Lab 6

Question:

Using Cat and Dog Identification Dataset Implement CNN using Keras and Tensorflow.

In [ ]:

```
# Imports
import os
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from matplotlib import image
import tensorflow as tf
from keras.preprocessing.image import ImageDataGenerator
from sklearn.model_selection import train_test_split
```

In [ ]:

```
tf.__version__
```

Out[ ]:

```
'2.8.0'
```

In [ ]:

```
# Folder and file locations
IMAGE_FOLDER = 'Images'
IMAGE_TRAIN_FOLDER = 'Images/train'
FILENAMES = os.listdir(IMAGE_TRAIN_FOLDER)
FILENAMES[0:5]
```

Out[ ]:

```
['dog.8011.jpg',
 'cat.5077.jpg',
 'dog.7322.jpg',
 'cat.2718.jpg',
 'cat.10151.jpg']
```

In [ ]:

```
# Generating dataframe of File paths and target variables
targets = list()
full_paths = list()
train_cats_dir = list()
train_dogs_dir = list()

# finding each file's target
for file_name in FILENAMES:
    target = file_name.split(".")[0] # target name
    full_path = os.path.join(IMAGE_TRAIN_FOLDER, file_name)

    if(target == "dog"):
        train_dogs_dir.append(full_path)
    if(target == "cat"):
        train_cats_dir.append(full_path)

    full_paths.append(full_path)
    targets.append(target)

dataset = pd.DataFrame() # make dataframe
dataset['image_path'] = full_paths # file path
dataset['target'] = targets # file's target
```

In [ ]:

```
dataset.head()
```

Out[ ]:

	image_path	target
0	Images/train/dog.8011.jpg	dog
1	Images/train/cat.5077.jpg	cat
2	Images/train/dog.7322.jpg	dog
3	Images/train/cat.2718.jpg	cat
4	Images/train/cat.10151.jpg	cat

In [ ]:

```
dataset['target'].value_counts()
```

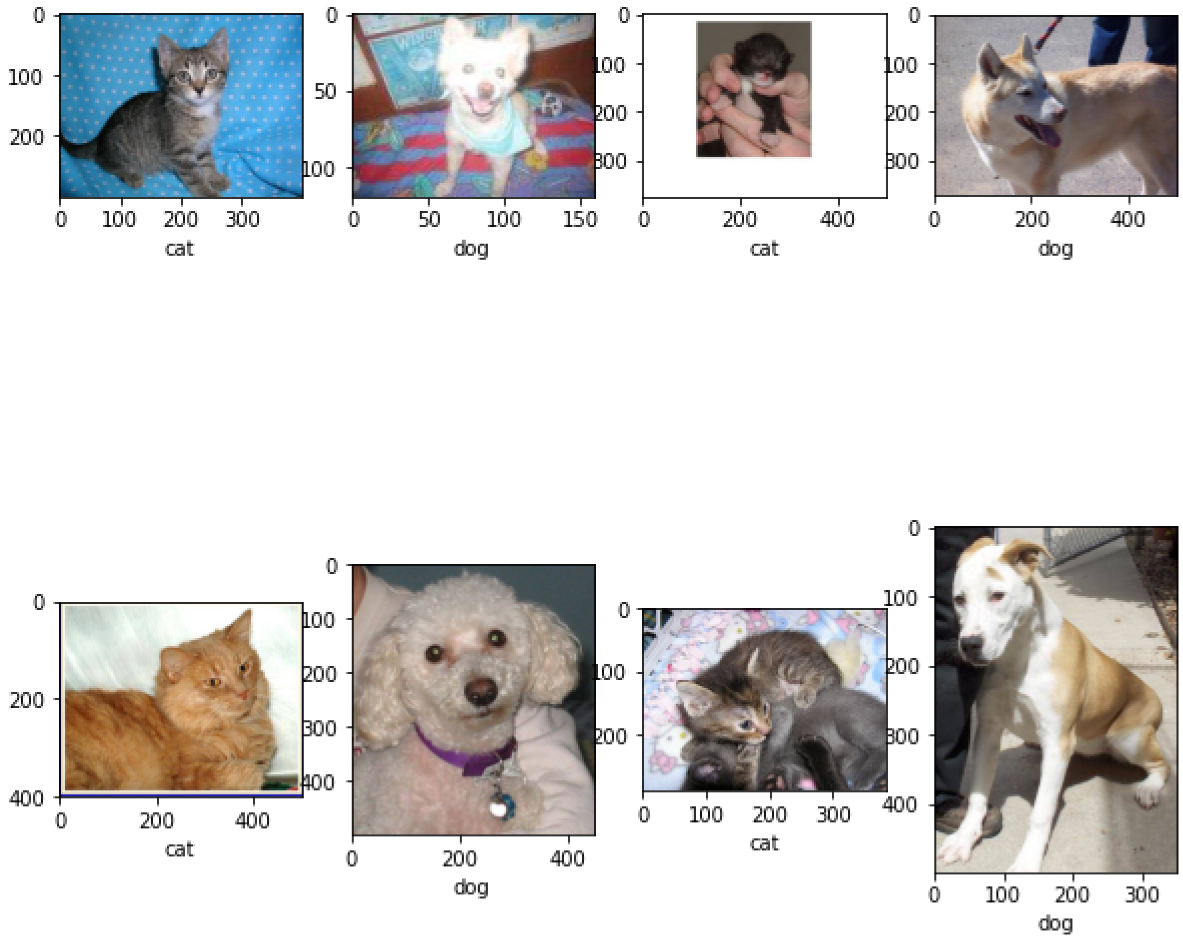
Out[ ]:

```
dog      12500
cat      12500
Name: target, dtype: int64
```

In [ ]:

```
# Show Images
col = 4
row = 2
# Showing cat images in odd places and dog images in evan places
plt.figure(figsize=(10,10))
for i in range(row*col):
    plt.subplot(row,col,i+1)
    plt.grid(False)
    if i % 2  == 0:
        cat = image.imread(train_cats_dir[i])
        plt.imshow(cat)
        plt.xlabel('cat')
    else:
        dog = image.imread(train_dogs_dir[i])
        plt.imshow(dog)
        plt.xlabel('dog')

plt.show()
```



In [ ]:

```
dataset_train, dataset_test = train_test_split(dataset, test_size=0.2, random_state=
```

In [ ]:

```
# Data Preprocessing
# Preprocessing the training data
training_data_generator = ImageDataGenerator(
                    rescale= 1./255,
                    shear_range= 0.2,
                    zoom_range= 0.2,
                    horizontal_flip= True)
training_set = training_data_generator.flow_from_dataframe(
                    dataframe = dataset_train,
                    x_col="image_path",
                    y_col="target",
                    target_size = (64,64),
                    batch_size = 32,
                    class_mode = 'binary'

)
```

```
Found 20000 validated image filenames belonging to 2 classes.
```

In [ ]:

```
testing_data_generator = ImageDataGenerator(
                    rescale= 1./255)
testing_set = testing_data_generator.flow_from_dataframe(
                    dataframe = dataset_test,
                    x_col="image_path",
                    y_col="target",
                    target_size= (64,64),
                    batch_size= 32,
                    class_mode= 'binary'
)
```

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

In [ ]:

```
# Initilization of the CNN
cnn = tf.keras.models.Sequential()
```

```
2022-05-31 19:12:48.608096: I tensorflow/core/platform/cpu_feature_guard.cc:151] This
TensorFlow binary is optimized with oneAPI Deep Neural Network Library (oneDNN) to us
e the following CPU instructions in performance-critical operations:  AVX2 FMA
To enable them in other operations, rebuild TensorFlow with the appropriate compiler
flags.
```

In [ ]:

```
# Part -1: Create first Calculation and pooling Layer
cnn.add(tf.keras.layers.Conv2D(filters=32, kernel_size= 3, activation="relu", input_s
cnn.add(tf.keras.layers.MaxPool2D(pool_size = 2, strides = 2))
```

In [ ]:

```
# Part -2: Create 2nd Calculation and pooling Layer
cnn.add(tf.keras.layers.Conv2D(filters=32, kernel_size= 3, activation="relu", input_s
cnn.add(tf.keras.layers.MaxPool2D(pool_size = 2, strides = 2))
```

In [ ]:

```
# Step -3: Flattening
cnn.add(tf.keras.layers.Flatten())
```

In [ ]:

```
# Step -4: FCNN with Relu
cnn.add(tf.keras.layers.Dense(units= 128,activation="relu"))
```

In [ ]:

```
# Step - 5: FCNN with Sigmoid
cnn.add(tf.keras.layers.Dense(units=1, activation="sigmoid"))
```

In [ ]:

```
# Step - 7: Optimiser and Loss
cnn.compile(optimizer ='adam',loss ='binary_crossentropy',metrics = ['accuracy'])
```

In [ ]:

```
cnn.summary()
```

```
Model: "sequential"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        896

 max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 29, 29, 32)        9248

 max_pooling2d_1 (MaxPooling  (None, 14, 14, 32)       0
 2D)

 flatten (Flatten)           (None, 6272)              0

 dense (Dense)               (None, 128)               802944

 dense_1 (Dense)             (None, 1)                 129

=================================================================
Total params: 813,217
Trainable params: 813,217
Non-trainable params: 0
_________________________________________________________________
```

In [ ]:

```
# Training the Model
modelHistory=cnn.fit(training_set,
                       epochs=10,
                       validation_data=testing_set,
                       validation_steps=dataset_test.shape[0]/150,
                       steps_per_epoch=dataset_train.shape[0]/150)
```

```
Epoch 1/10
133/133 [==============================] - 44s 328ms/step - loss: 0.5052 - accuracy:
0.7558 - val_loss: 0.4754 - val_accuracy: 0.7895
Epoch 2/10
133/133 [==============================] - 43s 326ms/step - loss: 0.5077 - accuracy:
0.7521 - val_loss: 0.4797 - val_accuracy: 0.7583
Epoch 3/10
133/133 [==============================] - 44s 326ms/step - loss: 0.4881 - accuracy:
0.7708 - val_loss: 0.5056 - val_accuracy: 0.7564
Epoch 4/10
133/133 [==============================] - 47s 349ms/step - loss: 0.4764 - accuracy:
0.7715 - val_loss: 0.4981 - val_accuracy: 0.7592
Epoch 5/10
133/133 [==============================] - 46s 345ms/step - loss: 0.4799 - accuracy:
0.7682 - val_loss: 0.4492 - val_accuracy: 0.7748
Epoch 6/10
133/133 [==============================] - 42s 314ms/step - loss: 0.4804 - accuracy:
0.7775 - val_loss: 0.4544 - val_accuracy: 0.7969
Epoch 7/10
133/133 [==============================] - 41s 307ms/step - loss: 0.4679 - accuracy:
0.7799 - val_loss: 0.4362 - val_accuracy: 0.8097
Epoch 8/10
133/133 [==============================] - 39s 295ms/step - loss: 0.4719 - accuracy:
0.7698 - val_loss: 0.4414 - val_accuracy: 0.7950
Epoch 9/10
133/133 [==============================] - 40s 298ms/step - loss: 0.4636 - accuracy:
0.7792 - val_loss: 0.4584 - val_accuracy: 0.7794
Epoch 10/10
133/133 [==============================] - 49s 359ms/step - loss: 0.4691 - accuracy:
0.7799 - val_loss: 0.4602 - val_accuracy: 0.7895
```

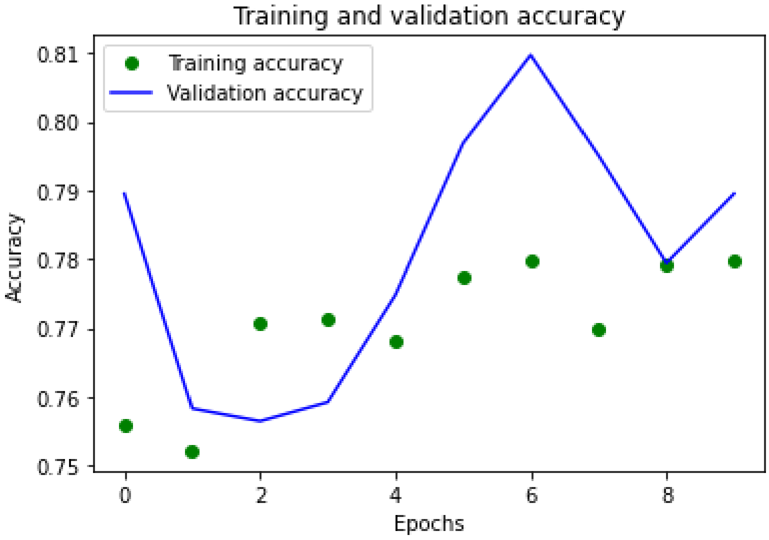
In [ ]:

```
# PRedicting accuracy of model
acc = modelHistory.history['accuracy']
```

```
val_acc = modelHistory.history['val_accuracy']

epochs = range(len(acc))

plt.plot(epochs, acc, 'go', label='Training accuracy')
plt.plot(epochs, val_acc, 'b', label='Validation accuracy')
plt.title('Training and validation accuracy')
plt.xlabel('Epochs')
plt.ylabel('Accuracy')
plt.legend()
_ = plt.show()
```


Training and validation accuracy
● Training accuracy
Validation accuracy
Accuracy
Epochs