Classification of Dogs and Cats Images - CNN Deep Learning!

In [1]:
```
# Assigning GPU memory usage to 50%
from tensorflow.compat.v1 import ConfigProto
from tensorflow.compat.v1 import InteractiveSession

config = ConfigProto()
config.gpu_options.per_process_gpu_memory_fraction = 0.5
config.gpu_options.allow_growth = True
session = InteractiveSession(config=config)
```

In [3]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [4]:
```
import tensorflow as tf
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

doing Data Augmentation

In [42]:
```
train_datagen = ImageDataGenerator(rescale = 1./255, shear_range = 0.2,zoom_range = 0.2,horizontal_flip
 = True)
```

In [43]:
```
test_datagen = ImageDataGenerator(rescale = 1./255)
```

Reading Data

Binary Classification

In [37]:
```
training_data = train_datagen.flow_from_directory('cats n dogs/Cats and Dogs train', target_size = (64,
 64), batch_size = 32, class_mode = 'binary')
```

```
Found 6200 images belonging to 2 classes.
```

In [38]:
```
test_data = test_datagen.flow_from_directory('cats n dogs/Cats and Dogs test',target_size = (64, 64),ba
tch_size = 32,class_mode = 'binary')
```

```
Found 3600 images belonging to 2 classes.
```

Creating Convolutional Neural Network

In [39]:
```
from tensorflow.keras.layers import Conv2D
```

In [40]:
```
from tensorflow.keras.layers import Dense
```

In [41]:
```
from tensorflow.keras.regularizers import l2
```

Creating Model

In [44]:
```
cnn = tf.keras.models.Sequential()
```

Adding The CNN Layer

In [45]:
```
cnn = tf.keras.models.Sequential()
```

Using Relu Activation Function !

In [46]:
```
cnn.add(tf.keras.layers.Conv2D(filters=32,padding="same",kernel_size=3, activation='relu', strides=2, i
nput_shape=[64, 64, 3]))
```

Adding Max-Pooling

In [47]:
```
cnn.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))
```

Adding the Second Layer

In [48]:
```
cnn.add(tf.keras.layers.Conv2D(filters=32,padding='same',kernel_size=3, activation='relu'))
```

In [49]:
```
cnn.add(tf.keras.layers.MaxPool2D(pool_size=2, strides=2))
```

Flattening..

In [50]:
```
cnn.add(tf.keras.layers.Flatten())
```

Adding dense layer

In [51]:
```
cnn.add(tf.keras.layers.Dense(units=128, activation='relu'))
```

Using Support Vector Machine (SVM) for last layer

Since , For Binary Classification, I will be using a LINEAR SVM

In [52]:
```
cnn.add(Dense(1, kernel_regularizer=tf.keras.regularizers.l2(0.01),activation ='linear'))
```

Initializing the Model

In [53]:
```
cnn.summary()
```

```
Model: "sequential_3"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
conv2d_2 (Conv2D)            (None, 32, 32, 32)        896
_________________________________________________________________
max_pooling2d_2 (MaxPooling2 (None, 16, 16, 32)        0
_________________________________________________________________
conv2d_3 (Conv2D)            (None, 16, 16, 32)        9248
_________________________________________________________________
max_pooling2d_3 (MaxPooling2 (None, 8, 8, 32)          0
_________________________________________________________________
flatten_1 (Flatten)          (None, 2048)              0
_________________________________________________________________
dense_2 (Dense)              (None, 128)               262272
_________________________________________________________________
dense_3 (Dense)              (None, 1)                 129
=================================================================
Total params: 272,545
Trainable params: 272,545
Non-trainable params: 0
_________________________________________________________________
```

Training the CNN Model

In [55]:
```
# Compiling using ADAM OPTIMIZER
## Loss is declared hinge for the outer svm layer

cnn.compile(optimizer = 'adam', loss = 'hinge', metrics = ['accuracy'])
```

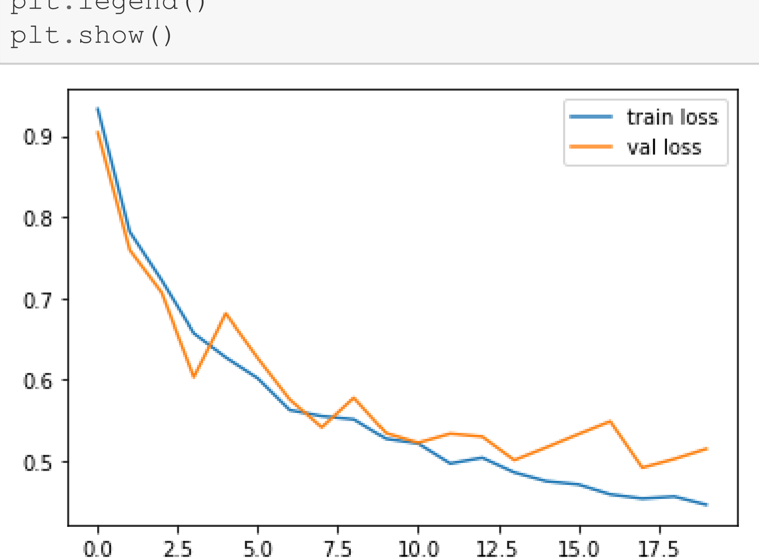
Now, Training the created Model , Doing Model fitting on the Training Data
And testing it on the Test data

In [56]:
```
r=cnn.fit(x = training_data, validation_data = test_data, epochs = 20)
```

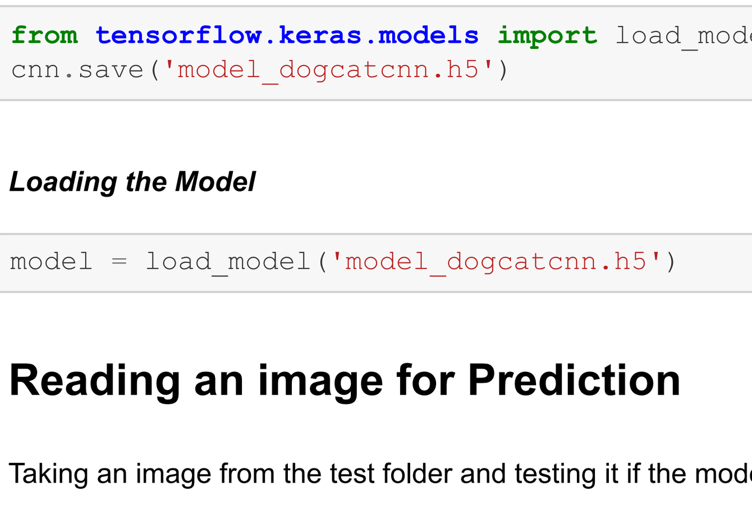
```
Epoch 1/20
194/194 [==============================] - 59s 305ms/step - loss: 0.9329 - accuracy: 0.5460 - val_los
s: 0.9038 - val_accuracy: 0.6386
Epoch 2/20
194/194 [==============================] - 35s 178ms/step - loss: 0.7816 - accuracy: 0.6329 - val_los
s: 0.7591 - val_accuracy: 0.6928
Epoch 3/20
194/194 [==============================] - 30s 157ms/step - loss: 0.7218 - accuracy: 0.6621 - val_los
s: 0.7064 - val_accuracy: 0.7225
Epoch 4/20
194/194 [==============================] - 31s 157ms/step - loss: 0.6570 - accuracy: 0.6942 - val_los
s: 0.6029 - val_accuracy: 0.7206
Epoch 5/20
194/194 [==============================] - 31s 158ms/step - loss: 0.6273 - accuracy: 0.7048 - val_los
s: 0.6809 - val_accuracy: 0.7481
Epoch 6/20
194/194 [==============================] - 31s 158ms/step - loss: 0.6015 - accuracy: 0.7269 - val_los
s: 0.6262 - val_accuracy: 0.7636
Epoch 7/20
194/194 [==============================] - 32s 163ms/step - loss: 0.5623 - accuracy: 0.7402 - val_los
s: 0.5752 - val_accuracy: 0.7633
Epoch 8/20
194/194 [==============================] - 35s 180ms/step - loss: 0.5548 - accuracy: 0.7424 - val_los
s: 0.5409 - val_accuracy: 0.7661
Epoch 9/20
194/194 [==============================] - 33s 170ms/step - loss: 0.5508 - accuracy: 0.7458 - val_los
s: 0.5774 - val_accuracy: 0.7764
Epoch 10/20
194/194 [==============================] - 33s 169ms/step - loss: 0.5269 - accuracy: 0.7556 - val_los
s: 0.5338 - val_accuracy: 0.7369
Epoch 11/20
194/194 [==============================] - 33s 172ms/step - loss: 0.5211 - accuracy: 0.7613 - val_los
s: 0.5220 - val_accuracy: 0.7647
Epoch 12/20
194/194 [==============================] - 34s 176ms/step - loss: 0.4964 - accuracy: 0.7684 - val_los
s: 0.5332 - val_accuracy: 0.7697
Epoch 13/20
194/194 [==============================] - 33s 173ms/step - loss: 0.5035 - accuracy: 0.7676 - val_los
s: 0.5295 - val_accuracy: 0.7489
Epoch 14/20
194/194 [==============================] - 33s 172ms/step - loss: 0.4854 - accuracy: 0.7744 - val_los
s: 0.5005 - val_accuracy: 0.7708
Epoch 15/20
194/194 [==============================] - 34s 174ms/step - loss: 0.4745 - accuracy: 0.7805 - val_los
s: 0.5162 - val_accuracy: 0.7667
Epoch 16/20
194/194 [==============================] - 34s 173ms/step - loss: 0.4705 - accuracy: 0.7850 - val_los
s: 0.5325 - val_accuracy: 0.7531
Epoch 17/20
194/194 [==============================] - 34s 175ms/step - loss: 0.4583 - accuracy: 0.7890 - val_los
s: 0.5484 - val_accuracy: 0.7936
Epoch 18/20
194/194 [==============================] - 34s 173ms/step - loss: 0.4531 - accuracy: 0.7960 - val_los
s: 0.4912 - val_accuracy: 0.7953
Epoch 19/20
194/194 [==============================] - 33s 168ms/step - loss: 0.4556 - accuracy: 0.7895 - val_los
s: 0.5019 - val_accuracy: 0.7869
Epoch 20/20
194/194 [==============================] - 31s 157ms/step - loss: 0.4455 - accuracy: 0.7969 - val_los
s: 0.5144 - val_accuracy: 0.7561
```

Plotting ACCURACY

In [57]:
```
plt.plot(r.history['accuracy'], label='Train accuract')
plt.plot(r.history['val_accuracy'], label='Test accuracy')
plt.legend()
plt.show()
```



In [58]:
```
plt.plot(r.history['loss'], label='train loss')
plt.plot(r.history['val_loss'], label='val loss')
plt.legend()
plt.show()
```



Saving The File

In [59]:
```
from tensorflow.keras.models import load_model
cnn.save('model_dogcatcnn.h5')
```

Loading the Model

In [60]:
```
model = load_model('model_dogcatcnn.h5')
```

Reading an image for Prediction

Taking an image from the test folder and testing it if the model is doing the right prediction!

If the value of Array is NEGATIVE -> It's a CAT

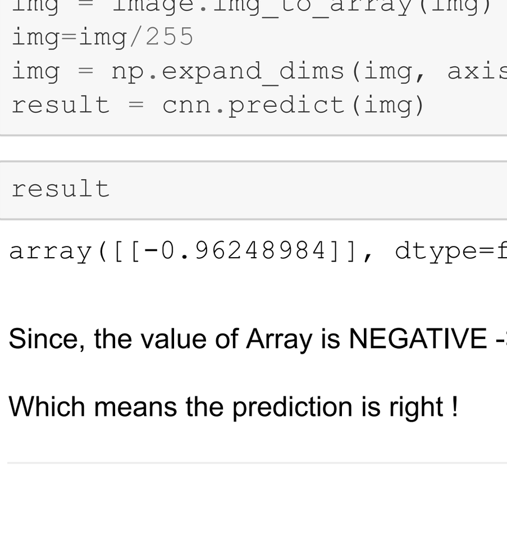
If the value of Array is POSITIVE -> It's a DOG

In [61]:
```
from tensorflow.keras.preprocessing import image
```

In [64]:
```
img = image.load_img('cats n dogs/Cats and Dogs test/Cat test/cat.10983.jpg',target_size=(244,244))
```

In [65]:
```
img
```

Out[65]:



In [67]:
```
img = image.load_img('cats n dogs/Cats and Dogs test/Cat test/cat.10983.jpg',target_size=(64,64))
img = image.img_to_array(img)
img=img/255
img = np.expand_dims(img, axis = 0)
result = cnn.predict(img)
```

In [68]:
```
result
```

Out[68]:
```
array([[-0.96248984]], dtype=float32)
```

Since, the value of Array is NEGATIVE -> It's a CAT

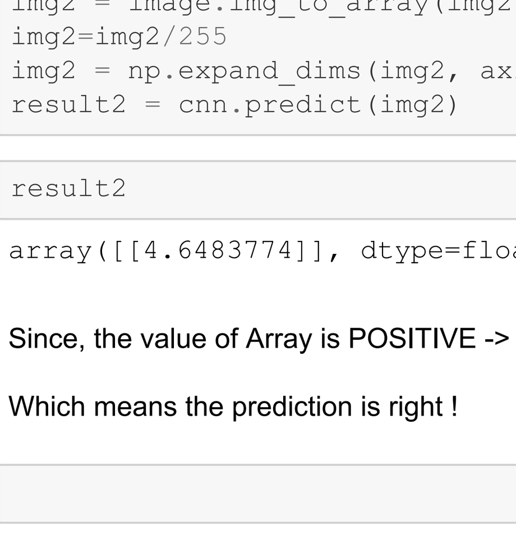
Which means the prediction is right !

Now, Predicting for another image

In [73]:
```
img2 = image.load_img('cats n dogs/Cats and Dogs test/Dog test/dog.9807.jpg',target_size=(244,244))
```

In [74]:
```
img2
```

Out[74]:



In [77]:
```
img2 = image.load_img('cats n dogs/Cats and Dogs test/Dog test/dog.9807.jpg',target_size=(64,64))
img2 = image.img_to_array(img2)
img2=img2/255
img2 = np.expand_dims(img2, axis = 0)
result2 = cnn.predict(img2)
```

In [78]:
```
result2
```

Out[78]:
```
array([[4.6483774]], dtype=float32)
```

Since, the value of Array is POSITIVE -> It's a DOG

Which means the prediction is right !

In [ ]: