```
1    from google.colab import files
2
3    uploaded = files.upload()
4
5    for fn in uploaded.keys():
6      print('User uploaded file "{name}" with length {length} bytes'.format(
7          name=fn, length=len(uploaded[fn])))
8
9    # Then move kaggle.json into the folder where the API expects to find it.
10   !mkdir -p ~/.kaggle/ && mv kaggle.json ~/.kaggle/ && chmod 600 ~/.kaggle/kaggle.json
```

[→] | Choose Files | kaggle.json
- **kaggle.json**(application/json) - 69 bytes, last modified: 2/12/2020 - 100% done
Saving kaggle.json to kaggle.json
User uploaded file "kaggle.json" with length 69 bytes

```
1    !kaggle competitions download -c dogs-vs-cats-redux-kernels-edition
```

[→] Warning: Looks like you're using an outdated API Version, please consider updating (s
Downloading test.zip to /content
 94% 254M/271M [00:02<00:00, 122MB/s]
100% 271M/271M [00:02<00:00, 120MB/s]
Downloading train.zip to /content
 99% 537M/544M [00:09<00:00, 82.0MB/s]
100% 544M/544M [00:09<00:00, 60.7MB/s]
Downloading sample_submission.csv to /content
  0% 0.00/111k [00:00<?, ?B/s]
100% 111k/111k [00:00<00:00, 113MB/s]
```

## ▾ Importing Libraries

```
1    import os, cv2 # to import directory of file
2    import zipfile
3    import pandas as pd #libraries to read
4    import numpy as np #for algebric function
5    import matplotlib.pyplot as plt # for visualization
6    import matplotlib.image as imgplt #for image visualization
7    import seaborn as sns #Seaborn for visualization
8
9    # Sklearn Libraries
10   from sklearn.model_selection import train_test_split #for test & train Split
11   from sklearn.metrics import confusion_matrix, accuracy_score # metrics
12   from sklearn.preprocessing import StandardScaler #for scaling to increase computing s
13
14   #keras libraries
15   import tensorflow as tf
16   from keras.utils.np_utils import to_categorical
17   from keras.models import Sequential
18   from keras.layers import Dense, Conv2D, Conv3D, Flatten, MaxPool2D, Dropout, Activati
19   from keras.preprocessing.image import img_to_array, ImageDataGenerator, load_img
20   from keras.callbacks import ReduceLROnPlateau
21   from keras.optimizers import RMSprop, Adam
```

⤷ The default version of TensorFlow in Colab will soon switch to TensorFlow 2.x.
We recommend you upgrade now or ensure your notebook will continue to use TensorFlow 1.x via the %te

```
Using TensorFlow backend.
```

▾ Reading files

```
1  sam_sub = pd.read_csv("/content/sample_submission.csv")
2  sam_sub[:2]
```

⤷

	id	label
0	1	0.5
1	2	0.5

▾ Reading file in Zip File

```
1  with zipfile.ZipFile("/content/test.zip") as z:
2      z.extractall(".")
3
4  with zipfile.ZipFile("/content/train.zip") as z:
5      z.extractall(".")
6
7  print(os.listdir('.'))
```

⤷ ['.config', 'test', 'sample_submission.csv', 'drive', 'train', 'test.zip', 'train.zip

```
1  train_dir = ["./train/"+i for i in os.listdir("./train")]
2  dog_dir = ["./train/"+i for i in os.listdir("./train") if 'dog' in i]
3  cat_dir = ["./train/"+i for i in os.listdir("./train") if 'cat' in i]
4  test_dir = ["./test/"+i for i in os.listdir("./test")]
5  print(train_dir[:4])
6  print(dog_dir[:2])
7  print(cat_dir[:2])
```

⤷ ['./train/dog.2382.jpg', './train/dog.2111.jpg', './train/cat.2300.jpg', './train/cat
['./train/dog.2382.jpg', './train/dog.2111.jpg']
['./train/cat.2300.jpg', './train/cat.10246.jpg']

▾ Sample Image

```
1  load_img(dog_dir[7])
```

⤷

Converting img into Arrays

Reading files in Directory

```
1   def read_image(file_path):
2       img = cv2.imread(file_path, cv2.IMREAD_COLOR) #cv2.IMREAD_GRAYSCALE
3       return cv2.resize(img, (175, 175), interpolation=cv2.INTER_CUBIC)
```

```
1   train = np.array([read_image(i) for i in train_dir])
2   test = np.array([read_image(i) for i in test_dir])
3   print("Train :",train.shape)
4   print("Test  :",test.shape)
```

```
Train : (25000, 175, 175, 3)
Test  : (12500, 175, 175, 3)
```

Assing 1 & 0 to Lable for Dog & Cat Resp. as mentioned in kaggle

```
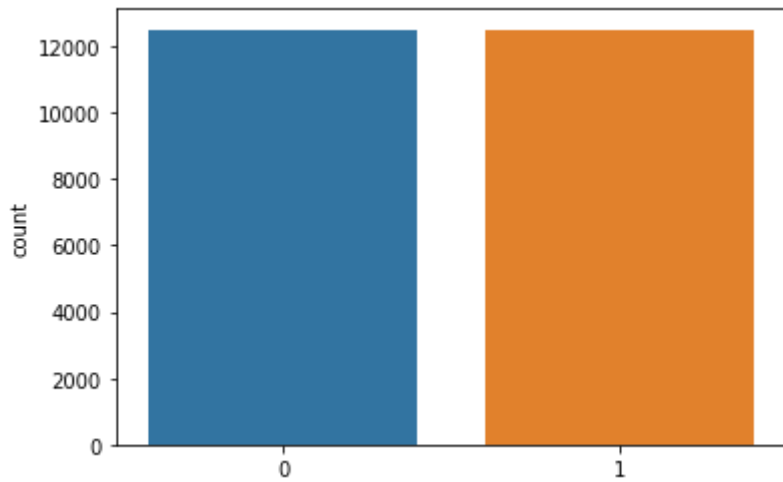1   lable = []
2   for i in os.listdir("./train"):
3     if 'dog' in i:
4         lable.append(1)
5     else:
6         lable.append(0)
7   lable = np.array(lable)
```

Visualization

```
1   sns.countplot(lable)
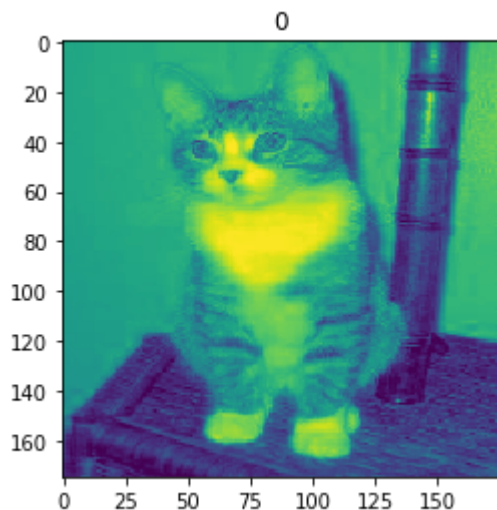2   #data is equally distributed
```

<matplotlib.axes._subplots.AxesSubplot at 0x7f5b35645898>


```
1  plt.imshow(train[7][:,:,0])
2  plt.title(lable[7])
3  #lable 0 --> Cat
4  #lable 1 --> Dog
```

Text(0.5, 1.0, '0')

Train Test Split

```
1  x=train
2  y=lable
3  from sklearn.model_selection import train_test_split
4  x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=.33,random_state=7)
5  print(x_train.shape)
6  print(x_test.shape)
7  print(y_train.shape)
8  print(y_test.shape)
```

CNN Model

Model 1

```python
def catvsdog(opt): model = Sequential()

#adding layers in models model.add(Conv2D(filters=32,kernel_size=(3,3),kernel_initializer='he_unit
(128,128,3),activation="relu")) model.add(Conv2D(filters=32,kernel_size=(3,3),padding="same",acti
model.add(MaxPool2D(2,2))

model.add(Conv2D(filters=64,kernel_size=(4,4),padding="same",activation="relu",kernel_initializer=

#model.add(Dropout(0.5))

#model.add(Conv2D(filters=128,kernel_size=(3,3),padding="same",activation="relu",kernel_initializ

#model.add(Conv2D(filters=128,kernel_size=(3,3),padding="same",activation="relu",kernel_initializ

#model.add(MaxPool2D(2,2))

model.add(Conv2D(filters=128,kernel_size=(3,3),padding="same",activation="relu",kernel_initializer
model.add(Conv2D(filters=256,kernel_size=(3,3),padding="same",activation="relu",kernel_initializer

model.add(Flatten())

model.add(Dense(256,activation="relu"))

#model.add(Dropout(.5))

model.add(Dense(256,activation="relu"))

#model.add(Dropout(.5))

model.add(Dense(1,activation="softmax"))

model.compile(optimizer=opt,loss="binary_crossentropy",metrics=["accuracy"])

return model
```

Model 2

```python
def catvsdog2(): model = Sequential()

model.add(Conv2D(32, (3, 3), input_shape=(128,128,3))) model.add(Activation("relu")) model.add(

model.add(Conv2D(32, (3, 3))) model.add(Activation("relu")) model.add(MaxPool2D(pool_size=(2,

model.add(Flatten()) model.add(Dense(16)) model.add(Activation("relu")) model.add(Dropout(0.5)

model.add(Activation("sigmoid"))

model.compile(loss="binary_crossentropy", optimizer="rmsprop", metrics=["accuracy"]) return moc
```

Model - 3

```python
def catvsdog3():
  model = Sequential()

  model.add(Conv2D(32, (3, 3), input_shape=(175,175,3)))
  model.add(Activation("relu"))
  model.add(MaxPool2D(pool_size=(2, 2)))

  model.add(Conv2D(64, (3, 3)))
  model.add(Activation("relu"))
  model.add(MaxPool2D(pool_size=(2, 2)))

  model.add(Conv2D(101, (3, 3)))
  model.add(Activation("relu"))
  model.add(Conv2D(64, (3, 3)))
  model.add(Activation("relu"))
  model.add(AvgPool2D(pool_size=(2, 2)))


  model.add(Conv2D(32, (3, 3)))
  model.add(Activation("relu"))
  model.add(MaxPool2D(pool_size=(2, 2)))

  model.add(Flatten())
  model.add(Dense(24))
  model.add(Activation("relu"))
  model.add(Dropout(0.25))
  model.add(Dense(15))
  model.add(Activation("relu"))
  model.add(Dropout(0.1))
  model.add(Dense(1))
  model.add(Activation("sigmoid"))

  model.compile(loss="binary_crossentropy",
                optimizer="rmsprop",
                metrics=["accuracy"])
  return model
```

```python
#model1 = catvsdog(Adam())
#model2 = catvsdog2()
model3 = catvsdog3()
```

```
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl
Instructions for updating:
Please use `rate` instead of `keep_prob`. Rate should be set to `rate = 1 - keep_prob
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/optimizers.py:79

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/tensorflow_core/python
Instructions for updating:
Use tf.where in 2.0, which has the same broadcast rule as np.where
```

Learning Rate optimize

```
1   reduce_lr = ReduceLROnPlateau(monitor='val_acc', patience=4, min_lr=0.0001)
```

Data Argumentation

```
1   datagen = ImageDataGenerator(
2       shear_range=0.1,
3       zoom_range=0.2,
4       rescale=1.0/255.0,
5       rotation_range = 20,
6       horizontal_flip=True,
7       vertical_flip=True,)
8   datagen.fit(x_train)
```

Fitting Model

```
1   mod = model3.fit(datagen.flow(x_train,y_train,batch_size=30),validation_data=(x_train
```

```
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

Epoch 1/50
WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

WARNING:tensorflow:From /usr/local/lib/python3.6/dist-packages/keras/backend/tensorfl

559/559 [==============================] - 124s 221ms/step - loss: 0.6746 - acc: 0.58
Epoch 2/50
559/559 [==============================] - 110s 197ms/step - loss: 0.6227 - acc: 0.65
Epoch 3/50
559/559 [==============================] - 109s 195ms/step - loss: 0.5998 - acc: 0.68
Epoch 4/50
559/559 [==============================] - 109s 194ms/step - loss: 0.5734 - acc: 0.70
Epoch 5/50
559/559 [==============================] - 109s 195ms/step - loss: 0.5568 - acc: 0.72
Epoch 6/50
559/559 [==============================] - 108s 193ms/step - loss: 0.5266 - acc: 0.74
Epoch 7/50
559/559 [==============================] - 108s 194ms/step - loss: 0.5118 - acc: 0.75
Epoch 8/50
559/559 [==============================] - 108s 193ms/step - loss: 0.4911 - acc: 0.76
Epoch 9/50
559/559 [==============================] - 109s 194ms/step - loss: 0.4750 - acc: 0.78
Epoch 10/50
559/559 [==============================] - 109s 194ms/step - loss: 0.4647 - acc: 0.78
Epoch 11/50
559/559 [==============================] - 108s 193ms/step - loss: 0.4483 - acc: 0.79
Epoch 12/50
559/559 [==============================] - 108s 194ms/step - loss: 0.4367 - acc: 0.80
Epoch 13/50
559/559 [==============================] - 109s 194ms/step - loss: 0.4246 - acc: 0.80
Epoch 14/50
559/559 [==============================] - 108s 193ms/step - loss: 0.3347 - acc: 0.85
Epoch 15/50
559/559 [==============================] - 107s 191ms/step - loss: 0.3194 - acc: 0.86
Epoch 16/50
559/559 [==============================] - 107s 191ms/step - loss: 0.3110 - acc: 0.87
Epoch 17/50
559/559 [==============================] - 105s 189ms/step - loss: 0.3093 - acc: 0.86
Epoch 18/50
559/559 [==============================] - 106s 189ms/step - loss: 0.3053 - acc: 0.87
Epoch 19/50
559/559 [==============================] - 107s 191ms/step - loss: 0.3027 - acc: 0.87
Epoch 20/50
559/559 [==============================] - 106s 190ms/step - loss: 0.3003 - acc: 0.87
Epoch 21/50
559/559 [==============================] - 107s 191ms/step - loss: 0.2958 - acc: 0.87
Epoch 22/50
559/559 [==============================] - 107s 191ms/step - loss: 0.2935 - acc: 0.87
Epoch 23/50
```

```
559/559 [==============================] - 105s 189ms/step - loss: 0.2929 - acc: 0.87
Epoch 24/50
559/559 [==============================] - 104s 186ms/step - loss: 0.2859 - acc: 0.88
Epoch 25/50
559/559 [==============================] - 106s 190ms/step - loss: 0.2825 - acc: 0.88
Epoch 26/50
559/559 [==============================] - 107s 191ms/step - loss: 0.2824 - acc: 0.88
Epoch 27/50
559/559 [==============================] - 106s 190ms/step - loss: 0.2792 - acc: 0.88
Epoch 28/50
559/559 [==============================] - 105s 188ms/step - loss: 0.2792 - acc: 0.88
Epoch 29/50
559/559 [==============================] - 104s 187ms/step - loss: 0.2769 - acc: 0.88
Epoch 30/50
559/559 [==============================] - 106s 189ms/step - loss: 0.2732 - acc: 0.88
Epoch 31/50
559/559 [==============================] - 105s 187ms/step - loss: 0.2711 - acc: 0.89
Epoch 32/50
559/559 [==============================] - 105s 188ms/step - loss: 0.2718 - acc: 0.88
Epoch 33/50
559/559 [==============================] - 105s 188ms/step - loss: 0.2723 - acc: 0.88
Epoch 34/50
559/559 [==============================] - 106s 190ms/step - loss: 0.2638 - acc: 0.89
Epoch 35/50
559/559 [==============================] - 105s 188ms/step - loss: 0.2635 - acc: 0.89
Epoch 36/50
559/559 [==============================] - 106s 189ms/step - loss: 0.2655 - acc: 0.89
Epoch 37/50
559/559 [==============================] - 105s 188ms/step - loss: 0.2685 - acc: 0.89
Epoch 38/50
559/559 [==============================] - 105s 187ms/step - loss: 0.2592 - acc: 0.89
Epoch 39/50
559/559 [==============================] - 105s 187ms/step - loss: 0.2596 - acc: 0.89
Epoch 40/50
559/559 [==============================] - 106s 190ms/step - loss: 0.2577 - acc: 0.89
Epoch 41/50
559/559 [==============================] - 105s 189ms/step - loss: 0.2528 - acc: 0.89
Epoch 42/50
559/559 [==============================] - 106s 189ms/step - loss: 0.2651 - acc: 0.89
Epoch 43/50
559/559 [==============================] - 106s 189ms/step - loss: 0.2569 - acc: 0.89
Epoch 44/50
559/559 [==============================] - 104s 187ms/step - loss: 0.2528 - acc: 0.89
Epoch 45/50
559/559 [==============================] - 107s 191ms/step - loss: 0.2533 - acc: 0.89
Epoch 46/50
559/559 [==============================] - 106s 190ms/step - loss: 0.2522 - acc: 0.89
Epoch 47/50
559/559 [==============================] - 104s 186ms/step - loss: 0.2511 - acc: 0.89
Epoch 48/50
559/559 [==============================] - 105s 188ms/step - loss: 0.2561 - acc: 0.89
Epoch 49/50
559/559 [==============================] - 104s 187ms/step - loss: 0.2539 - acc: 0.89
Epoch 50/50
559/559 [==============================] - 105s 188ms/step - loss: 0.2493 - acc: 0.90
```

# Evaluation

```
1    print(mod.history.keys())
```

```
dict_keys(['val_loss', 'val_acc', 'loss', 'acc', 'lr'])
```

```
1    # summarize history for accuracy
2    plt.plot(mod.history['acc'])
3    plt.plot(mod.history['val_acc'])
4    plt.title('model accuracy')
5    plt.ylabel('accuracy')
6    plt.xlabel('epoch')
7    plt.legend(['train', 'test'], loc='upper left')
8    plt.show()
9
```
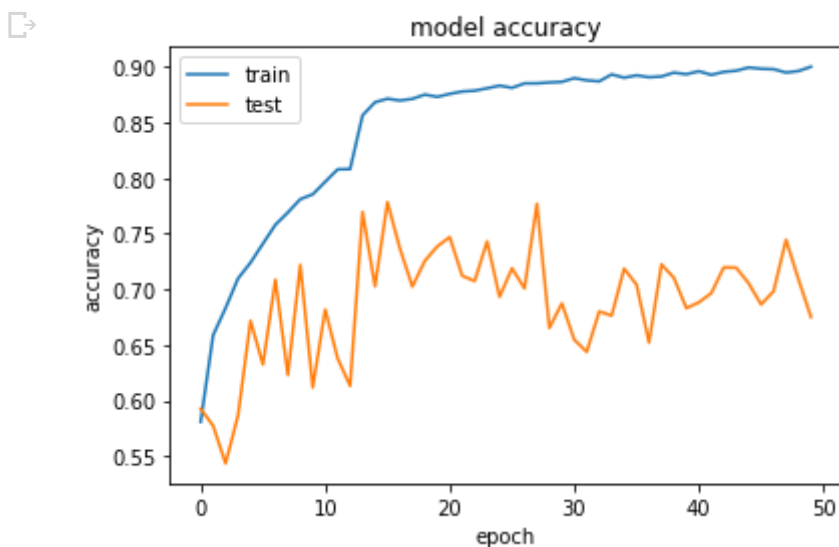


```
1    # summarize mod for loss
2    plt.plot(mod.history['loss'])
3    plt.plot(mod.history['val_loss'])
4    plt.title('model loss')
5    plt.ylabel('loss')
6    plt.xlabel('epoch')
7    plt.legend(['train', 'test'], loc='upper left')
8    plt.show()
```
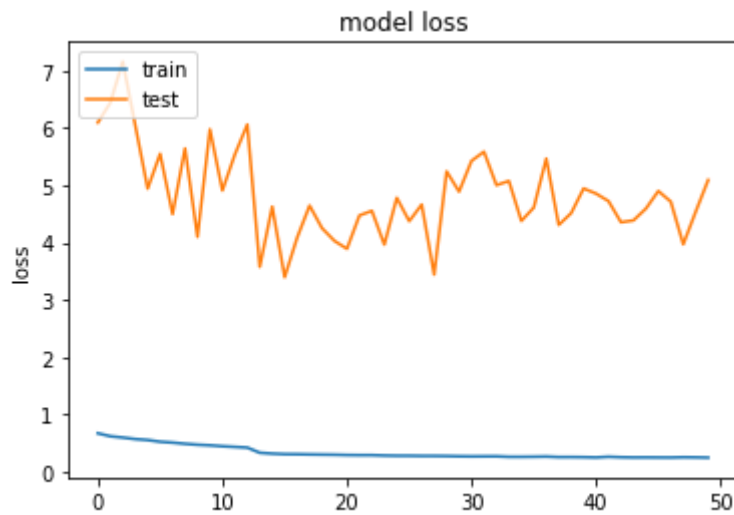
```
1  y_pred = model3.predict(x_test)
2  y_pred[:5]
```

```
array([[1.],
       [1.],
       [1.],
       [1.],
       [1.]], dtype=float32)
```

```
1  print(accuracy_score(y_pred.round(),y_test))
2  confusion_matrix(y_pred.round(),y_test)
```

```
0.6678787878787878
array([[1454,   89],
       [2651, 4056]])
```

```
1
```

```
1
```

```
1  preds = model3.predict(test)
```

```
1  rst = pd.DataFrame(preds.astype(int),columns=["label"])
2  rst["id"] = pd.Series(range(1,(len(preds)+1)))
3  sub = rst[["id","label"]]
4  #p = np.array(preds)
5  sub.to_csv("submission.csv",index=False)
```

```
1  sub[:3]
```

	id	label
0	1	1
1	2	0
2	3	0

```
1  sam_sub[:3]
```

	id	label
0	1	0.5
1	2	0.5
2	3	0.5

```
1  preds.astype(int)
```

```
array([[1],
       [0],
       [0],
       ...,
       [0],
       [1],
       [1]])
```

```
1  len(preds)
```

```
12500
```

```
1  sub.shape
```

```
(12500, 2)
```

```
1
```