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PROJECT : Cat & Dog Classification using Convolutional Neural Network

In [3]:

```
import warnings
warnings.filterwarnings('ignore')
```

In [12]:

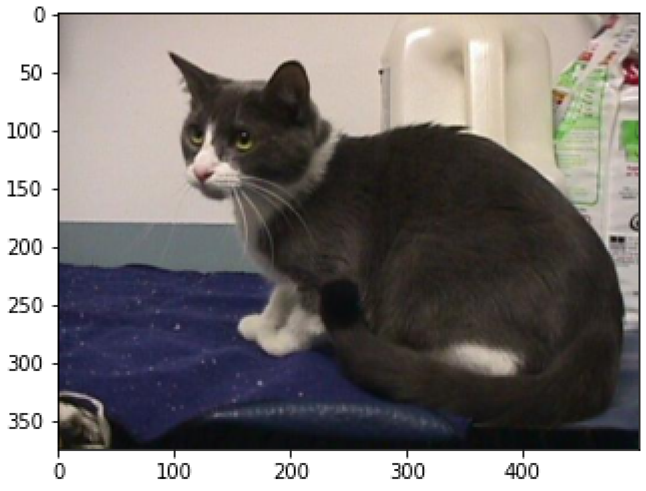
```
import matplotlib.pyplot as plt
import cv2
%matplotlib inline
```

In [57]:

```
#Upload image of cat number 4
cat4 = cv2.imread('CATS_DOGS/train/CAT/4.jpg')
cat4 = cv2.cvtColor(cat4,cv2.COLOR_BGR2RGB)
plt.imshow(cat4)
```

Out[57]:

```
<matplotlib.image.AxesImage at 0x25ce3bd4130>
```



In [58]:

```
#image shape
cat4.shape
```

Out[58]:

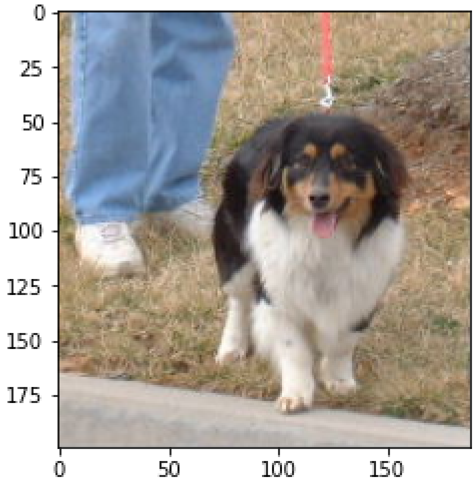
```
(375, 500, 3)
```

In [59]:

```
#Upload image of dog number 4
dog = cv2.imread('CATS_DOGS/train/DOG/2.jpg')
dog  = cv2.cvtColor(dog,cv2.COLOR_BGR2RGB)
plt.imshow(dog)
```

Out[59]:

```
<matplotlib.image.AxesImage at 0x25ce5341c90>
```



In [60]:

```
#image shape
dog.shape
```

Out[60]:

```
(199, 188, 3)
```

PREPROCESSING

In [6]:

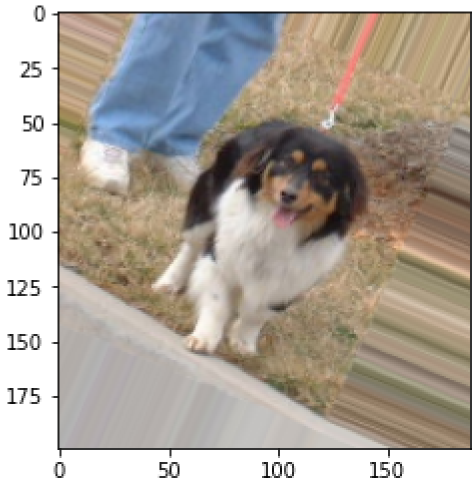
```
from keras.preprocessing.image import ImageDataGenerator
```

In [62]:

```
#create an ImageDataGenerator object
image_gen = ImageDataGenerator(rotation_range=30,
                                width_shift_range=0.1,
                                height_shift_range=0.1,
                                shear_range=0.2,
                                zoom_range=0.2,
                                fill_mode='nearest',
                                horizontal_flip=True,
                                vertical_flip=False,
                                rescale=1/255)
```

In [63]:
```
plt.imshow(image_gen.random_transform(dog))
```

Out[63]:
```
<matplotlib.image.AxesImage at 0x25ce559f700>
```



In [64]:
```
image_gen.flow_from_directory('CATS_DOGS/train')
```

```
Found 18743 images belonging to 2 classes.
```

Out[64]:
```
<keras.preprocessing.image.DirectoryIterator at 0x25ce3bdca00>
```

In [ ]:
```

```

CREATE MODEL

In [65]:
```
from keras.models import Sequential
from keras.layers import Activation,Dropout,Flatten,Conv2D,MaxPooling2D
```

In [66]:
```
model = Sequential()

model.add(Conv2D(filters=32,kernel_size=(3,3),input_shape=(150,150,3),a
model.add(MaxPooling2D(pool_size=(2,2)))

model.add(Conv2D(filters=64,kernel_size=(3,3),input_shape=(150,150,3),a
model.add(MaxPooling2D(pool_size=(2,2)))

model.add(Conv2D(filters=64,kernel_size=(3,3),input_shape=(150,150,3),a
model.add(MaxPooling2D(pool_size=(2,2)))

model.add(Flatten())

model.add(Dense(128,activation='relu'))

model.add(Dropout(0.5))

model.add(Dense(1,activation='sigmoid'))

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

In [67]:

```
model.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                Output Shape              Param #   
=================================================================
 conv2d_3 (Conv2D)           (None, 148, 148, 32)      896       
                                                                 
 max_pooling2d_3 (MaxPooling  (None, 74, 74, 32)       0         
 2D)                                                             
                                                                 
 conv2d_4 (Conv2D)           (None, 72, 72, 64)        18496     
                                                                 
 max_pooling2d_4 (MaxPooling  (None, 36, 36, 64)       0         
 2D)                                                             
                                                                 
 conv2d_5 (Conv2D)           (None, 34, 34, 64)        36928     
                                                                 
 max_pooling2d_5 (MaxPooling  (None, 17, 17, 64)       0         
 2D)                                                             
                                                                 
 flatten_1 (Flatten)         (None, 18496)             0         
```

In [8]:

```
batch_size = 16
```

In [68]:

```

train_image_gen = image_gen.flow_from_directory('CATS_DOGS/train',
                                               target_size=(150,150),
                                               batch_size = batch_size,
                                               class_mode='binary')
```

```
Found 18743 images belonging to 2 classes.
```

In [69]:

```
test_image_gen = image_gen.flow_from_directory('CATS_DOGS/test',
                                               target_size=(150,150),
                                               batch_size = batch_size,
                                               class_mode='binary')
```

```
Found 6251 images belonging to 2 classes.
```

In [70]:

```
train_image_gen.class_indices
```

Out[70]:

```
{'CAT': 0, 'DOG': 1}
```

In [71]:

```
result = model.fit_generator(train_image_gen,epochs=100,steps_per_epoch
                             validation_data=test_image_gen,validation_s
```

```
Epoch 1/100
150/150 [==============================] - 116s 762ms/step - loss: 0.696
7 - accuracy: 0.5111 - val_loss: 0.6955 - val_accuracy: 0.5156
Epoch 2/100
150/150 [==============================] - 108s 721ms/step - loss: 0.692
2 - accuracy: 0.5379 - val_loss: 0.6888 - val_accuracy: 0.6094
Epoch 3/100
150/150 [==============================] - 115s 767ms/step - loss: 0.687
3 - accuracy: 0.5612 - val_loss: 0.6717 - val_accuracy: 0.5156
Epoch 4/100
150/150 [==============================] - 93s 619ms/step - loss: 0.6718
- accuracy: 0.5958 - val_loss: 0.6809 - val_accuracy: 0.5573
Epoch 5/100
150/150 [==============================] - 90s 600ms/step - loss: 0.6799
- accuracy: 0.5829 - val_loss: 0.6957 - val_accuracy: 0.5208
Epoch 6/100
150/150 [==============================] - 92s 612ms/step - loss: 0.6750
- accuracy: 0.5858 - val_loss: 0.6544 - val_accuracy: 0.6042
Epoch 7/100
```

In [ ]:

```

```

EVALUATING THE MODEL

In [72]:

```
result.history['accuracy']
```

```
Out[72]: [0.5110832452774048,
          0.5379166603088379,
          0.5612499713897705,
          0.5958333611488342,
          0.5829166769981384,
          0.5858333110809326,
          0.6349999904632568,
          0.6366666555404663,
          0.6604166626930237,
          0.6479166746139526,
          0.6616666913032532,
          0.65625,
          0.6766666769981384,
          0.6858333349227905,
          0.7030531167984009,
          0.6937500238418579,
          0.7172731161117554,
          0.699999988079071,
          0.7195833325386047,
          0.7370833158493042,
          0.7162500023841858,
          0.6983333230018616,
          0.7304166555404663,
          0.7268925309181213,
          0.7329166531562805,
          0.7262499928474426,
          0.731249988079071,
          0.7395833134651184,
          0.7391666769981384,
          0.7524999976158142,
          0.7433333396911621,
          0.7450000047683716,
          0.7641666531562805,
          0.7662066221237183,
          0.7570833563804626,
          0.7462499737739563,
          0.7754077911376953,
          0.7637500166893005,
          0.7516666650772095,
          0.7666666507720947,
          0.7554166913032532,
          0.7712500095367432,
          0.7595833539962769,
          0.7674999833106995,
          0.7716666460037231,
          0.7917189598083496,
          0.7891666889190674,
          0.79708331823349,
          0.8016666769981384,
          0.7820995450019836,
          0.7854453921318054,
          0.7729166746139526,
          0.7745833396911621,
          0.7858333587646484,
          0.8004166483879089,
          0.7954166531562805,
          0.7787500023841858,
          0.7858333587646484,
          0.8083333373069763,
          0.800000011920929,
          0.8125,
          0.809166669845581,
          0.8058333396911621,
          0.8087499737739563,
          0.8025000095367432,
          0.7920833230018616,
          0.8122124671936035,
          0.8183333277702332,
          0.8079166412353516,
          0.8083333373069763,
          0.8054166436195374,
          0.8187500238418579,
          0.815416693687439,
          0.8324999809265137,
          0.8183333277702332,
          0.8204166889190674,
          0.8170833587646484,
          0.8133333325386047,
          0.8125,
          0.8038477897644043,
          0.8402342200279236,
          0.8162500262260437,
          0.8287500143051147,
          0.8070833086967468,
          0.8070833086967468,
          0.8147218823432922,
          0.8195833563804626,
          0.8362500071525574,
          0.8423253893852234,
          0.8149999976158142,
          0.8137500286102295,
          0.824999988079071,
          0.8366666436195374,
          0.840416669845581,
          0.8450000286102295,
          0.8423253893852234,
          0.8333333134651184,
          0.8352153897285461,
          0.8366666436195374,
          0.8424999713897705]
```

In [74]:

```python
#save the model
model.save('cat_dog_100epochs.h5')
```

PREDICTING ON NEW IMAGES

In [9]:

```python
#importing the saved model
from keras.models import load_model
new_model = load_model('cat_dog_100epochs.h5')
```

In [10]:

```python
test_data_gen = ImageDataGenerator(rescale=1/255)
genrated_test_images = test_data_gen.flow_from_directory(
                                                        'CATS_DOGS/test
                                                        target_size=(15
                                                        batch_size=batc
                                                        class_mode='bin
```

```
Found 6251 images belonging to 2 classes.
```

```
In [11]: genrated_test_images.class_indices
```

```
Out[11]: {'CAT': 0, 'DOG': 1}
```

```
In [12]: predictions = new_model.predict(genrated_test_images)
```

```
391/391 [==============================] - 294s 752ms/step
```

```
In [13]: predictions
```

```
Out[13]: array([[0.18466547],
                [0.3501265 ],
                [0.99689215],
                ...,
                [0.77171296],
                [0.26374152],
                [0.04919095]], dtype=float32)
```

```
In [14]: predictions.shape
```

```
Out[14]: (6251, 1)
```

```
In [15]: class_prediction = (predictions >= 0.5).astype('int')
         class_prediction
```

```
Out[15]: array([[0],
                [0],
                [1],
                ...,
                [1],
                [0],
                [0]])
```

```
In [16]: class_prediction.shape
```

```
Out[16]: (6251, 1)
```

```
In [17]: actual_classes = genrated_test_images.classes
         actual_classes
```

```
Out[17]: array([0, 0, 0, ..., 1, 1, 1])
```

```
In [18]: actual_classes.shape
```

```
Out[18]: (6251,)
```

```
In [19]: from sklearn.metrics import classification_report, confusion_matrix
```

```
In [20]: print(confusion_matrix(actual_classes,class_prediction))
```

```
[[1513 1613]
 [1540 1585]]
```

In [21]:

```
print(classification_report(actual_classes,class_prediction))
```

```
              precision    recall  f1-score   support

           0       0.50      0.48      0.49      3126
           1       0.50      0.51      0.50      3125

    accuracy                           0.50      6251
   macro avg       0.50      0.50      0.50      6251
weighted avg       0.50      0.50      0.50      6251
```