/1412 [=====] - 17s 12ms/sample - loss: 0.6765 -
 accuracy: 0.5928 - val_loss: 0.6887 - val_accuracy: 0.5396
 Epoch 4/10
 1412/1412 [=====] - 19s 13ms/sample - loss: 0.6588 -
 accuracy: 0.6204 - val_loss: 0.6868 - val_accuracy: 0.5462
 Epoch 5/10
 1412/1412 [=====] - 19s 14ms/sample - loss: 0.6403 -
 accuracy: 0.6445 - val_loss: 0.7195 - val_accuracy: 0.5297
 Epoch 6/10
 1412/1412 [=====] - 19s 13ms/sample - loss: 0.6154 -
 accuracy: 0.6721 - val_loss: 0.7186 - val_accuracy: 0.5132
 Epoch 7/10
 1412/1412 [=====] - 18s 13ms/sample - loss: 0.5918 -
 accuracy: 0.6969 - val_loss: 0.6891 - val_accuracy: 0.5858
 Epoch 8/10
 1412/1412 [=====] - 16s 12ms/sample - loss: 0.5765 -
 accuracy: 0.7025 - val_loss: 0.6720 - val_accuracy: 0.5875
 Epoch 9/10
 1412/1412 [=====] - 17s 12ms/sample - loss: 0.5599 -
 accuracy: 0.7401 - val_loss: 0.7765 - val_accuracy: 0.5215
 Epoch 10/10
 1412/1412 [=====] - 18s 12ms/sample - loss: 0.5559 -
 accuracy: 0.7252 - val_loss: 0.6907 - val_accuracy: 0.5561
 2-conv-64-nodes-0-dense-1593440550
 Model: "sequential_4"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_7 (Conv2D)	(None, 98, 98, 64)	640
activation_11 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_7 (MaxPooling2D)	(None, 49, 49, 64)	0
conv2d_8 (Conv2D)	(None, 47, 47, 64)	36928
activation_12 (Activation)	(None, 47, 47, 64)	0
max_pooling2d_8 (MaxPooling2D)	(None, 23, 23, 64)	0
flatten_4 (Flatten)	(None, 33856)	0
dense_4 (Dense)	(None, 1)	33857
activation_13 (Activation)	(None, 1)	0
<hr/>		
Total params:	71,425	
Trainable params:	71,425	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6972 -
accuracy: 0.5021 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 2/10
1412/1412 [=====] - 26s 18ms/sample - loss: 0.6932 -
accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 3/10
1412/1412 [=====] - 27s 19ms/sample - loss: 0.6932 -
accuracy: 0.5035 - val_loss: 0.6930 - val_accuracy: 0.5149
Epoch 4/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6935 -
accuracy: 0.5007 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 5/10
1412/1412 [=====] - 26s 18ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 6/10
1412/1412 [=====] - 26s 19ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 7/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 8/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 9/10
1412/1412 [=====] - 30s 21ms/sample - loss: 0.6931 -
accuracy: 0.5035 - val_loss: 0.6934 - val_accuracy: 0.4884
Epoch 10/10
1412/1412 [=====] - 30s 22ms/sample - loss: 0.6921 -
accuracy: 0.5297 - val_loss: 0.6920 - val_accuracy: 0.5297
3-conv-64-nodes-0-dense-1593440828

Model: "sequential_5"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_9 (Conv2D)	(None, 98, 98, 64)	640
activation_14 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_9 (MaxPooling2D)	(None, 49, 49, 64)	0
conv2d_10 (Conv2D)	(None, 47, 47, 64)	36928
activation_15 (Activation)	(None, 47, 47, 64)	0
max_pooling2d_10 (MaxPooling2D)	(None, 23, 23, 64)	0
conv2d_11 (Conv2D)	(None, 21, 21, 64)	36928
activation_16 (Activation)	(None, 21, 21, 64)	0
max_pooling2d_11 (MaxPooling2D)	(None, 10, 10, 64)	0
flatten_5 (Flatten)	(None, 6400)	0
dense_5 (Dense)	(None, 1)	6401
activation_17 (Activation)	(None, 1)	0
<hr/>		
Total params:	80,897	
Trainable params:	80,897	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 35s 25ms/sample - loss: 0.6958 - accuracy: 0.4979 - val_loss: 0.6931 - val_accuracy: 0.5149
Epoch 2/10
1412/1412 [=====] - 33s 23ms/sample - loss: 0.6931 - accuracy: 0.5120 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 3/10
1412/1412 [=====] - 33s 24ms/sample - loss: 0.6931 - accuracy: 0.5120 - val_loss: 0.6931 - val_accuracy: 0.4868
Epoch 4/10
1412/1412 [=====] - 37s 26ms/sample - loss: 0.6933 - accuracy: 0.5057 - val_loss: 0.6935 - val_accuracy: 0.4851
Epoch 5/10
1412/1412 [=====] - 31s 22ms/sample - loss: 0.6933 - accuracy: 0.4915 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 6/10
1412/1412 [=====] - 35s 25ms/sample - loss: 0.6932 - accuracy: 0.4929 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 7/10
1412/1412 [=====] - 35s 25ms/sample - loss: 0.6924 - accuracy: 0.5127 - val_loss: 0.6888 - val_accuracy: 0.5149
Epoch 8/10
1412/1412 [=====] - 34s 24ms/sample - loss: 0.6894 - accuracy: 0.5283 - val_loss: 0.6804 - val_accuracy: 0.5726

Epoch 9/10

1412/1412 [=====] - 33s 23ms/sample - loss: 0.6756 -

accuracy: 0.5899 - val_loss: 0.6708 - val_accuracy: 0.5792

Epoch 10/10

1412/1412 [=====] - 33s 24ms/sample - loss: 0.6462 -

accuracy: 0.6197 - val_loss: 0.6489 - val_accuracy: 0.6205

1-conv-128-nodes-0-dense-1593441167

Model: "sequential_6"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_12 (Conv2D)	(None, 98, 98, 128)	1280
<hr/>		
activation_18 (Activation)	(None, 98, 98, 128)	0
<hr/>		
max_pooling2d_12 (MaxPooling)	(None, 49, 49, 128)	0
<hr/>		
flatten_6 (Flatten)	(None, 307328)	0
<hr/>		
dense_6 (Dense)	(None, 1)	307329
<hr/>		
activation_19 (Activation)	(None, 1)	0
<hr/>		
Total params: 308,609		
Trainable params: 308,609		
Non-trainable params: 0		

Train on 1412 samples, validate on 606 samples

Epoch 1/10

1412/1412 [=====] - 36s 26ms/sample - loss: 0.7787 -

accuracy: 0.5000 - val_loss: 0.6948 - val_accuracy: 0.4851

Epoch 2/10

1412/1412 [=====] - 33s 23ms/sample - loss: 0.6927 -

accuracy: 0.5475 - val_loss: 0.6935 - val_accuracy: 0.4769

Epoch 3/10

1412/1412 [=====] - 33s 23ms/sample - loss: 0.6896 -

accuracy: 0.5836 - val_loss: 0.6921 - val_accuracy: 0.5149

Epoch 4/10

1412/1412 [=====] - 33s 24ms/sample - loss: 0.6837 -

accuracy: 0.5977 - val_loss: 0.6919 - val_accuracy: 0.5248

Epoch 5/10

1412/1412 [=====] - 34s 24ms/sample - loss: 0.6699 -

accuracy: 0.6112 - val_loss: 0.7066 - val_accuracy: 0.4983

Epoch 6/10

1412/1412 [=====] - 36s 25ms/sample - loss: 0.6486 -

accuracy: 0.6530 - val_loss: 0.6888 - val_accuracy: 0.5479

Epoch 7/10

1412/1412 [=====] - 32s 23ms/sample - loss: 0.6309 -

accuracy: 0.6601 - val_loss: 0.6915 - val_accuracy: 0.5545

Epoch 8/10

1412/1412 [=====] - 35s 25ms/sample - loss: 0.6009 -

accuracy: 0.6884 - val_loss: 0.6838 - val_accuracy: 0.5825

Epoch 9/10

1412/1412 [=====] - 36s 25ms/sample - loss: 0.5821 -

accuracy: 0.7061 - val_loss: 0.7165 - val_accuracy: 0.5248

Epoch 10/10

1412/1412 [=====] - 33s 24ms/sample - loss: 0.5637 -

accuracy: 0.7330 - val_loss: 0.6919 - val_accuracy: 0.5924

2-conv-128-nodes-0-dense-1593441508

Model: "sequential_7"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_13 (Conv2D)	(None, 98, 98, 128)	1280
<hr/>		
activation_20 (Activation)	(None, 98, 98, 128)	0
<hr/>		
max_pooling2d_13 (MaxPooling)	(None, 49, 49, 128)	0
<hr/>		
conv2d_14 (Conv2D)	(None, 47, 47, 128)	147584
<hr/>		
activation_21 (Activation)	(None, 47, 47, 128)	0
<hr/>		
max_pooling2d_14 (MaxPooling)	(None, 23, 23, 128)	0
<hr/>		
flatten_7 (Flatten)	(None, 67712)	0
<hr/>		
dense_7 (Dense)	(None, 1)	67713
<hr/>		
activation_22 (Activation)	(None, 1)	0
<hr/>		
Total params: 216,577		
Trainable params: 216,577		
Non-trainable params: 0		

Train on 1412 samples, validate on 606 samples

Epoch 1/10

1412/1412 [=====] - 74s 52ms/sample - loss: 0.6959 - accuracy: 0.4880 - val_loss: 0.6932 - val_accuracy: 0.4851

Epoch 2/10

1412/1412 [=====] - 74s 52ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6932 - val_accuracy: 0.4851

Epoch 3/10

1412/1412 [=====] - 66s 47ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851

Epoch 4/10

1412/1412 [=====] - 65s 46ms/sample - loss: 0.6932 - accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851

Epoch 5/10

1412/1412 [=====] - 66s 47ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851

Epoch 6/10

1412/1412 [=====] - 65s 46ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851

Epoch 7/10

1412/1412 [=====] - 65s 46ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6935 - val_accuracy: 0.4851

Epoch 8/10

1412/1412 [=====] - 65s 46ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6935 - val_accuracy: 0.4851

Epoch 9/10

1412/1412 [=====] - 65s 46ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851

Epoch 10/10

1412/1412 [=====] - 68s 48ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851
3-conv-128-nodes-0-dense-1593442181
Model: "sequential_8"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_15 (Conv2D)	(None, 98, 98, 128)	1280
activation_23 (Activation)	(None, 98, 98, 128)	0
max_pooling2d_15 (MaxPooling)	(None, 49, 49, 128)	0
conv2d_16 (Conv2D)	(None, 47, 47, 128)	147584
activation_24 (Activation)	(None, 47, 47, 128)	0
max_pooling2d_16 (MaxPooling)	(None, 23, 23, 128)	0
conv2d_17 (Conv2D)	(None, 21, 21, 128)	147584
activation_25 (Activation)	(None, 21, 21, 128)	0
max_pooling2d_17 (MaxPooling)	(None, 10, 10, 128)	0
flatten_8 (Flatten)	(None, 12800)	0
dense_8 (Dense)	(None, 1)	12801
activation_26 (Activation)	(None, 1)	0
<hr/>		
Total params:	309,249	
Trainable params:	309,249	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 75s 53ms/sample - loss: 0.6942 -
accuracy: 0.5057 - val_loss: 0.6942 - val_accuracy: 0.4851
Epoch 2/10
1412/1412 [=====] - 76s 54ms/sample - loss: 0.6939 -
accuracy: 0.4901 - val_loss: 0.6927 - val_accuracy: 0.5149
Epoch 3/10
1412/1412 [=====] - 76s 54ms/sample - loss: 0.6937 -
accuracy: 0.5028 - val_loss: 0.6935 - val_accuracy: 0.4851
Epoch 4/10
1412/1412 [=====] - 72s 51ms/sample - loss: 0.6929 -
accuracy: 0.5113 - val_loss: 0.6912 - val_accuracy: 0.5825
Epoch 5/10
1412/1412 [=====] - 73s 51ms/sample - loss: 0.6916 -
accuracy: 0.5326 - val_loss: 0.6872 - val_accuracy: 0.5462
Epoch 6/10
1412/1412 [=====] - 73s 51ms/sample - loss: 0.6685 -
accuracy: 0.6091 - val_loss: 0.6595 - val_accuracy: 0.5957
Epoch 7/10
1412/1412 [=====] - 72s 51ms/sample - loss: 0.6408 -
accuracy: 0.6360 - val_loss: 0.6300 - val_accuracy: 0.6584

Epoch 8/10
 1412/1412 [=====] - 73s 51ms/sample - loss: 0.6202 -
 accuracy: 0.6601 - val_loss: 0.6409 - val_accuracy: 0.6469
 Epoch 9/10
 1412/1412 [=====] - 74s 52ms/sample - loss: 0.5976 -
 accuracy: 0.6686 - val_loss: 0.6054 - val_accuracy: 0.6568
 Epoch 10/10
 1412/1412 [=====] - 74s 53ms/sample - loss: 0.5787 -
 accuracy: 0.6926 - val_loss: 0.6571 - val_accuracy: 0.6469
 1-conv-32-nodes-1-dense-1593442919
 Model: "sequential_9"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_18 (Conv2D)	(None, 98, 98, 32)	320
<hr/>		
activation_27 (Activation)	(None, 98, 98, 32)	0
<hr/>		
max_pooling2d_18 (MaxPooling)	(None, 49, 49, 32)	0
<hr/>		
flatten_9 (Flatten)	(None, 76832)	0
<hr/>		
dense_9 (Dense)	(None, 32)	2458656
<hr/>		
activation_28 (Activation)	(None, 32)	0
<hr/>		
dense_10 (Dense)	(None, 1)	33
<hr/>		
activation_29 (Activation)	(None, 1)	0
<hr/>		
Total params: 2,459,009		
Trainable params: 2,459,009		
Non-trainable params: 0		

Train on 1412 samples, validate on 606 samples
 Epoch 1/10
 1412/1412 [=====] - 14s 10ms/sample - loss: 0.7598 -
 accuracy: 0.5241 - val_loss: 0.7062 - val_accuracy: 0.5149
 Epoch 2/10
 1412/1412 [=====] - 12s 9ms/sample - loss: 0.6947 -
 accuracy: 0.5142 - val_loss: 0.7006 - val_accuracy: 0.4851
 Epoch 3/10
 1412/1412 [=====] - 11s 8ms/sample - loss: 0.6880 -
 accuracy: 0.5297 - val_loss: 0.6922 - val_accuracy: 0.5215
 Epoch 4/10
 1412/1412 [=====] - 11s 8ms/sample - loss: 0.6766 -
 accuracy: 0.5864 - val_loss: 0.6910 - val_accuracy: 0.5297
 Epoch 5/10
 1412/1412 [=====] - 11s 8ms/sample - loss: 0.6615 -
 accuracy: 0.6565 - val_loss: 0.6934 - val_accuracy: 0.5297
 Epoch 6/10
 1412/1412 [=====] - 12s 8ms/sample - loss: 0.6503 -
 accuracy: 0.6551 - val_loss: 0.6903 - val_accuracy: 0.5429
 Epoch 7/10
 1412/1412 [=====] - 11s 8ms/sample - loss: 0.6296 -
 accuracy: 0.6537 - val_loss: 0.6938 - val_accuracy: 0.5561
 Epoch 8/10

```
1412/1412 [=====] - 11s 8ms/sample - loss: 0.6241 -
accuracy: 0.6551 - val_loss: 0.7172 - val_accuracy: 0.5000
Epoch 9/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.6088 -
accuracy: 0.6891 - val_loss: 0.7634 - val_accuracy: 0.4983
Epoch 10/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.5901 -
accuracy: 0.7103 - val_loss: 0.6910 - val_accuracy: 0.5677
2-conv-32-nodes-1-dense-1593443035
Model: "sequential_10"
```

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_19 (Conv2D)	(None, 98, 98, 32)	320
activation_30 (Activation)	(None, 98, 98, 32)	0
max_pooling2d_19 (MaxPooling)	(None, 49, 49, 32)	0
conv2d_20 (Conv2D)	(None, 47, 47, 32)	9248
activation_31 (Activation)	(None, 47, 47, 32)	0
max_pooling2d_20 (MaxPooling)	(None, 23, 23, 32)	0
flatten_10 (Flatten)	(None, 16928)	0
dense_11 (Dense)	(None, 32)	541728
activation_32 (Activation)	(None, 32)	0
dense_12 (Dense)	(None, 1)	33
activation_33 (Activation)	(None, 1)	0
<hr/>		
Total params:	551,329	
Trainable params:	551,329	
Non-trainable params:	0	

```
Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 15s 11ms/sample - loss: 0.6969 -
accuracy: 0.4936 - val_loss: 0.6931 - val_accuracy: 0.5149
Epoch 2/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6935 -
accuracy: 0.5163 - val_loss: 0.6931 - val_accuracy: 0.4851
Epoch 3/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6926 -
accuracy: 0.5156 - val_loss: 0.6931 - val_accuracy: 0.5149
Epoch 4/10
1412/1412 [=====] - 13s 10ms/sample - loss: 0.6932 -
accuracy: 0.4936 - val_loss: 0.6931 - val_accuracy: 0.5149
Epoch 5/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6932 -
accuracy: 0.4894 - val_loss: 0.6932 - val_accuracy: 0.4851
Epoch 6/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6931 -
```

```

accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 7/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 8/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 9/10
1412/1412 [=====] - 13s 10ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 10/10
1412/1412 [=====] - 13s 9ms/sample - loss: 0.6932 -
accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
3-conv-32-nodes-1-dense-1593443170
Model: "sequential_11"

```

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_21 (Conv2D)	(None, 98, 98, 32)	320
activation_34 (Activation)	(None, 98, 98, 32)	0
max_pooling2d_21 (MaxPooling)	(None, 49, 49, 32)	0
conv2d_22 (Conv2D)	(None, 47, 47, 32)	9248
activation_35 (Activation)	(None, 47, 47, 32)	0
max_pooling2d_22 (MaxPooling)	(None, 23, 23, 32)	0
conv2d_23 (Conv2D)	(None, 21, 21, 32)	9248
activation_36 (Activation)	(None, 21, 21, 32)	0
max_pooling2d_23 (MaxPooling)	(None, 10, 10, 32)	0
flatten_11 (Flatten)	(None, 3200)	0
dense_13 (Dense)	(None, 32)	102432
activation_37 (Activation)	(None, 32)	0
dense_14 (Dense)	(None, 1)	33
activation_38 (Activation)	(None, 1)	0
<hr/>		

Total params: 121,281
Trainable params: 121,281
Non-trainable params: 0

Train on 1412 samples, validate on 606 samples

```

Epoch 1/10
1412/1412 [=====] - 16s 11ms/sample - loss: 0.6941 -
accuracy: 0.4958 - val_loss: 0.6922 - val_accuracy: 0.5149
Epoch 2/10
1412/1412 [=====] - 13s 10ms/sample - loss: 0.6925 -
accuracy: 0.5113 - val_loss: 0.6884 - val_accuracy: 0.5149

```

```

Epoch 3/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6925 -
accuracy: 0.5333 - val_loss: 0.6901 - val_accuracy: 0.5858
Epoch 4/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6851 -
accuracy: 0.5729 - val_loss: 0.6822 - val_accuracy: 0.5875
Epoch 5/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6598 -
accuracy: 0.6239 - val_loss: 0.7193 - val_accuracy: 0.5050
Epoch 6/10
1412/1412 [=====] - 13s 10ms/sample - loss: 0.6516 -
accuracy: 0.6084 - val_loss: 0.6677 - val_accuracy: 0.5990
Epoch 7/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6300 -
accuracy: 0.6537 - val_loss: 0.6612 - val_accuracy: 0.5858
Epoch 8/10
1412/1412 [=====] - 13s 10ms/sample - loss: 0.6356 -
accuracy: 0.6572 - val_loss: 0.6423 - val_accuracy: 0.6485
Epoch 9/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6032 -
accuracy: 0.6671 - val_loss: 0.6270 - val_accuracy: 0.6700
Epoch 10/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.5781 -
accuracy: 0.6884 - val_loss: 0.6441 - val_accuracy: 0.6271
1-conv-64-nodes-1-dense-1593443309
Model: "sequential_12"

```

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_24 (Conv2D)	(None, 98, 98, 64)	640
activation_39 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_24 (MaxPooling)	(None, 49, 49, 64)	0
flatten_12 (Flatten)	(None, 153664)	0
dense_15 (Dense)	(None, 64)	9834560
activation_40 (Activation)	(None, 64)	0
dense_16 (Dense)	(None, 1)	65
activation_41 (Activation)	(None, 1)	0
<hr/>		
Total params:	9,835,265	
Trainable params:	9,835,265	
Non-trainable params:	0	

```

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 22s 16ms/sample - loss: 0.8266 -
accuracy: 0.5276 - val_loss: 0.6927 - val_accuracy: 0.4983
Epoch 2/10
1412/1412 [=====] - 23s 17ms/sample - loss: 0.6930 -
accuracy: 0.5361 - val_loss: 0.6898 - val_accuracy: 0.5413
Epoch 3/10

```

1412/1412 [=====] - 24s 17ms/sample - loss: 0.6794 -
accuracy: 0.5694 - val_loss: 0.6907 - val_accuracy: 0.5297
Epoch 4/10
1412/1412 [=====] - 22s 16ms/sample - loss: 0.6673 -
accuracy: 0.5984 - val_loss: 0.6982 - val_accuracy: 0.5000
Epoch 5/10
1412/1412 [=====] - 29s 20ms/sample - loss: 0.6471 -
accuracy: 0.6664 - val_loss: 0.7056 - val_accuracy: 0.5132
Epoch 6/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.6323 -
accuracy: 0.6523 - val_loss: 0.7128 - val_accuracy: 0.5182
Epoch 7/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.6099 -
accuracy: 0.6785 - val_loss: 0.6925 - val_accuracy: 0.5396
Epoch 8/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.5818 -
accuracy: 0.7089 - val_loss: 0.6876 - val_accuracy: 0.5528
Epoch 9/10
1412/1412 [=====] - 21s 15ms/sample - loss: 0.5620 -
accuracy: 0.7181 - val_loss: 0.6979 - val_accuracy: 0.5462
Epoch 10/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.5443 -
accuracy: 0.7415 - val_loss: 0.6933 - val_accuracy: 0.5578
2-conv-64-nodes-1-dense-1593443532
Model: "sequential_13"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_25 (Conv2D)	(None, 98, 98, 64)	640
activation_42 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_25 (MaxPooling)	(None, 49, 49, 64)	0
conv2d_26 (Conv2D)	(None, 47, 47, 64)	36928
activation_43 (Activation)	(None, 47, 47, 64)	0
max_pooling2d_26 (MaxPooling)	(None, 23, 23, 64)	0
flatten_13 (Flatten)	(None, 33856)	0
dense_17 (Dense)	(None, 64)	2166848
activation_44 (Activation)	(None, 64)	0
dense_18 (Dense)	(None, 1)	65
activation_45 (Activation)	(None, 1)	0
<hr/>		

Total params: 2,204,481
Trainable params: 2,204,481
Non-trainable params: 0

Train on 1412 samples, validate on 606 samples

Epoch 1/10

1412/1412 [=====] - 30s 21ms/sample - loss: 0.7010 -

```

accuracy: 0.5014 - val_loss: 0.6932 - val_accuracy: 0.4851
Epoch 2/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6931 - val_accuracy: 0.4868
Epoch 3/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6934 -
accuracy: 0.5085 - val_loss: 0.6932 - val_accuracy: 0.4851
Epoch 4/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6933 -
accuracy: 0.4844 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 5/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6930 -
accuracy: 0.5156 - val_loss: 0.6929 - val_accuracy: 0.5050
Epoch 6/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6920 -
accuracy: 0.5602 - val_loss: 0.6931 - val_accuracy: 0.4901
Epoch 7/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6913 -
accuracy: 0.5312 - val_loss: 0.6936 - val_accuracy: 0.4851
Epoch 8/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6936 - val_accuracy: 0.4851
Epoch 9/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6937 - val_accuracy: 0.4851
Epoch 10/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6937 - val_accuracy: 0.4851
3-conv-64-nodes-1-dense-1593443815
Model: "sequential_14"

```

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_27 (Conv2D)	(None, 98, 98, 64)	640
activation_46 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_27 (MaxPooling)	(None, 49, 49, 64)	0
conv2d_28 (Conv2D)	(None, 47, 47, 64)	36928
activation_47 (Activation)	(None, 47, 47, 64)	0
max_pooling2d_28 (MaxPooling)	(None, 23, 23, 64)	0
conv2d_29 (Conv2D)	(None, 21, 21, 64)	36928
activation_48 (Activation)	(None, 21, 21, 64)	0
max_pooling2d_29 (MaxPooling)	(None, 10, 10, 64)	0
flatten_14 (Flatten)	(None, 6400)	0
dense_19 (Dense)	(None, 64)	409664
activation_49 (Activation)	(None, 64)	0

dense_20 (Dense)	(None, 1)	65
activation_50 (Activation)	(None, 1)	0

Total params: 484,225
Trainable params: 484,225
Non-trainable params: 0

Train on 1412 samples, validate on 606 samples

Epoch 1/10
1412/1412 [=====] - 31s 22ms/sample - loss: 0.6942 - accuracy: 0.5156 - val_loss: 0.6935 - val_accuracy: 0.4851

Epoch 2/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6932 - val_accuracy: 0.4851

Epoch 3/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6932 - accuracy: 0.5234 - val_loss: 0.6901 - val_accuracy: 0.5413

Epoch 4/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6865 - accuracy: 0.5404 - val_loss: 0.6778 - val_accuracy: 0.6172

Epoch 5/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6787 - accuracy: 0.5729 - val_loss: 0.6927 - val_accuracy: 0.4884

Epoch 6/10
1412/1412 [=====] - 30s 22ms/sample - loss: 0.6933 - accuracy: 0.5085 - val_loss: 0.6920 - val_accuracy: 0.4934

Epoch 7/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6799 - accuracy: 0.5722 - val_loss: 0.6556 - val_accuracy: 0.6254

Epoch 8/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6597 - accuracy: 0.6232 - val_loss: 0.7747 - val_accuracy: 0.4851

Epoch 9/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6732 - accuracy: 0.6098 - val_loss: 0.6462 - val_accuracy: 0.6749

Epoch 10/10
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6439 - accuracy: 0.6721 - val_loss: 0.6450 - val_accuracy: 0.6700

1-conv-128-nodes-1-dense-1593444111
Model: "sequential_15"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_30 (Conv2D)	(None, 98, 98, 128)	1280
<hr/>		
activation_51 (Activation)	(None, 98, 98, 128)	0
<hr/>		
max_pooling2d_30 (MaxPooling)	(None, 49, 49, 128)	0
<hr/>		
flatten_15 (Flatten)	(None, 307328)	0
<hr/>		
dense_21 (Dense)	(None, 128)	39338112
<hr/>		
activation_52 (Activation)	(None, 128)	0
<hr/>		
dense_22 (Dense)	(None, 1)	129

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activation_53 (Activation)    (None, 1)          0
=====
Total params: 39,339,521
Trainable params: 39,339,521
Non-trainable params: 0

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 59s 42ms/sample - loss: 0.9465 -
accuracy: 0.5035 - val_loss: 0.6916 - val_accuracy: 0.5165
Epoch 2/10
1412/1412 [=====] - 55s 39ms/sample - loss: 0.6851 -
accuracy: 0.5758 - val_loss: 0.6886 - val_accuracy: 0.5462
Epoch 3/10
1412/1412 [=====] - 55s 39ms/sample - loss: 0.6588 -
accuracy: 0.6501 - val_loss: 0.6886 - val_accuracy: 0.5512
Epoch 4/10
1412/1412 [=====] - 58s 41ms/sample - loss: 0.6398 -
accuracy: 0.6254 - val_loss: 0.6872 - val_accuracy: 0.5512
Epoch 5/10
1412/1412 [=====] - 59s 42ms/sample - loss: 0.5947 -
accuracy: 0.7068 - val_loss: 0.7732 - val_accuracy: 0.4967
Epoch 6/10
1412/1412 [=====] - 55s 39ms/sample - loss: 0.5812 -
accuracy: 0.6941 - val_loss: 0.7039 - val_accuracy: 0.5545
Epoch 7/10
1412/1412 [=====] - 57s 40ms/sample - loss: 0.5505 -
accuracy: 0.7195 - val_loss: 0.6714 - val_accuracy: 0.6106
Epoch 8/10
1412/1412 [=====] - 58s 41ms/sample - loss: 0.4873 -
accuracy: 0.7691 - val_loss: 0.6688 - val_accuracy: 0.6188
Epoch 9/10
1412/1412 [=====] - 55s 39ms/sample - loss: 0.4684 -
accuracy: 0.7663 - val_loss: 0.6908 - val_accuracy: 0.5924
Epoch 10/10
1412/1412 [=====] - 55s 39ms/sample - loss: 0.4291 -
accuracy: 0.8024 - val_loss: 0.6649 - val_accuracy: 0.6238
2-conv-128-nodes-1-dense-1593444681
Model: "sequential_16"

```

Layer (type)	Output Shape	Param #
conv2d_31 (Conv2D)	(None, 98, 98, 128)	1280
activation_54 (Activation)	(None, 98, 98, 128)	0
max_pooling2d_31 (MaxPooling)	(None, 49, 49, 128)	0
conv2d_32 (Conv2D)	(None, 47, 47, 128)	147584
activation_55 (Activation)	(None, 47, 47, 128)	0
max_pooling2d_32 (MaxPooling)	(None, 23, 23, 128)	0
flatten_16 (Flatten)	(None, 67712)	0

dense_23 (Dense)	(None, 128)	8667264
activation_56 (Activation)	(None, 128)	0
dense_24 (Dense)	(None, 1)	129
activation_57 (Activation)	(None, 1)	0
<hr/>		
Total params: 8,816,257		
Trainable params: 8,816,257		
Non-trainable params: 0		

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 72s 51ms/sample - loss: 0.7292 -
accuracy: 0.4908 - val_loss: 0.6931 - val_accuracy: 0.4851
Epoch 2/10
1412/1412 [=====] - 70s 50ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 3/10
1412/1412 [=====] - 70s 49ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 4/10
1412/1412 [=====] - 70s 50ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 5/10
1412/1412 [=====] - 70s 50ms/sample - loss: 0.6933 -
accuracy: 0.4993 - val_loss: 0.6934 - val_accuracy: 0.4851
Epoch 6/10
1412/1412 [=====] - 70s 49ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6935 - val_accuracy: 0.4851
Epoch 7/10
1412/1412 [=====] - 79s 56ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6935 - val_accuracy: 0.4851
Epoch 8/10
1412/1412 [=====] - 72s 51ms/sample - loss: 0.6932 -
accuracy: 0.5064 - val_loss: 0.6938 - val_accuracy: 0.4851
Epoch 9/10
1412/1412 [=====] - 70s 49ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6936 - val_accuracy: 0.4851
Epoch 10/10
1412/1412 [=====] - 70s 50ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6937 - val_accuracy: 0.4851
3-conv-128-nodes-1-dense-1593445394
Model: "sequential_17"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_33 (Conv2D)	(None, 98, 98, 128)	1280
activation_58 (Activation)	(None, 98, 98, 128)	0
max_pooling2d_33 (MaxPooling)	(None, 49, 49, 128)	0
conv2d_34 (Conv2D)	(None, 47, 47, 128)	147584
activation_59 (Activation)	(None, 47, 47, 128)	0

max_pooling2d_34 (MaxPooling)	(None, 23, 23, 128)	0
conv2d_35 (Conv2D)	(None, 21, 21, 128)	147584
activation_60 (Activation)	(None, 21, 21, 128)	0
max_pooling2d_35 (MaxPooling)	(None, 10, 10, 128)	0
flatten_17 (Flatten)	(None, 12800)	0
dense_25 (Dense)	(None, 128)	1638528
activation_61 (Activation)	(None, 128)	0
dense_26 (Dense)	(None, 1)	129
activation_62 (Activation)	(None, 1)	0
<hr/>		
Total params:	1,935,105	
Trainable params:	1,935,105	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples

Epoch 1/10
 1412/1412 [=====] - 76s 54ms/sample - loss: 0.6993 -
 accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851

Epoch 2/10
 1412/1412 [=====] - 76s 54ms/sample - loss: 0.6934 -
 accuracy: 0.4865 - val_loss: 0.6934 - val_accuracy: 0.4851

Epoch 3/10
 1412/1412 [=====] - 73s 52ms/sample - loss: 0.6930 -
 accuracy: 0.5000 - val_loss: 0.6930 - val_accuracy: 0.4851

Epoch 4/10
 1412/1412 [=====] - 74s 52ms/sample - loss: 0.6928 -
 accuracy: 0.5120 - val_loss: 0.6957 - val_accuracy: 0.4851

Epoch 5/10
 1412/1412 [=====] - 74s 52ms/sample - loss: 0.6924 -
 accuracy: 0.5127 - val_loss: 0.6916 - val_accuracy: 0.5066

Epoch 6/10
 1412/1412 [=====] - 76s 54ms/sample - loss: 0.6781 -
 accuracy: 0.5977 - val_loss: 0.6704 - val_accuracy: 0.5759

Epoch 7/10
 1412/1412 [=====] - 78s 55ms/sample - loss: 0.6587 -
 accuracy: 0.6020 - val_loss: 0.6702 - val_accuracy: 0.6155

Epoch 8/10
 1412/1412 [=====] - 74s 52ms/sample - loss: 0.6422 -
 accuracy: 0.6296 - val_loss: 0.6411 - val_accuracy: 0.6304

Epoch 9/10
 1412/1412 [=====] - 74s 52ms/sample - loss: 0.6199 -
 accuracy: 0.6636 - val_loss: 0.6356 - val_accuracy: 0.6419

Epoch 10/10
 1412/1412 [=====] - 74s 53ms/sample - loss: 0.6042 -
 accuracy: 0.6721 - val_loss: 0.6171 - val_accuracy: 0.6617

1-conv-32-nodes-2-dense-1593446144

Model: "sequential_18"

Layer (type)	Output Shape	Param #
conv2d_36 (Conv2D)	(None, 98, 98, 32)	320
activation_63 (Activation)	(None, 98, 98, 32)	0
max_pooling2d_36 (MaxPooling)	(None, 49, 49, 32)	0
flatten_18 (Flatten)	(None, 76832)	0
dense_27 (Dense)	(None, 32)	2458656
activation_64 (Activation)	(None, 32)	0
dense_28 (Dense)	(None, 32)	1056
activation_65 (Activation)	(None, 32)	0
dense_29 (Dense)	(None, 1)	33
activation_66 (Activation)	(None, 1)	0

Total params: 2,460,065
Trainable params: 2,460,065
Non-trainable params: 0

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 13s 10ms/sample - loss: 0.7392 - accuracy: 0.4986 - val_loss: 0.7021 - val_accuracy: 0.5149
Epoch 2/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.7061 - accuracy: 0.5227 - val_loss: 0.6917 - val_accuracy: 0.5182
Epoch 3/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.6837 - accuracy: 0.5559 - val_loss: 0.6913 - val_accuracy: 0.5281
Epoch 4/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.6624 - accuracy: 0.5984 - val_loss: 0.6908 - val_accuracy: 0.5462
Epoch 5/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.6189 - accuracy: 0.6820 - val_loss: 0.7410 - val_accuracy: 0.5050
Epoch 6/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.6019 - accuracy: 0.6799 - val_loss: 0.6876 - val_accuracy: 0.5941
Epoch 7/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.5587 - accuracy: 0.7224 - val_loss: 0.8223 - val_accuracy: 0.5132
Epoch 8/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.5333 - accuracy: 0.7387 - val_loss: 0.7054 - val_accuracy: 0.5693
Epoch 9/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.4829 - accuracy: 0.7854 - val_loss: 0.6946 - val_accuracy: 0.6106
Epoch 10/10
1412/1412 [=====] - 11s 8ms/sample - loss: 0.4432 - accuracy: 0.7882 - val_loss: 0.6826 - val_accuracy: 0.6254

2-conv-32-nodes-2-dense-1593446256

Model: "sequential_19"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_37 (Conv2D)	(None, 98, 98, 32)	320
activation_67 (Activation)	(None, 98, 98, 32)	0
max_pooling2d_37 (MaxPooling)	(None, 49, 49, 32)	0
conv2d_38 (Conv2D)	(None, 47, 47, 32)	9248
activation_68 (Activation)	(None, 47, 47, 32)	0
max_pooling2d_38 (MaxPooling)	(None, 23, 23, 32)	0
flatten_19 (Flatten)	(None, 16928)	0
dense_30 (Dense)	(None, 32)	541728
activation_69 (Activation)	(None, 32)	0
dense_31 (Dense)	(None, 32)	1056
activation_70 (Activation)	(None, 32)	0
dense_32 (Dense)	(None, 1)	33
activation_71 (Activation)	(None, 1)	0
<hr/>		
Total params:	552,385	
Trainable params:	552,385	
Non-trainable params:	0	

Train on 1412 samples, validate on 606 samples

Epoch 1/10

1412/1412 [=====] - 15s 11ms/sample - loss: 0.6986 - accuracy: 0.4922 - val_loss: 0.6933 - val_accuracy: 0.4851

Epoch 2/10

1412/1412 [=====] - 13s 9ms/sample - loss: 0.6931 - accuracy: 0.4943 - val_loss: 0.6940 - val_accuracy: 0.4851

Epoch 3/10

1412/1412 [=====] - 13s 9ms/sample - loss: 0.6915 - accuracy: 0.5503 - val_loss: 0.6909 - val_accuracy: 0.5891

Epoch 4/10

1412/1412 [=====] - 13s 9ms/sample - loss: 0.6903 - accuracy: 0.5510 - val_loss: 0.6926 - val_accuracy: 0.4901

Epoch 5/10

1412/1412 [=====] - 13s 9ms/sample - loss: 0.6768 - accuracy: 0.6169 - val_loss: 0.6811 - val_accuracy: 0.5545

Epoch 6/10

1412/1412 [=====] - 13s 9ms/sample - loss: 0.6652 - accuracy: 0.6105 - val_loss: 0.6711 - val_accuracy: 0.5924

Epoch 7/10

1412/1412 [=====] - 13s 9ms/sample - loss: 0.6322 - accuracy: 0.6544 - val_loss: 0.6916 - val_accuracy: 0.5429

Epoch 8/10
 1412/1412 [=====] - 13s 9ms/sample - loss: 0.6060 -
 accuracy: 0.6657 - val_loss: 0.6559 - val_accuracy: 0.5957
 Epoch 9/10
 1412/1412 [=====] - 13s 9ms/sample - loss: 0.5685 -
 accuracy: 0.7061 - val_loss: 0.6273 - val_accuracy: 0.6617
 Epoch 10/10
 1412/1412 [=====] - 13s 9ms/sample - loss: 0.5368 -
 accuracy: 0.7238 - val_loss: 0.6029 - val_accuracy: 0.6799
 3-conv-32-nodes-2-dense-1593446390
 Model: "sequential_20"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_39 (Conv2D)	(None, 98, 98, 32)	320
activation_72 (Activation)	(None, 98, 98, 32)	0
max_pooling2d_39 (MaxPooling)	(None, 49, 49, 32)	0
conv2d_40 (Conv2D)	(None, 47, 47, 32)	9248
activation_73 (Activation)	(None, 47, 47, 32)	0
max_pooling2d_40 (MaxPooling)	(None, 23, 23, 32)	0
conv2d_41 (Conv2D)	(None, 21, 21, 32)	9248
activation_74 (Activation)	(None, 21, 21, 32)	0
max_pooling2d_41 (MaxPooling)	(None, 10, 10, 32)	0
flatten_20 (Flatten)	(None, 3200)	0
dense_33 (Dense)	(None, 32)	102432
activation_75 (Activation)	(None, 32)	0
dense_34 (Dense)	(None, 32)	1056
activation_76 (Activation)	(None, 32)	0
dense_35 (Dense)	(None, 1)	33
activation_77 (Activation)	(None, 1)	0
<hr/>		

Total params: 122,337
 Trainable params: 122,337
 Non-trainable params: 0

Train on 1412 samples, validate on 606 samples
 Epoch 1/10
 1412/1412 [=====] - 16s 11ms/sample - loss: 0.6939 -
 accuracy: 0.5092 - val_loss: 0.6930 - val_accuracy: 0.5726
 Epoch 2/10
 1412/1412 [=====] - 14s 10ms/sample - loss: 0.6928 -
 accuracy: 0.5439 - val_loss: 0.6913 - val_accuracy: 0.5363

```

Epoch 3/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6912 -
accuracy: 0.5425 - val_loss: 0.6873 - val_accuracy: 0.5759
Epoch 4/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6826 -
accuracy: 0.5524 - val_loss: 0.6812 - val_accuracy: 0.5974
Epoch 5/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6634 -
accuracy: 0.6076 - val_loss: 0.6565 - val_accuracy: 0.6139
Epoch 6/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6440 -
accuracy: 0.6424 - val_loss: 0.6378 - val_accuracy: 0.6370
Epoch 7/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6233 -
accuracy: 0.6565 - val_loss: 0.6711 - val_accuracy: 0.5759
Epoch 8/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.6340 -
accuracy: 0.6494 - val_loss: 0.6284 - val_accuracy: 0.6584
Epoch 9/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.5874 -
accuracy: 0.6969 - val_loss: 0.6389 - val_accuracy: 0.6733
Epoch 10/10
1412/1412 [=====] - 14s 10ms/sample - loss: 0.5752 -
accuracy: 0.6997 - val_loss: 0.5957 - val_accuracy: 0.6815
1-conv-64-nodes-2-dense-1593446529
Model: "sequential_21"

```

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_42 (Conv2D)	(None, 98, 98, 64)	640
activation_78 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_42 (MaxPooling)	(None, 49, 49, 64)	0
flatten_21 (Flatten)	(None, 153664)	0
dense_36 (Dense)	(None, 64)	9834560
activation_79 (Activation)	(None, 64)	0
dense_37 (Dense)	(None, 64)	4160
activation_80 (Activation)	(None, 64)	0
dense_38 (Dense)	(None, 1)	65
activation_81 (Activation)	(None, 1)	0
<hr/>		
Total params: 9,839,425		
Trainable params: 9,839,425		
Non-trainable params: 0		

```

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 21s 15ms/sample - loss: 0.7878 -
accuracy: 0.4979 - val_loss: 0.6974 - val_accuracy: 0.4851

```

Epoch 2/10
1412/1412 [=====] - 22s 16ms/sample - loss: 0.7052 -
accuracy: 0.5014 - val_loss: 0.6910 - val_accuracy: 0.5182
Epoch 3/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.6892 -
accuracy: 0.5418 - val_loss: 0.6949 - val_accuracy: 0.5297
Epoch 4/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.6702 -
accuracy: 0.5885 - val_loss: 0.7194 - val_accuracy: 0.4901
Epoch 5/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.6360 -
accuracy: 0.6395 - val_loss: 0.7078 - val_accuracy: 0.5149
Epoch 6/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.6060 -
accuracy: 0.6728 - val_loss: 0.6824 - val_accuracy: 0.6040
Epoch 7/10
1412/1412 [=====] - 19s 14ms/sample - loss: 0.5638 -
accuracy: 0.7011 - val_loss: 0.7605 - val_accuracy: 0.5561
Epoch 8/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.5218 -
accuracy: 0.7422 - val_loss: 0.6783 - val_accuracy: 0.6106
Epoch 9/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.4613 -
accuracy: 0.7911 - val_loss: 0.6797 - val_accuracy: 0.6353
Epoch 10/10
1412/1412 [=====] - 20s 14ms/sample - loss: 0.4429 -
accuracy: 0.7939 - val_loss: 0.7874 - val_accuracy: 0.5512
2-conv-64-nodes-2-dense-1593446732
Model: "sequential_22"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_43 (Conv2D)	(None, 98, 98, 64)	640
activation_82 (Activation)	(None, 98, 98, 64)	0
max_pooling2d_43 (MaxPooling)	(None, 49, 49, 64)	0
conv2d_44 (Conv2D)	(None, 47, 47, 64)	36928
activation_83 (Activation)	(None, 47, 47, 64)	0
max_pooling2d_44 (MaxPooling)	(None, 23, 23, 64)	0
flatten_22 (Flatten)	(None, 33856)	0
dense_39 (Dense)	(None, 64)	2166848
activation_84 (Activation)	(None, 64)	0
dense_40 (Dense)	(None, 64)	4160
activation_85 (Activation)	(None, 64)	0
dense_41 (Dense)	(None, 1)	65
activation_86 (Activation)	(None, 1)	0

```
=====
Total params: 2,208,641
Trainable params: 2,208,641
Non-trainable params: 0
```

```
Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 30s 21ms/sample - loss: 0.7004 -
accuracy: 0.5057 - val_loss: 0.6929 - val_accuracy: 0.5149
Epoch 2/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6929 -
accuracy: 0.5255 - val_loss: 0.6965 - val_accuracy: 0.4851
Epoch 3/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6943 -
accuracy: 0.5064 - val_loss: 0.6939 - val_accuracy: 0.4851
Epoch 4/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6931 -
accuracy: 0.5064 - val_loss: 0.6928 - val_accuracy: 0.5363
Epoch 5/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6924 -
accuracy: 0.5297 - val_loss: 0.6932 - val_accuracy: 0.4851
Epoch 6/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6922 -
accuracy: 0.5234 - val_loss: 0.6907 - val_accuracy: 0.5644
Epoch 7/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6816 -
accuracy: 0.5807 - val_loss: 0.6928 - val_accuracy: 0.5149
Epoch 8/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6635 -
accuracy: 0.6133 - val_loss: 0.6684 - val_accuracy: 0.5875
Epoch 9/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6382 -
accuracy: 0.6317 - val_loss: 0.6700 - val_accuracy: 0.6106
Epoch 10/10
1412/1412 [=====] - 28s 20ms/sample - loss: 0.6204 -
accuracy: 0.6728 - val_loss: 0.6507 - val_accuracy: 0.6320
3-conv-64-nodes-2-dense-1593447012
Model: "sequential_23"
```

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_45 (Conv2D)	(None, 98, 98, 64)	640
<hr/>		
activation_87 (Activation)	(None, 98, 98, 64)	0
<hr/>		
max_pooling2d_45 (MaxPooling)	(None, 49, 49, 64)	0
<hr/>		
conv2d_46 (Conv2D)	(None, 47, 47, 64)	36928
<hr/>		
activation_88 (Activation)	(None, 47, 47, 64)	0
<hr/>		
max_pooling2d_46 (MaxPooling)	(None, 23, 23, 64)	0
<hr/>		
conv2d_47 (Conv2D)	(None, 21, 21, 64)	36928
<hr/>		
activation_89 (Activation)	(None, 21, 21, 64)	0
<hr/>		

```
max_pooling2d_47 (MaxPooling (None, 10, 10, 64) 0
```

flatten_23 (Flatten)	(None, 6400)	0
dense_42 (Dense)	(None, 64)	409664
activation_90 (Activation)	(None, 64)	0
dense_43 (Dense)	(None, 64)	4160
activation_91 (Activation)	(None, 64)	0
dense_44 (Dense)	(None, 1)	65
activation_92 (Activation)	(None, 1)	0

```
=====
```

```
Total params: 488,385
```

```
Trainable params: 488,385
```

```
Non-trainable params: 0
```

```
Train on 1412 samples, validate on 606 samples
```

```
Epoch 1/10
```

```
1412/1412 [=====] - 31s 22ms/sample - loss: 0.6940 - accuracy: 0.4873 - val_loss: 0.6930 - val_accuracy: 0.5842
```

```
Epoch 2/10
```

```
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6936 - accuracy: 0.4908 - val_loss: 0.6963 - val_accuracy: 0.4851
```

```
Epoch 3/10
```

```
1412/1412 [=====] - 29s 20ms/sample - loss: 0.6942 - accuracy: 0.5064 - val_loss: 0.6935 - val_accuracy: 0.4851
```

```
Epoch 4/10
```

```
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6930 - accuracy: 0.5064 - val_loss: 0.6931 - val_accuracy: 0.4851
```

```
Epoch 5/10
```

```
1412/1412 [=====] - 29s 20ms/sample - loss: 0.6923 - accuracy: 0.5411 - val_loss: 0.6859 - val_accuracy: 0.5149
```

```
Epoch 6/10
```

```
1412/1412 [=====] - 30s 21ms/sample - loss: 0.6906 - accuracy: 0.5276 - val_loss: 0.6946 - val_accuracy: 0.4851
```

```
Epoch 7/10
```

```
1412/1412 [=====] - 32s 23ms/sample - loss: 0.6935 - accuracy: 0.5064 - val_loss: 0.6941 - val_accuracy: 0.4851
```

```
Epoch 8/10
```

```
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6932 - accuracy: 0.5064 - val_loss: 0.6937 - val_accuracy: 0.4851
```

```
Epoch 9/10
```

```
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6937 - val_accuracy: 0.4851
```

```
Epoch 10/10
```

```
1412/1412 [=====] - 29s 21ms/sample - loss: 0.6931 - accuracy: 0.5064 - val_loss: 0.6936 - val_accuracy: 0.4851
```

```
1-conv-128-nodes-2-dense-1593447309
```

```
Model: "sequential_24"
```

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_48 (Conv2D)	(None, 98, 98, 128)	1280

activation_93 (Activation)	(None, 98, 98, 128)	0
max_pooling2d_48 (MaxPooling)	(None, 49, 49, 128)	0
flatten_24 (Flatten)	(None, 307328)	0
dense_45 (Dense)	(None, 128)	39338112
activation_94 (Activation)	(None, 128)	0
dense_46 (Dense)	(None, 128)	16512
activation_95 (Activation)	(None, 128)	0
dense_47 (Dense)	(None, 1)	129
activation_96 (Activation)	(None, 1)	0
<hr/>		
Total params:	39,356,033	
Trainable params:	39,356,033	
Non-trainable params:	0	
<hr/>		
Train on 1412 samples, validate on 606 samples		
Epoch 1/10		
1412/1412 [=====] - 59s 42ms/sample - loss: 0.8758 -		
accuracy: 0.5050 - val_loss: 0.6914 - val_accuracy: 0.5413		
Epoch 2/10		
1412/1412 [=====] - 55s 39ms/sample - loss: 0.6842 -		
accuracy: 0.5411 - val_loss: 0.6937 - val_accuracy: 0.5033		
Epoch 3/10		
1412/1412 [=====] - 54s 38ms/sample - loss: 0.6729 -		
accuracy: 0.5864 - val_loss: 0.6848 - val_accuracy: 0.5891		
Epoch 4/10		
1412/1412 [=====] - 54s 38ms/sample - loss: 0.6281 -		
accuracy: 0.6742 - val_loss: 0.6710 - val_accuracy: 0.5875		
Epoch 5/10		
1412/1412 [=====] - 54s 38ms/sample - loss: 0.5680 -		
accuracy: 0.7146 - val_loss: 0.6612 - val_accuracy: 0.6139		
Epoch 6/10		
1412/1412 [=====] - 54s 39ms/sample - loss: 0.5220 -		
accuracy: 0.7542 - val_loss: 0.6644 - val_accuracy: 0.5941		
Epoch 7/10		
1412/1412 [=====] - 54s 38ms/sample - loss: 0.4656 -		
accuracy: 0.7875 - val_loss: 0.6671 - val_accuracy: 0.6485		
Epoch 8/10		
1412/1412 [=====] - 54s 38ms/sample - loss: 0.4093 -		
accuracy: 0.8038 - val_loss: 0.7118 - val_accuracy: 0.5858		
Epoch 9/10		
1412/1412 [=====] - 54s 39ms/sample - loss: 0.3765 -		
accuracy: 0.8385 - val_loss: 0.6729 - val_accuracy: 0.6254		
Epoch 10/10		
1412/1412 [=====] - 54s 38ms/sample - loss: 0.3406 -		
accuracy: 0.8477 - val_loss: 0.7122 - val_accuracy: 0.6749		
2-conv-128-nodes-2-dense-1593447861		
Model: "sequential_25"		

Layer (type)	Output Shape	Param #
conv2d_49 (Conv2D)	(None, 98, 98, 128)	1280
activation_97 (Activation)	(None, 98, 98, 128)	0
max_pooling2d_49 (MaxPooling)	(None, 49, 49, 128)	0
conv2d_50 (Conv2D)	(None, 47, 47, 128)	147584
activation_98 (Activation)	(None, 47, 47, 128)	0
max_pooling2d_50 (MaxPooling)	(None, 23, 23, 128)	0
flatten_25 (Flatten)	(None, 67712)	0
dense_48 (Dense)	(None, 128)	8667264
activation_99 (Activation)	(None, 128)	0
dense_49 (Dense)	(None, 128)	16512
activation_100 (Activation)	(None, 128)	0
dense_50 (Dense)	(None, 1)	129
activation_101 (Activation)	(None, 1)	0

Total params: 8,832,769
Trainable params: 8,832,769
Non-trainable params: 0

Train on 1412 samples, validate on 606 samples
Epoch 1/10
1412/1412 [=====] - 72s 51ms/sample - loss: 0.6986 - accuracy: 0.5021 - val_loss: 0.6936 - val_accuracy: 0.4851
Epoch 2/10
1412/1412 [=====] - 72s 51ms/sample - loss: 0.6932 - accuracy: 0.5064 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 3/10
1412/1412 [=====] - 69s 49ms/sample - loss: 0.6933 - accuracy: 0.5064 - val_loss: 0.6936 - val_accuracy: 0.4851
Epoch 4/10
1412/1412 [=====] - 69s 49ms/sample - loss: 0.6933 - accuracy: 0.4936 - val_loss: 0.6929 - val_accuracy: 0.5429
Epoch 5/10
1412/1412 [=====] - 71s 50ms/sample - loss: 0.6928 - accuracy: 0.5326 - val_loss: 0.6939 - val_accuracy: 0.4851
Epoch 6/10
1412/1412 [=====] - 69s 49ms/sample - loss: 0.6932 - accuracy: 0.5021 - val_loss: 0.6933 - val_accuracy: 0.4851
Epoch 7/10
1412/1412 [=====] - 69s 49ms/sample - loss: 0.6933 - accuracy: 0.5064 - val_loss: 0.6938 - val_accuracy: 0.4851
Epoch 8/10
1412/1412 [=====] - 68s 48ms/sample - loss: 0.6933 - accuracy: 0.5064 - val_loss: 0.6937 - val_accuracy: 0.4851

Epoch 9/10

1412/1412 [=====] - 69s 49ms/sample - loss: 0.6938 -

accuracy: 0.5064 - val_loss: 0.6939 - val_accuracy: 0.4851

Epoch 10/10

1412/1412 [=====] - 69s 49ms/sample - loss: 0.6935 -

accuracy: 0.5064 - val_loss: 0.6939 - val_accuracy: 0.4851

3-conv-128-nodes-2-dense-1593448557

Model: "sequential_26"

Layer (type)	Output Shape	Param #
<hr/>		
conv2d_51 (Conv2D)	(None, 98, 98, 128)	1280
activation_102 (Activation)	(None, 98, 98, 128)	0
max_pooling2d_51 (MaxPooling)	(None, 49, 49, 128)	0
conv2d_52 (Conv2D)	(None, 47, 47, 128)	147584
activation_103 (Activation)	(None, 47, 47, 128)	0
max_pooling2d_52 (MaxPooling)	(None, 23, 23, 128)	0
conv2d_53 (Conv2D)	(None, 21, 21, 128)	147584
activation_104 (Activation)	(None, 21, 21, 128)	0
max_pooling2d_53 (MaxPooling)	(None, 10, 10, 128)	0
flatten_26 (Flatten)	(None, 12800)	0
dense_51 (Dense)	(None, 128)	1638528
activation_105 (Activation)	(None, 128)	0
dense_52 (Dense)	(None, 128)	16512
activation_106 (Activation)	(None, 128)	0
dense_53 (Dense)	(None, 1)	129
activation_107 (Activation)	(None, 1)	0
<hr/>		

Total params: 1,951,617

Trainable params: 1,951,617

Non-trainable params: 0

Train on 1412 samples, validate on 606 samples

Epoch 1/10

1412/1412 [=====] - 76s 54ms/sample - loss: 0.6949 -

accuracy: 0.4894 - val_loss: 0.6934 - val_accuracy: 0.4851

Epoch 2/10

1412/1412 [=====] - 74s 52ms/sample - loss: 0.6936 -

accuracy: 0.4844 - val_loss: 0.6930 - val_accuracy: 0.5149

Epoch 3/10

1412/1412 [=====] - 81s 57ms/sample - loss: 0.6933 -

accuracy: 0.5113 - val_loss: 0.6913 - val_accuracy: 0.5149

```

Epoch 4/10
1412/1412 [=====] - 74s 52ms/sample - loss: 0.6934 -
accuracy: 0.5212 - val_loss: 0.6943 - val_accuracy: 0.4851
Epoch 5/10
1412/1412 [=====] - 73s 52ms/sample - loss: 0.6932 -
accuracy: 0.5064 - val_loss: 0.6926 - val_accuracy: 0.4983
Epoch 6/10
1412/1412 [=====] - 73s 52ms/sample - loss: 0.6908 -
accuracy: 0.5191 - val_loss: 0.6861 - val_accuracy: 0.6254
Epoch 7/10
1412/1412 [=====] - 75s 53ms/sample - loss: 0.6939 -
accuracy: 0.5078 - val_loss: 0.6931 - val_accuracy: 0.4851
Epoch 8/10
1412/1412 [=====] - 74s 52ms/sample - loss: 0.6941 -
accuracy: 0.4844 - val_loss: 0.6940 - val_accuracy: 0.4851
Epoch 9/10
1412/1412 [=====] - 73s 52ms/sample - loss: 0.6934 -
accuracy: 0.5064 - val_loss: 0.6941 - val_accuracy: 0.4851
Epoch 10/10
1412/1412 [=====] - 73s 52ms/sample - loss: 0.6932 -
accuracy: 0.5064 - val_loss: 0.6937 - val_accuracy: 0.4851

```

In [7]: `model.save("3-conv-32-nodes-2-dense-1593446390.model")`

```
INFO:tensorflow:Assets written to: 3-conv-32-nodes-2-dense-1593446390.model/assets
```

we save the model with the highest accuracy on validation dataset

Tensorboard : TensorFlow's visualization toolkit

Go to cmd and type the following commands

```

tensorboard --logdir='logs/'
Copy the link and paste on browser to see the visualizations
Go to http://localhost:6006/

```

In []: