dogs-vs-cats-classification

January 31, 2024

0.1 Dataset Information

The training archive contains 25,000 images of dogs and cats. Train your algorithm on these files and predict the labels

(1 = dog, 0 = cat).

0.2 Download Dataset

[ ]:

```
!wget https://download.microsoft.com/download/3/E/1/
 ↪3E1C3F21-ECDB-4869-8368-6DEBA77B919F/kagglecatsanddogs_5340.zip
```

```
--2021-05-06 16:04:20--  https://download.microsoft.com/download/3/E/1/3E1C3F21-
ECDB-4869-8368-6DEBA77B919F/kagglecatsanddogs_3367a.zip
Resolving download.microsoft.com (download.microsoft.com)… 23.78.216.154,
2600:1417:8000:980::e59, 2600:1417:8000:9b2::e59
Connecting to download.microsoft.com
(download.microsoft.com)|23.78.216.154|:443… connected.
HTTP request sent, awaiting response… 200 OK
Length: 824894548 (787M) [application/octet-stream]
Saving to: ‘kagglecatsanddogs_3367a.zip’

kagglecatsanddogs_3 100%[===================>] 786.68M   187MB/s    in 4.3s

2021-05-06 16:04:24 (183 MB/s) - ‘kagglecatsanddogs_3367a.zip’ saved
[824894548/824894548]
```

0.3 Unzip the Dataset

[1]:

```
# !unzip kagglecatsanddogs_3367a.zip
```

0.4 Import Modules

[ ]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
import os
import tqdm
import random
from keras.preprocessing.image import load_img
warnings.filterwarnings('ignore')
```

0.5 Create Dataframe for Input and Output

[ ]:

```
input_path = []
label = []

for class_name in os.listdir("PetImages"):
    for path in os.listdir("PetImages/"+class_name):
        if class_name == 'Cat':
            label.append(0)
        else:
            label.append(1)
        input_path.append(os.path.join("PetImages", class_name, path))
print(input_path[0], label[0])
```

```
PetImages/Dog/4253.jpg 1
```

[ ]:

```
df = pd.DataFrame()
df['images'] = input_path
df['label'] = label
df = df.sample(frac=1).reset_index(drop=True)
df.head()
```

[ ]:

```
                   images  label
0    PetImages/Dog/67.jpg      1
1  PetImages/Dog/8273.jpg      1
2  PetImages/Dog/9117.jpg      1
3   PetImages/Cat/654.jpg      0
4  PetImages/Cat/6418.jpg      0
```

[ ]:

```
for i in df['images']:
    if '.jpg' not in i:
        print(i)
```

```
PetImages/Cat/Thumbs.db
PetImages/Dog/Thumbs.db
```

[ ]:

```
import PIL
l = []
for image in df['images']:
    try:
        img = PIL.Image.open(image)
    except:
        l.append(image)
l
```

[ ]:

```
['PetImages/Cat/666.jpg',
 'PetImages/Cat/Thumbs.db',
 'PetImages/Dog/Thumbs.db',
 'PetImages/Dog/11702.jpg']
```

[ ]:

```
# delete db files
df = df[df['images']!='PetImages/Dog/Thumbs.db']
df = df[df['images']!='PetImages/Cat/Thumbs.db']
df = df[df['images']!='PetImages/Cat/666.jpg']
df = df[df['images']!='PetImages/Dog/11702.jpg']
len(df)
```

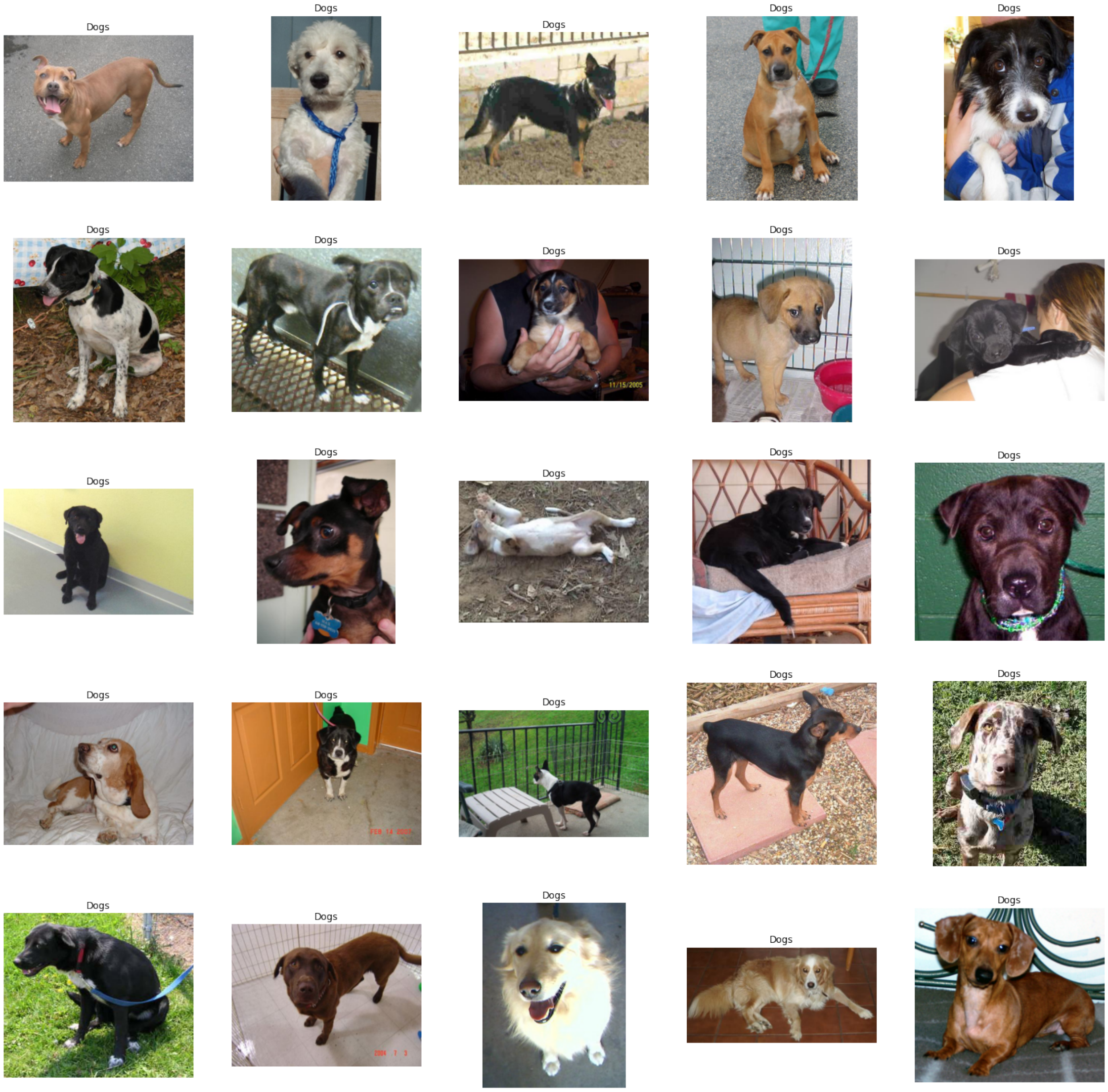
[ ]:

```
24998
```

0.6 Exploratory Data Analysis

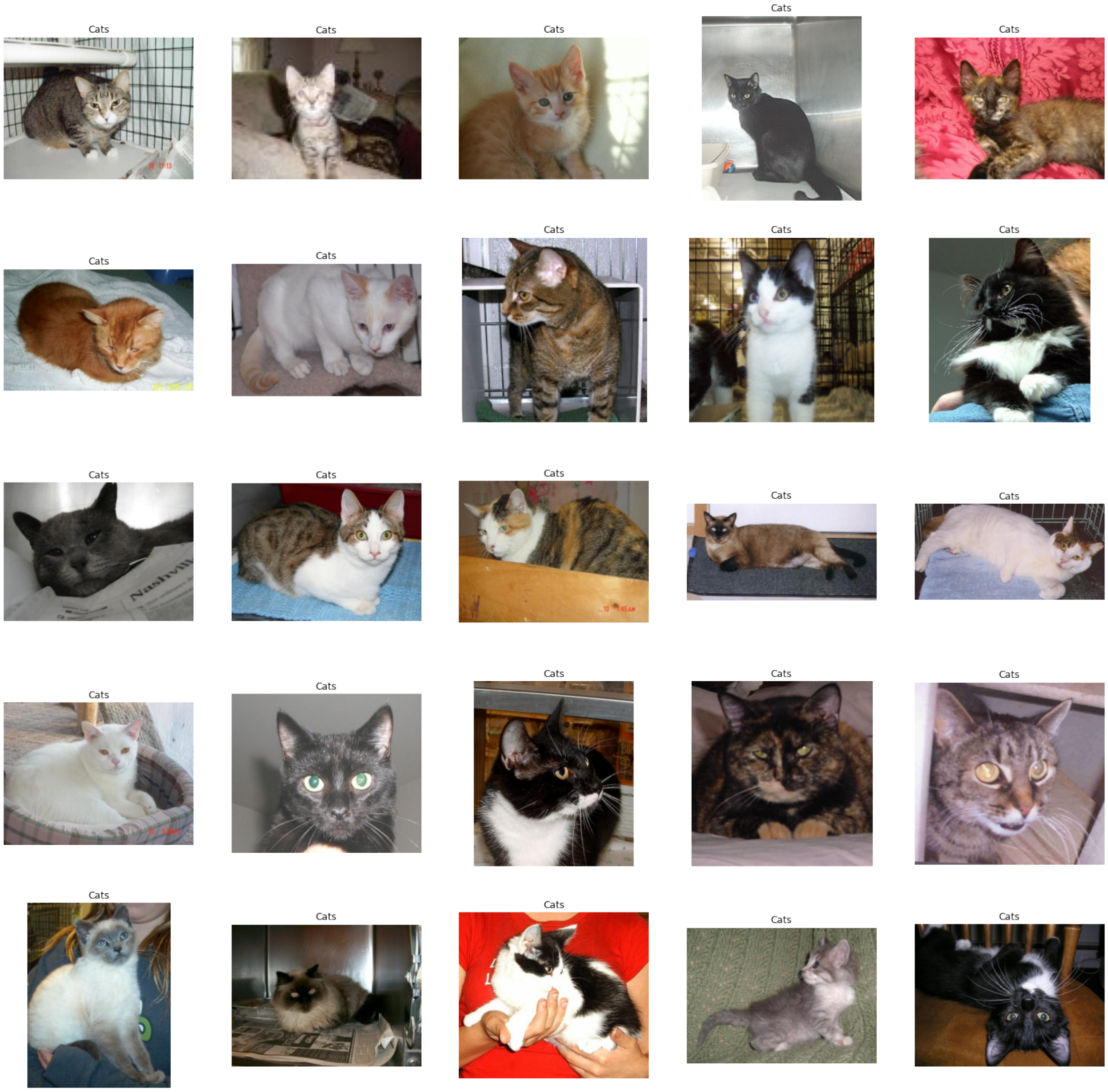
[ ]:

```
# to display grid of images
plt.figure(figsize=(25,25))
temp = df[df['label']==1]['images']
start = random.randint(0, len(temp))
files = temp[start:start+25]

for index, file in enumerate(files):
    plt.subplot(5,5, index+1)
    img = load_img(file)
    img = np.array(img)
    plt.imshow(img)
    plt.title('Dogs')
    plt.axis('off')
```



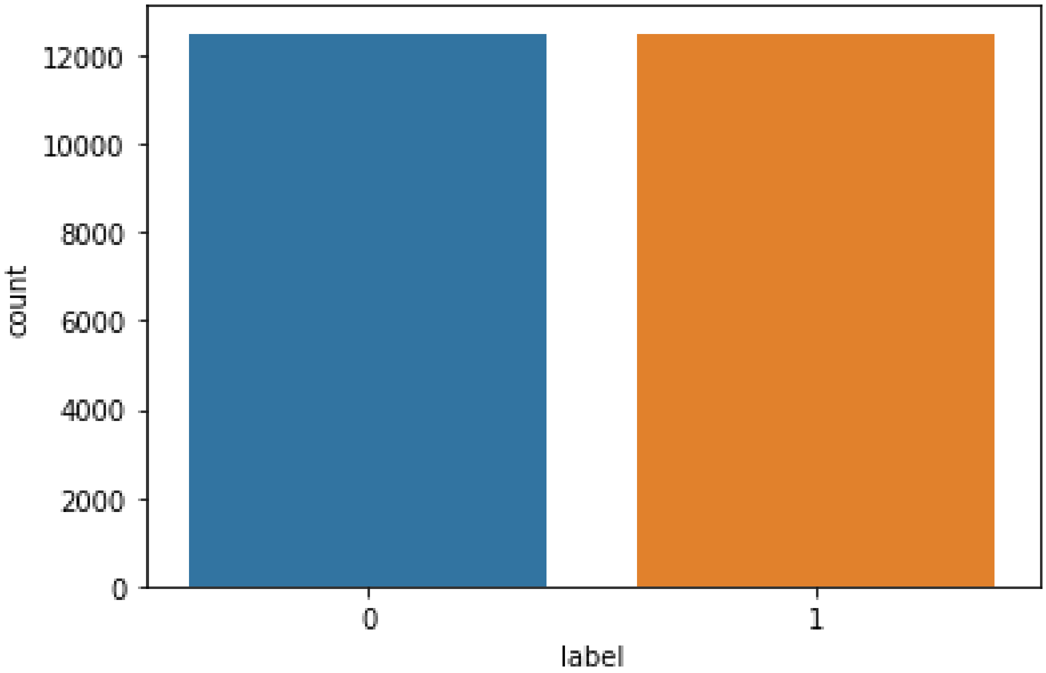
[ ]:

```
# to display grid of images
plt.figure(figsize=(25,25))
temp = df[df['label']==0]['images']
start = random.randint(0, len(temp))
files = temp[start:start+25]

for index, file in enumerate(files):
    plt.subplot(5,5, index+1)
    img = load_img(file)
    img = np.array(img)
    plt.imshow(img)
    plt.title('Cats')
    plt.axis('off')
```



```
[ ]: import seaborn as sns
     sns.countplot(df['label'])
```

```
[ ]: <matplotlib.axes._subplots.AxesSubplot at 0x7f71e0c80190>
```



0.7 Create DataGenerator for the Images

[ ]:
```
df['label'] = df['label'].astype('str')
```

[ ]:
```
df.head()
```

[ ]:
```
                  images label
0    PetImages/Dog/67.jpg     1
1  PetImages/Dog/8273.jpg     1
2  PetImages/Dog/9117.jpg     1
3   PetImages/Cat/654.jpg     0
4  PetImages/Cat/6418.jpg     0
```

[ ]:
```
# input split
from sklearn.model_selection import train_test_split
train, test = train_test_split(df, test_size=0.2, random_state=42)
```

[ ]:
```
from keras.preprocessing.image import ImageDataGenerator
train_generator = ImageDataGenerator(
    rescale = 1./255,  # normalization of images
    rotation_range = 40, # augmention of images to avoid overfitting
    shear_range = 0.2,
    zoom_range = 0.2,
    horizontal_flip = True,
    fill_mode = 'nearest'
)

val_generator = ImageDataGenerator(rescale = 1./255)

train_iterator = train_generator.flow_from_dataframe(
    train,
    x_col='images',
    y_col='label',
    target_size=(128,128),
    batch_size=512,
    class_mode='binary'
)

val_iterator = val_generator.flow_from_dataframe(
    test,
    x_col='images',
    y_col='label',
    target_size=(128,128),
    batch_size=512,
    class_mode='binary'
)
```

```
Found 19998 validated image filenames belonging to 2 classes.
Found 5000 validated image filenames belonging to 2 classes.
```

0.8 Model Creation

[ ]:

```
from keras import Sequential
from keras.layers import Conv2D, MaxPool2D, Flatten, Dense

model = Sequential([
                    Conv2D(16, (3,3), activation='relu',␣
 ↪input_shape=(128,128,3)),
                    MaxPool2D((2,2)),
                    Conv2D(32, (3,3), activation='relu'),
                    MaxPool2D((2,2)),
                    Conv2D(64, (3,3), activation='relu'),
                    MaxPool2D((2,2)),
                    Flatten(),
                    Dense(512, activation='relu'),
                    Dense(1, activation='sigmoid')
])
```

[ ]:

```
model.compile(optimizer='adam', loss='binary_crossentropy',␣
 ↪metrics=['accuracy'])
model.summary()
```

```
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_12 (Conv2D)           (None, 126, 126, 16)      448
_________________________________________________________________
max_pooling2d_12 (MaxPooling (None, 63, 63, 16)        0
_________________________________________________________________
conv2d_13 (Conv2D)           (None, 61, 61, 32)        4640
_________________________________________________________________
max_pooling2d_13 (MaxPooling (None, 30, 30, 32)        0
_________________________________________________________________
conv2d_14 (Conv2D)           (None, 28, 28, 64)        18496
_________________________________________________________________
max_pooling2d_14 (MaxPooling (None, 14, 14, 64)        0
_________________________________________________________________
flatten_4 (Flatten)          (None, 12544)             0
_________________________________________________________________
dense_8 (Dense)              (None, 512)               6423040
_________________________________________________________________
dense_9 (Dense)              (None, 1)                 513
=================================================================
Total params: 6,447,137
Trainable params: 6,447,137
Non-trainable params: 0
_________________________________________________________________
```

```
[ ]: history = model.fit(train_iterator, epochs=10, validation_data=val_iterator)
```

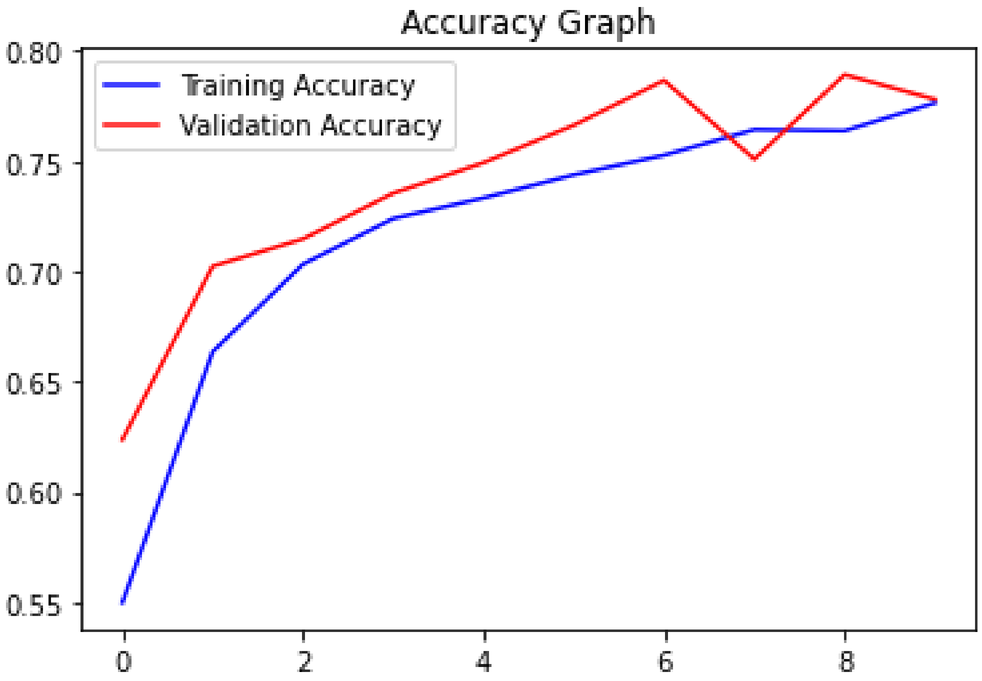
```
Epoch 1/10
40/40 [==============================] - 150s 4s/step - loss: 0.8679 - accuracy:
0.5187 - val_loss: 0.6399 - val_accuracy: 0.6238
Epoch 2/10
40/40 [==============================] - 147s 4s/step - loss: 0.6280 - accuracy:
0.6416 - val_loss: 0.5672 - val_accuracy: 0.7024
Epoch 3/10
40/40 [==============================] - 146s 4s/step - loss: 0.5737 - accuracy:
0.6980 - val_loss: 0.5493 - val_accuracy: 0.7148
Epoch 4/10
40/40 [==============================] - 146s 4s/step - loss: 0.5478 - accuracy:
0.7221 - val_loss: 0.5351 - val_accuracy: 0.7356
Epoch 5/10
40/40 [==============================] - 145s 4s/step - loss: 0.5276 - accuracy:
0.7338 - val_loss: 0.5104 - val_accuracy: 0.7494
Epoch 6/10
40/40 [==============================] - 144s 4s/step - loss: 0.5127 - accuracy:
0.7405 - val_loss: 0.4853 - val_accuracy: 0.7664
Epoch 7/10
```

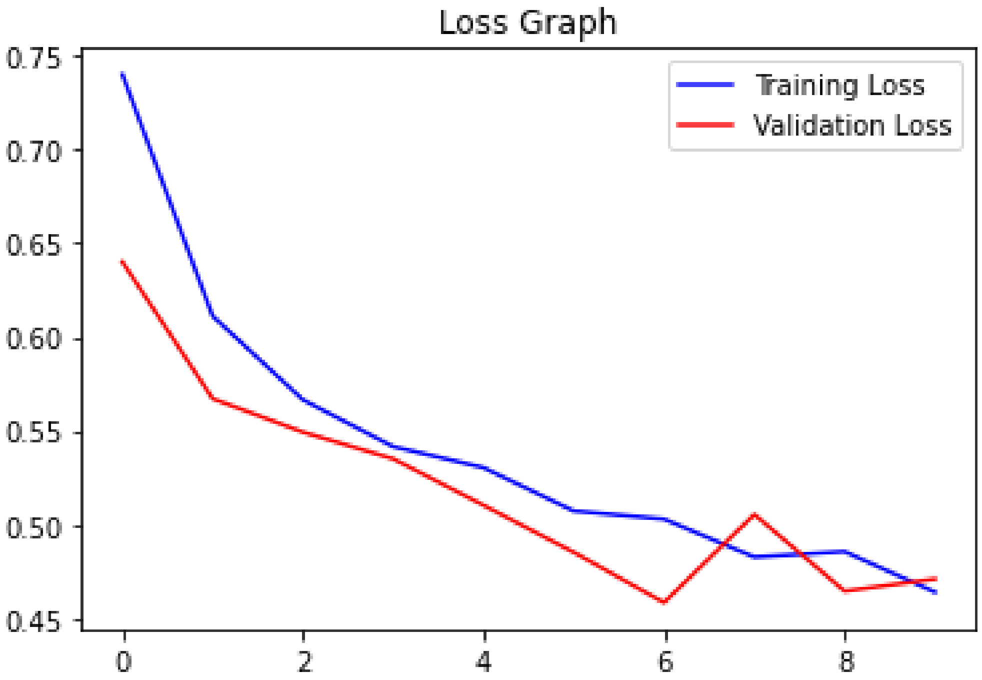
```
40/40 [==============================] - 144s 4s/step - loss: 0.5059 - accuracy:
0.7544 - val_loss: 0.4586 - val_accuracy: 0.7868
Epoch 8/10
40/40 [==============================] - 143s 4s/step - loss: 0.4842 - accuracy:
0.7644 - val_loss: 0.5054 - val_accuracy: 0.7510
Epoch 9/10
40/40 [==============================] - 143s 4s/step - loss: 0.4971 - accuracy:
0.7530 - val_loss: 0.4647 - val_accuracy: 0.7894
Epoch 10/10
40/40 [==============================] - 142s 4s/step - loss: 0.4642 - accuracy:
0.7770 - val_loss: 0.4711 - val_accuracy: 0.7782
```

0.9 Visualization of Results

[ ]:

```
acc = history.history['accuracy']
val_acc = history.history['val_accuracy']
epochs = range(len(acc))

plt.plot(epochs, acc, 'b', label='Training Accuracy')
plt.plot(epochs, val_acc, 'r', label='Validation Accuracy')
plt.title('Accuracy Graph')
plt.legend()
plt.figure()

loss = history.history['loss']
val_loss = history.history['val_loss']
plt.plot(epochs, loss, 'b', label='Training Loss')
plt.plot(epochs, val_loss, 'r', label='Validation Loss')
plt.title('Loss Graph')
plt.legend()
plt.show()
```


Accuracy Graph
Training Accuracy
Validation Accuracy
0.80
0.75
0.70
0.65
0.60
0.55
0
2
4
6
8


Loss Graph
Training Loss
Validation Loss
0.75
0.70
0.65
0.60
0.55
0.50
0.45
0
2
4
6
8

[ ]:

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[ ]: