Cat and Dog Image Classifier

In the realm of computer vision, the ability to distinguish between different objects within images is a fundamental challange. One such task is the classification of images into distinct categories, a task that has seen significant advancements with the aid of machine learning technique. This project focuses on building an image classifier capable of accurately differentiating between images of cats and dogs.

Fetching data from kaggle

In [2]:
```
!mkdir -p ~/.kaggle
!cp kaggle.json ~/.kaggle/
```

In [3]:
```
!kaggle datasets download -d salader/dogs-vs-cats
```

```
Warning: Your Kaggle API key is readable by other users on this system! To fix this, you can run 'chmod 600 /roo
t/.kaggle/kaggle.json'
Downloading dogs-vs-cats.zip to /content
 99% 1.06G/1.06G [00:12<00:00, 177MB/s]
100% 1.06G/1.06G [00:12<00:00, 92.5MB/s]
```

The data that we have is in zip format so now we'll unzip the data

In [4]:
```
import zipfile
zip_ref = zipfile.ZipFile('/content/dogs-vs-cats.zip', 'r')
zip_ref.extractall('/content')
zip_ref.close()
```

Importing required libraries

In [5]:
```
import tensorflow as tf
from tensorflow import keras
from keras import Sequential
from keras.layers import Dense,Conv2D,MaxPooling2D,Flatten,BatchNormalization,Dropout
```

Here, we'll use generators to divide data in different batches.

so, what are generators ? In the context of python programming and particulary when dealing with data processing, generators are a type of iterable object that can be used to generate a sequence of values dynamically. They provide a way to iterate over large or potentially infinite sequences without needing to store them in memory all at once.

In [6]:
```
#generators
train_ds=keras.utils.image_dataset_from_directory(
    directory = '/content/train',
    labels='inferred',
    label_mode ='int',
    batch_size=32,
    image_size=(256,256)
)

validation_ds=keras.utils.image_dataset_from_directory(
    directory = '/content/test',
    labels='inferred',
    label_mode ='int',
    batch_size=32,
    image_size=(256,256)
)
```

```
Found 20000 files belonging to 2 classes.
Found 5000 files belonging to 2 classes.
```

the each array that we have is of value from 0 to 255 and we need to make that value to 0 to 1 so we'll normalizing it to get the better result of our model.

In [7]:
```
#normalize
def process(image,label):
  image = tf.cast(image/255. ,tf.float32)
```

```
    return image,label

train_ds = train_ds.map(process)
validation_ds = validation_ds.map(process)
```

CNN Model

In [8]:
```
#create CNN model

model = Sequential()

model.add(Conv2D(32,kernel_size=(3,3),padding='valid',activation='relu',input_shape=(256,256,3)))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2,3),strides=2,padding='valid'))

model.add(Conv2D(64,kernel_size=(3,3),padding='valid',activation='relu'))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2,3),strides=2,padding='valid'))

model.add(Conv2D(128,kernel_size=(3,3),padding='valid',activation='relu'))
model.add(BatchNormalization())
model.add(MaxPooling2D(pool_size=(2,3),strides=2,padding='valid'))

model.add(Flatten())

model.add(Dense(128,activation='relu'))
model.add(Dropout(0.1))
model.add(Dense(64,activation='relu'))
model.add(Dropout(0.1))
model.add(Dense(1,activation='sigmoid'))
```

In [9]:
```
model.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 conv2d (Conv2D)             (None, 254, 254, 32)      896       
                                                                 
 batch_normalization (Batch  (None, 254, 254, 32)      128       
 Normalization)                                                  
                                                                 
 max_pooling2d (MaxPooling2  (None, 127, 126, 32)      0         
 D)                                                              
                                                                 
 conv2d_1 (Conv2D)           (None, 125, 124, 64)      18496     
                                                                 
 batch_normalization_1 (Bat  (None, 125, 124, 64)      256       
 chNormalization)                                                
                                                                 
 max_pooling2d_1 (MaxPoolin  (None, 62, 61, 64)        0         
 g2D)                                                            
                                                                 
 conv2d_2 (Conv2D)           (None, 60, 59, 128)       73856     
                                                                 
 batch_normalization_2 (Bat  (None, 60, 59, 128)       512       
 chNormalization)                                                
                                                                 
 max_pooling2d_2 (MaxPoolin  (None, 30, 29, 128)       0         
 g2D)                                                            
                                                                 
 flatten (Flatten)           (None, 111360)            0         
                                                                 
 dense (Dense)               (None, 128)               14254208  
                                                                 
 dropout (Dropout)           (None, 128)               0         
                                                                 
 dense_1 (Dense)             (None, 64)                8256      
                                                                 
 dropout_1 (Dropout)         (None, 64)                0         
                                                                 
 dense_2 (Dense)             (None, 1)                 65        
                                                                 
=================================================================
Total params: 14356673 (54.77 MB)
Trainable params: 14356225 (54.76 MB)
Non-trainable params: 448 (1.75 KB)
_________________________________________________________________
```

In [10]:
```
model.compile(optimizer='adam',loss='binary_crossentropy',metrics=['accuracy'])
```

In [11]:
```
history=model.fit(train_ds,epochs=10,validation_data=validation_ds)
```

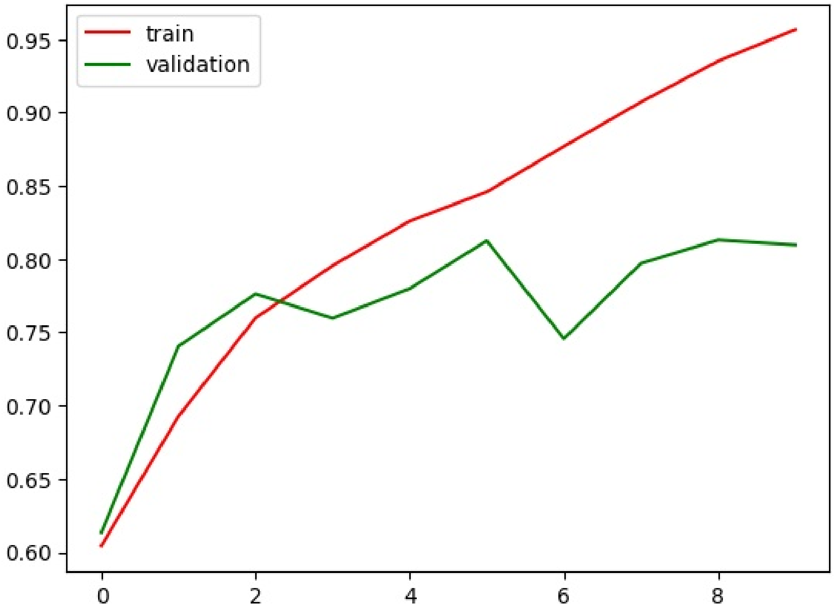
```
Epoch 1/10
625/625 [==============================] - 78s 109ms/step - loss: 1.3636 - accuracy: 0.6043 - val_loss: 0.8392 -
val_accuracy: 0.6134
Epoch 2/10
625/625 [==============================] - 65s 104ms/step - loss: 0.6082 - accuracy: 0.6926 - val_loss: 0.5231 -
val_accuracy: 0.7404
Epoch 3/10
625/625 [==============================] - 68s 109ms/step - loss: 0.4981 - accuracy: 0.7598 - val_loss: 0.4792 -
val_accuracy: 0.7762
Epoch 4/10
625/625 [==============================] - 66s 105ms/step - loss: 0.4440 - accuracy: 0.7955 - val_loss: 0.4915 -
val_accuracy: 0.7596
Epoch 5/10
625/625 [==============================] - 65s 103ms/step - loss: 0.3941 - accuracy: 0.8259 - val_loss: 0.4610 -
val_accuracy: 0.7798
Epoch 6/10
625/625 [==============================] - 67s 107ms/step - loss: 0.3501 - accuracy: 0.8458 - val_loss: 0.4569 -
val_accuracy: 0.8124
Epoch 7/10
625/625 [==============================] - 64s 102ms/step - loss: 0.2867 - accuracy: 0.8769 - val_loss: 0.7153 -
val_accuracy: 0.7456
Epoch 8/10
625/625 [==============================] - 67s 106ms/step - loss: 0.2231 - accuracy: 0.9071 - val_loss: 0.5901 -
val_accuracy: 0.7970
Epoch 9/10
625/625 [==============================] - 67s 107ms/step - loss: 0.1634 - accuracy: 0.9351 - val_loss: 0.4636 -
val_accuracy: 0.8130
Epoch 10/10
625/625 [==============================] - 65s 103ms/step - loss: 0.1179 - accuracy: 0.9565 - val_loss: 0.5757 -
val_accuracy: 0.8096
```

Plotting graphs to see the result of training

In [13]:

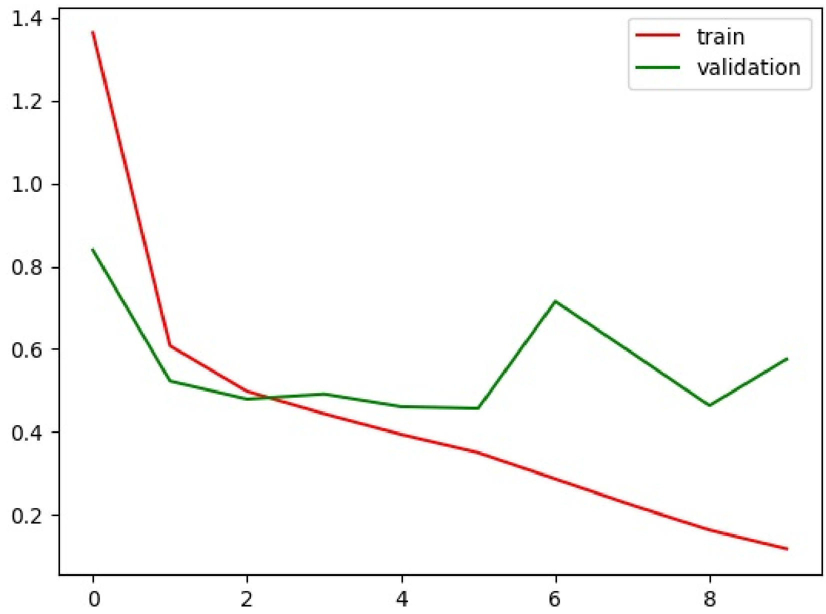
```
import matplotlib.pyplot as plt

plt.plot(history.history['accuracy'],color='red',label='train')
plt.plot(history.history['val_accuracy'],color='green',label='validation')
plt.legend()
plt.show()
```



In [14]:

```
plt.plot(history.history['loss'],color='red',label='train')
plt.plot(history.history['val_loss'],color='green',label='validation')
plt.legend()
plt.show()
```



Testing the given image

In [16]:
```
import cv2
```

In [17]:
```
test_img = cv2.imread('/content/cat.jpg')
```

In [18]:
```
plt.imshow(test_img)
```

Out[18]: <matplotlib.image.AxesImage at 0x7ef9506f3010>

In [19]:
```
test_img.shape
```

Out[19]: (180, 320, 3)

In [21]:
```
test_img = cv2.resize(test_img,(256,256))
```

In [22]:
```
test_input = test_img.reshape((1,256,256,3))
```

In [23]:
```
model.predict(test_input)
```

```
1/1 [==============================] - 0s 389ms/step
```

Out[23]: array([[0.]], dtype=float32)

Conclusion

As we can see from above code that it is giving as array([[0]]) position because the 1st input we have put is cat image and 2nd is dog image so 0 index for cat image and 1 for dg image.

In [ ]:

Loading [MathJax]/jax/output/CommonHTML/fonts/TeX/fontdata.js