Task_2: Cat and Dog Image Classifier

Author: Bandana Prakash

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Domain: Data Science

Task : We are developing image classification model to distinguish between images of cats and dogs.In this model I've taken a sample dataset from kaggle that contains different images of cats and dogs in two separate folders.

Libraries used :

Pandas – This library is used to load 2D array format and DataFrames.

Numpy – Numpy library is used to perform large computations in a easier way.

Matplotlib – Matplotlib library is used to visualize the predictions and models.

Sklearn – Scikit-learn also known as Sklearn library is used to perform tasks from data preprocessing to model development and evaluation.

OpenCV – This OpenCV library is an open-source library mainly focused on image processing and handling.

Tensorflow – This is an open-source library that is used to achieve complex functionalities with single lines of code.

```
import matplotlib.pyplot as plt
import tensorflow as tf
import pandas as pd
import numpy as np

import warnings
warnings.filterwarnings('ignore')

from tensorflow import keras
from keras import layers
from keras.models import Sequential
from keras.layers import Activation, Dropout, Flatten, Dense
from keras.layers import Conv2D, MaxPooling2D
from keras.utils import image_dataset_from_directory
from keras.preprocessing.image import ImageDataGenerator, load_img
from keras.preprocessing import image_dataset_from_directory

import os
import matplotlib.image as mpimg
```

```
!mkdir -p ~/.kaggle
!cp kaggle.json ~/.kaggle/
```

```
!kaggle datasets download -d salader/dogs-vs-cats
```

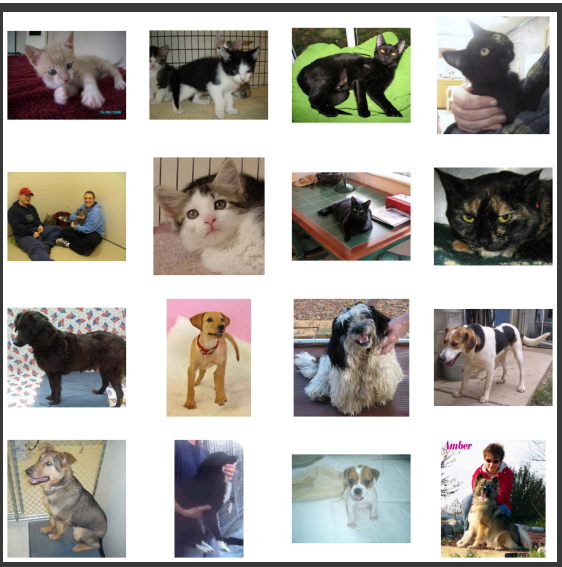
```
Warning: Your Kaggle API key is readable by other users on this system! To fix
Dataset URL: https://www.kaggle.com/datasets/salader/dogs-vs-cats
License(s): unknown
dogs-vs-cats.zip: Skipping, found more recently modified local copy (use --for
```

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

```
path ='/content/dogs_vs_cats'
classes = os.listdir(path)
classes
```

```
['train', 'test']
```

```
fig = plt.gcf()
fig.set_size_inches(16, 16)

cat_dir = os.path.join('/content/dogs_vs_cats/test/cats')
dog_dir = os.path.join('/content/dogs_vs_cats/test/dogs')
cat_names = os.listdir(cat_dir)
dog_names = os.listdir(dog_dir)

pic_index = 210

cat_images = [os.path.join(cat_dir, fname)
              for fname in cat_names[pic_index-8:pic_index]]
dog_images = [os.path.join(dog_dir, fname)
              for fname in dog_names[pic_index-8:pic_index]]

for i, img_path in enumerate(cat_images + dog_images):
    sp = plt.subplot(4, 4, i+1)
    sp.axis('Off')

    img = mpimg.imread(img_path)
    plt.imshow(img)

plt.show()
```


Amber

```
base_dir = '/content/dogs_vs_cats'

# Create datasets
train_datagen = image_dataset_from_directory(base_dir,
                                             image_size=(200,200),
                                             subset='training',
                                             seed = 1,
                                             validation_split=0.1,
                                             batch_size= 32)
test_datagen = image_dataset_from_directory(base_dir,
                                             image_size=(200,200),
                                             subset='validation',
                                             seed = 1,
                                             validation_split=0.1,
                                             batch_size= 32)
```

```
Found 25000 files belonging to 2 classes.
Using 22500 files for training.
Found 25000 files belonging to 2 classes.
Using 2500 files for validation.
```

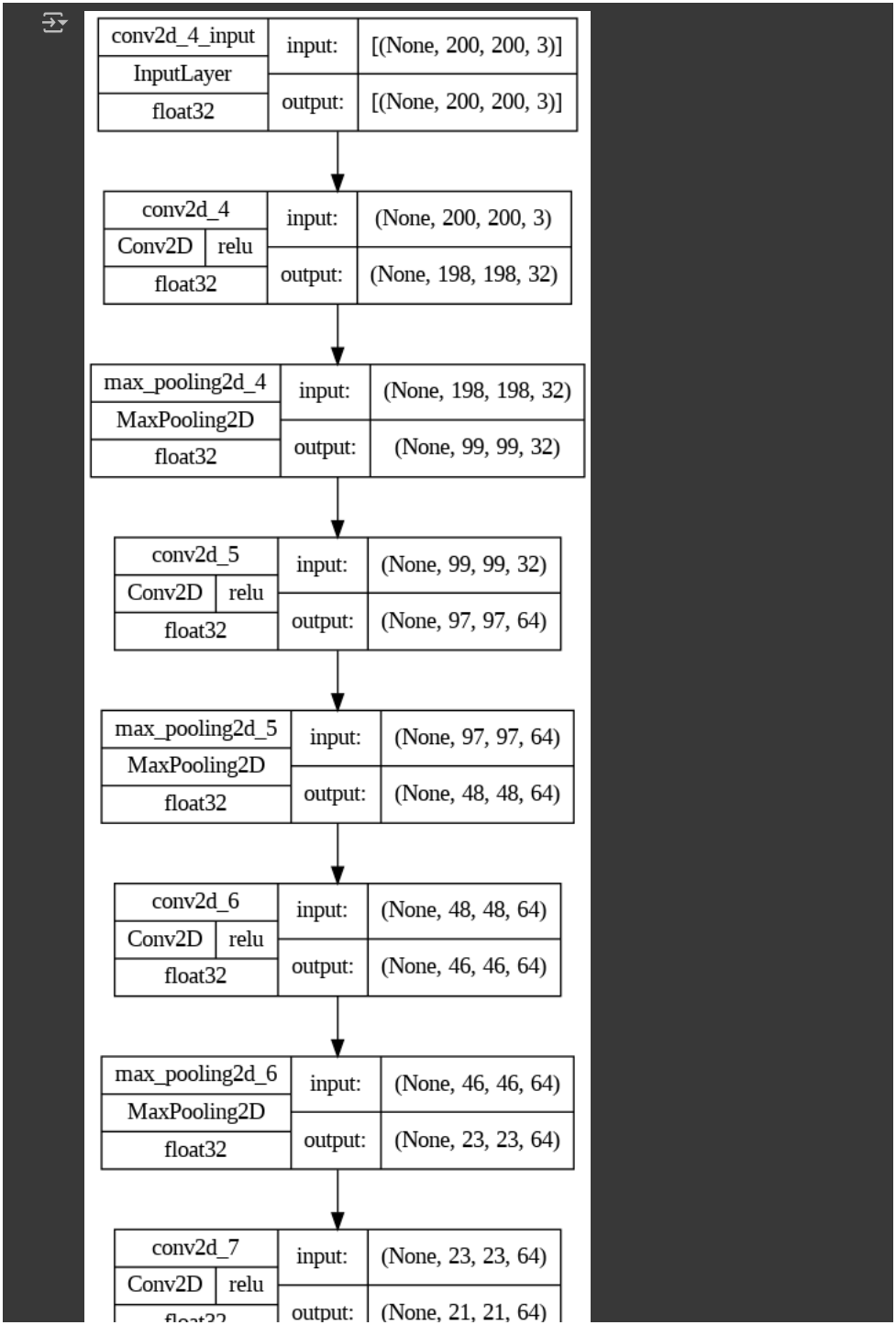
```
model = tf.keras.models.Sequential([
    layers.Conv2D(32, (3, 3), activation='relu', input_shape=(200, 200, 3)),
    layers.MaxPooling2D(2, 2),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D(2, 2),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D(2, 2),
    layers.Conv2D(64, (3, 3), activation='relu'),
    layers.MaxPooling2D(2, 2),

    layers.Flatten(),
    layers.Dense(512, activation='relu'),
    layers.BatchNormalization(),
    layers.Dense(512, activation='relu'),
    layers.Dropout(0.1),
    layers.BatchNormalization(),
    layers.Dense(512, activation='relu'),
    layers.Dropout(0.2),
    layers.BatchNormalization(),
    layers.Dense(1, activation='sigmoid')
])
```

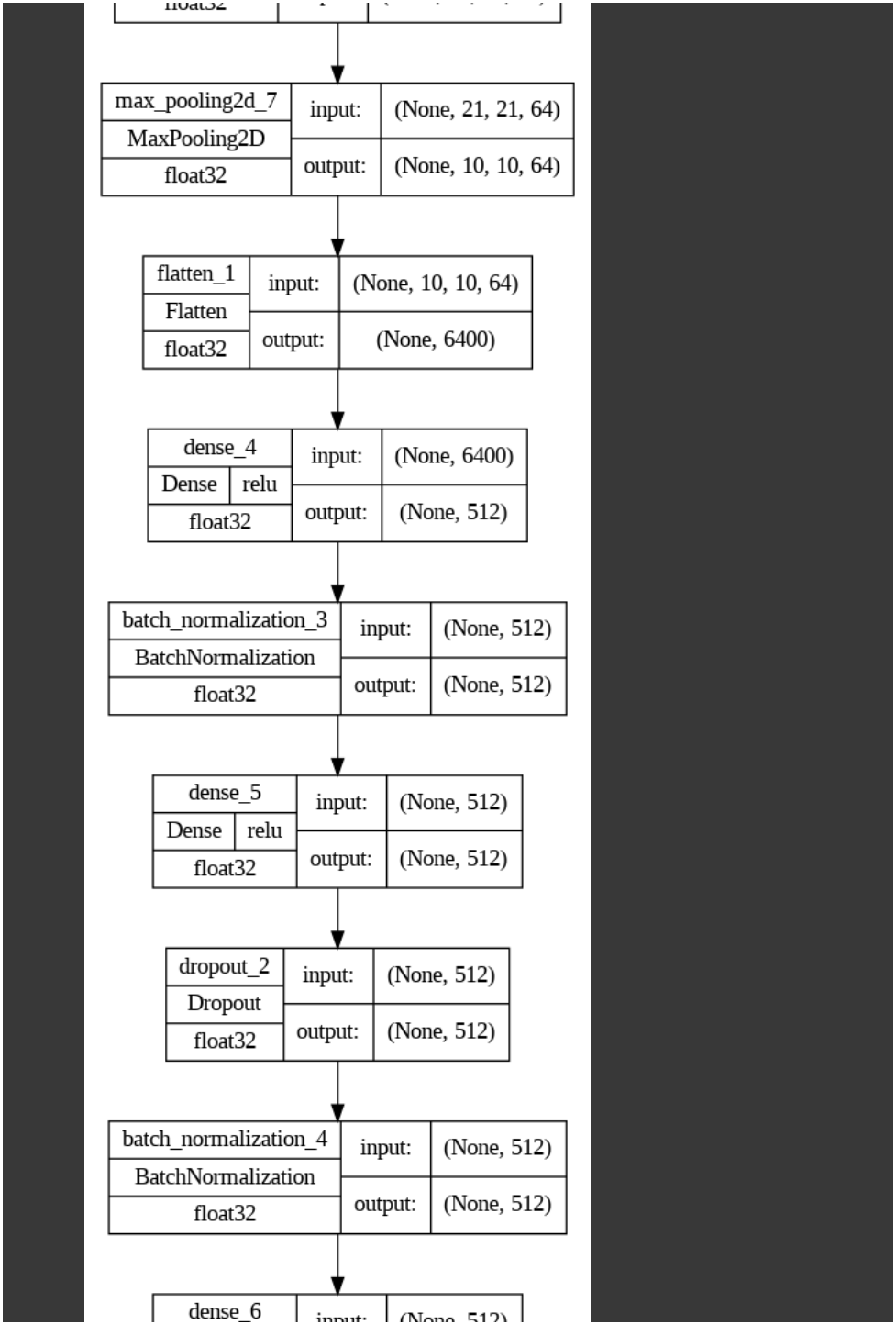
```
model.summary()
```

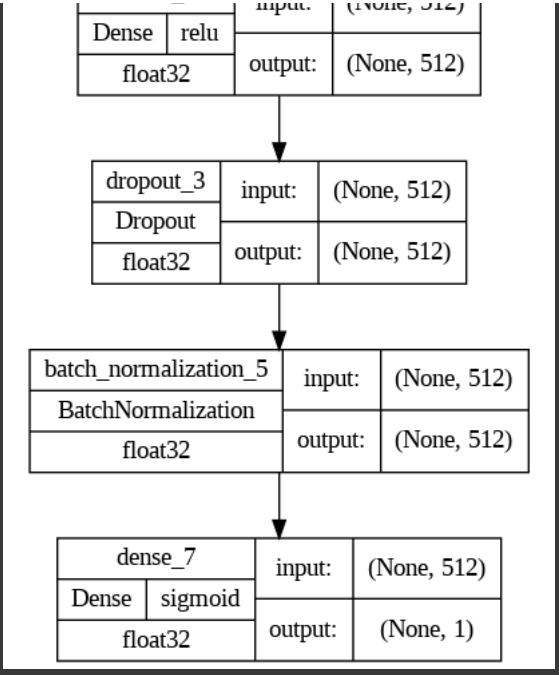
```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d_4 (Conv2D)           (None, 198, 198, 32)      896

 max_pooling2d_4 (MaxPoolin  (None, 99, 99, 32)        0
 g2D)

 conv2d_5 (Conv2D)           (None, 97, 97, 64)        18496
```

```
 max_pooling2d_5 (MaxPoolin  (None, 48, 48, 64)        0
 g2D)

 conv2d_6 (Conv2D)           (None, 46, 46, 64)        36928

 max_pooling2d_6 (MaxPoolin  (None, 23, 23, 64)        0
 g2D)

 conv2d_7 (Conv2D)           (None, 21, 21, 64)        36928

 max_pooling2d_7 (MaxPoolin  (None, 10, 10, 64)        0
 g2D)

 flatten_1 (Flatten)         (None, 6400)              0

 dense_4 (Dense)             (None, 512)               3277312

 batch_normalization_3 (Bat  (None, 512)               2048
 chNormalization)

 dense_5 (Dense)             (None, 512)               262656

 dropout_2 (Dropout)         (None, 512)               0

 batch_normalization_4 (Bat  (None, 512)               2048
 chNormalization)

 dense_6 (Dense)             (None, 512)               262656

 dropout_3 (Dropout)         (None, 512)               0

 batch_normalization_5 (Bat  (None, 512)               2048
 chNormalization)

 dense_7 (Dense)             (None, 1)                 513

=================================================================
Total params: 3902529 (14.89 MB)
Trainable params: 3899457 (14.88 MB)
Non-trainable params: 3072 (12.00 KB)
_________________________________________________________________
```

```
keras.utils.plot_model(
    model,
    show_shapes=True,
    show_dtype=True,
    show_layer_activations=True
)
```


conv2d_4_input
InputLayer
float32
input: [(None, 200, 200, 3)]
output: [(None, 200, 200, 3)]
conv2d_4
Conv2D relu
float32
input: (None, 200, 200, 3)
output: (None, 198, 198, 32)
max_pooling2d_4
MaxPooling2D
float32
input: (None, 198, 198, 32)
output: (None, 99, 99, 32)
conv2d_5
Conv2D relu
float32
input: (None, 99, 99, 32)
output: (None, 97, 97, 64)
max_pooling2d_5
MaxPooling2D
float32
input: (None, 97, 97, 64)
output: (None, 48, 48, 64)
conv2d_6
Conv2D relu
float32
input: (None, 48, 48, 64)
output: (None, 46, 46, 64)
max_pooling2d_6
MaxPooling2D
float32
input: (None, 46, 46, 64)
output: (None, 23, 23, 64)
conv2d_7
Conv2D relu
input: (None, 23, 23, 64)
output: (None, 21, 21, 64)


float32
max_pooling2d_7
MaxPooling2D
float32
input:
(None, 21, 21, 64)
output:
(None, 10, 10, 64)
flatten_1
Flatten
float32
input:
(None, 10, 10, 64)
output:
(None, 6400)
dense_4
Dense
relu
float32
input:
(None, 6400)
output:
(None, 512)
batch_normalization_3
BatchNormalization
float32
input:
(None, 512)
output:
(None, 512)
dense_5
Dense
relu
float32
input:
(None, 512)
output:
(None, 512)
dropout_2
Dropout
float32
input:
(None, 512)
output:
(None, 512)
batch_normalization_4
BatchNormalization
float32
input:
(None, 512)
output:
(None, 512)
dense_6

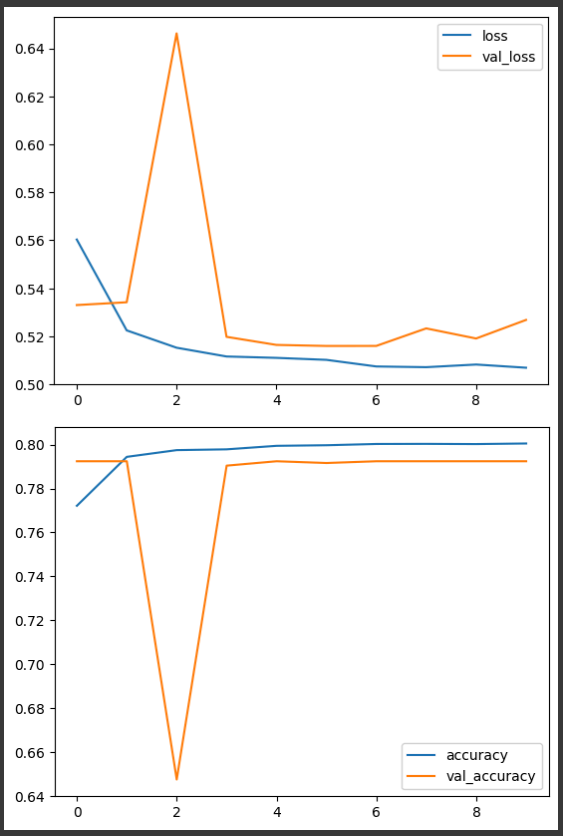



```
model.compile(
    loss='binary_crossentropy',
    optimizer='adam',
    metrics=['accuracy']
)
```

```
history = model.fit(train_datagen,
        epochs=10,
        validation_data=test_datagen)
```

```
Epoch 1/10
704/704 [==============================] - 1656s 2s/step - loss: 0.5603 - accu
Epoch 2/10
704/704 [==============================] - 1617s 2s/step - loss: 0.5225 - accu
Epoch 3/10
704/704 [==============================] - 1590s 2s/step - loss: 0.5152 - accu
Epoch 4/10
704/704 [==============================] - 1589s 2s/step - loss: 0.5116 - accu
Epoch 5/10
704/704 [==============================] - 1583s 2s/step - loss: 0.5110 - accu
Epoch 6/10
704/704 [==============================] - 1581s 2s/step - loss: 0.5102 - accu
Epoch 7/10
704/704 [==============================] - 1555s 2s/step - loss: 0.5074 - accu
Epoch 8/10
704/704 [==============================] - 1575s 2s/step - loss: 0.5071 - accu
Epoch 9/10
704/704 [==============================] - 1596s 2s/step - loss: 0.5082 - accu
Epoch 10/10
704/704 [==============================] - 1621s 2s/step - loss: 0.5069 - accu
```

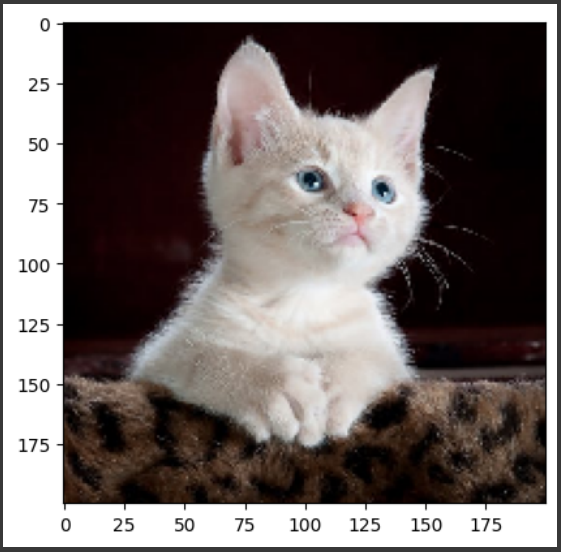
```
history_df = pd.DataFrame(history.history)
history_df.loc[:, ['loss', 'val_loss']].plot()
history_df.loc[:, ['accuracy', 'val_accuracy']].plot()
plt.show()
```




```
from keras.preprocessing import image

#Input image
test_image = image.load_img('cat.jpeg',target_size=(200,200))
```

```
#For show image
plt.imshow(test_image)
test_image = image.img_to_array(test_image)
test_image = np.expand_dims(test_image,axis=0)

# Result array
result = model.predict(test_image)

#Mapping result array with the main name list
i=0
if(result>=1):
   print("Dog")
else:
   print("Cat")
```

```
1/1 [==============================] - 0s 37ms/st
Cat
```




```
test_image = image.load_img('dogg.jpg', target_size=(200, 200))

# For show image
plt.imshow(test_image)
test_image = image.img_to_array(test_image)
test_image = np.expand_dims(test_image, axis=0)

# Result array
result = model.predict(test_image)
# Mapping result array with the main name list
i = 0
if(result >= 0.5):
  print("Cat")
else:
  print("Dog")
```

```
1/1 [==============================] - 0s 127ms/s
Dog
```