Importing Libraries & Setting up directories

In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from matplotlib.image import imread
```

In [2]:
```
import os
os.chdir('C:\\Users\\breje\\OneDrive\\Desktop\\ML Dataset\\Deep Learning A-Z\
```

In [3]:
```
my_dir = 'C:\\Users\\breje\\OneDrive\\Desktop\\ML Dataset\\Deep Learning A-Z\
```

In [4]:
```
os.listdir(my_dir)
```

Out[4]:
```
['.DS_Store', 'single_prediction', 'test_set', 'training_set']
```

In [5]:
```
train_dir = my_dir+'\\training_set'
test_dir = my_dir+'\\test_set'
```

Exploring the Dataset

In [6]:
```
print(os.listdir(train_dir),os.listdir(test_dir))
```

```
['cats', 'dogs'] ['cats', 'dogs']
```

In [7]:
```
len(os.listdir(train_dir+'\\cats'))
```

Out[7]:
```
4000
```

In [8]:
```
len(os.listdir(train_dir+'\\dogs'))
```

Out[8]:
```
4000
```

In [9]:
```
len(os.listdir(test_dir+'\\cats'))
```

Out[9]:
```
1000
```

In [10]:
```
len(os.listdir(test_dir+'\\dogs'))
```

Out[10]:
```
1000
```

** We have 8000 training data and 200 testing data**

In [11]:
```
img_sample = train_dir+'\\dogs\\dog.2005.jpg'
```

In [12]:
```
plt.imshow(imread(img_sample))
```

Out[12]: <matplotlib.image.AxesImage at 0x155ff9d6e88>

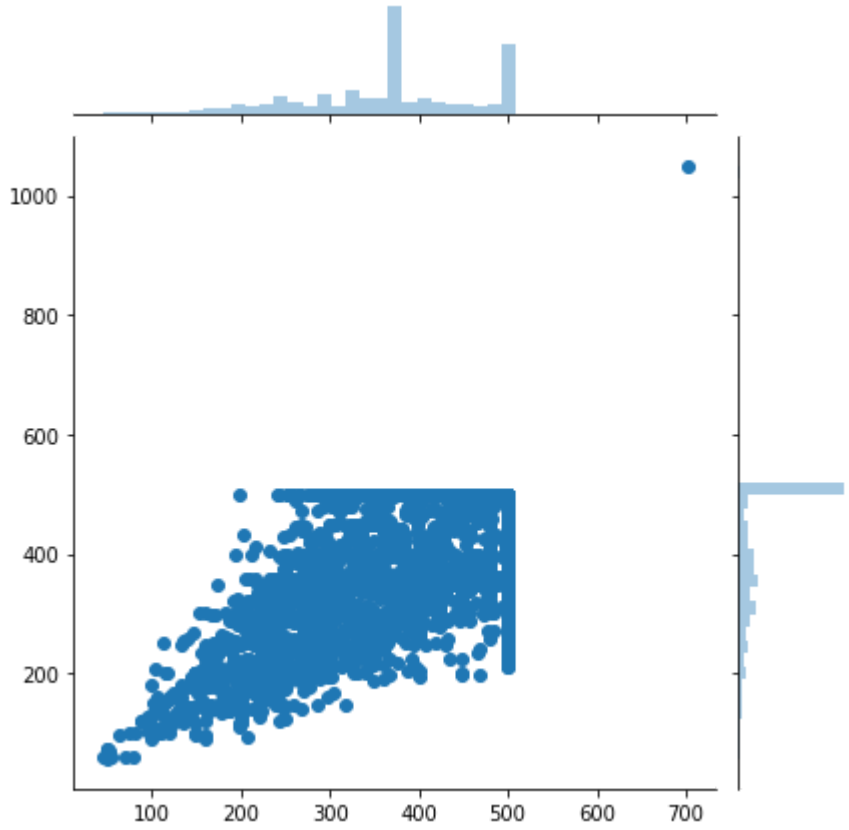
In [13]:
```
imread(img_sample).shape
```

Out[13]: (375, 499, 3)

In [14]:
```
dim1=[]
dim2=[]
col=[]
for i in os.listdir(train_dir+'\\dogs'):
    img = imread(train_dir+'\\dogs\\'+i)
    d1, d2, c1 = img.shape
    dim1.append(d1)
    dim2.append(d2)
    col.append(c1)
```

In [15]:
```
sns.jointplot(dim1, dim2)
```

Out[15]: <seaborn.axisgrid.JointGrid at 0x155ffa78648>



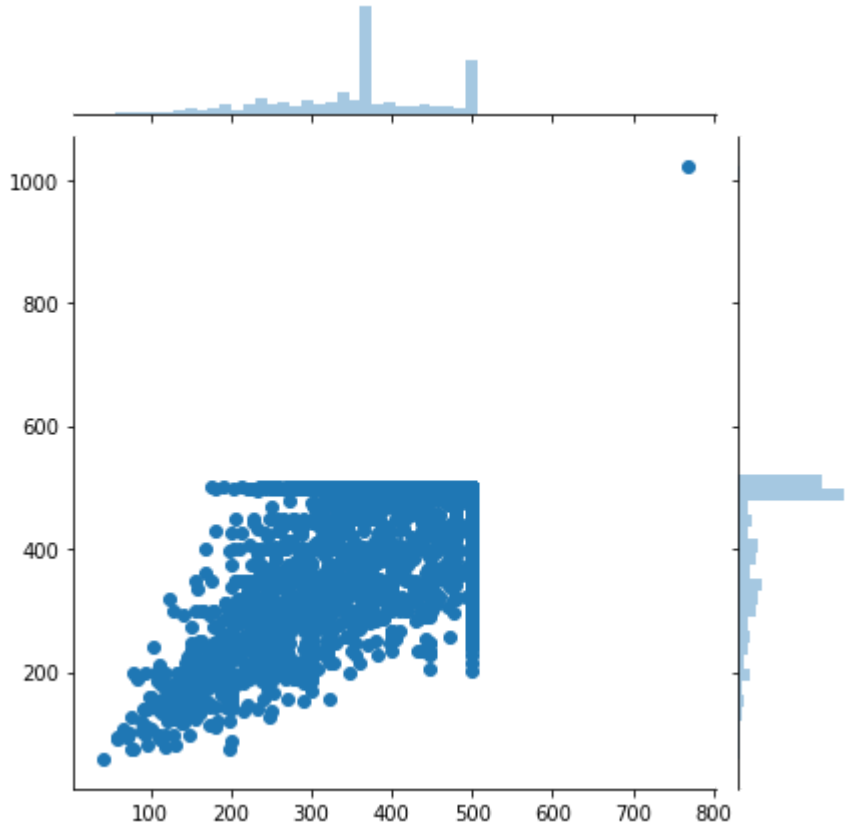
In [16]:
```
print(np.mean(dim1), np.mean(dim2))
```

```
364.84475 397.98225
```

In [17]:
```
dim1=[]
dim2=[]
col=[]
for i in os.listdir(train_dir+'\\cats'):
    img = imread(train_dir+'\\cats\\'+i)
    d1, d2, c1 = img.shape
    dim1.append(d1)
    dim2.append(d2)
    col.append(c1)
```

In [18]:
```
sns.jointplot(dim1, dim2)
```

Out[18]: <seaborn.axisgrid.JointGrid at 0x155ffc9d048>



In [19]:
```
print(np.mean(dim1), np.mean(dim2))
```

```
356.09925 409.61975
```

** 128x128 will be a right reshape size, due to my low budget laptop**

Building the CNN model

In [20]:
```
from keras.models import Sequential
from keras.layers import Conv2D, MaxPool2D, Flatten, Dense, Dropout
from keras.callbacks import EarlyStopping
```

```
Using TensorFlow backend.
```

In [21]:
```
model = Sequential()
model.add(Conv2D(filters=64, kernel_size=(3,3), padding='same', activation='r
model.add(MaxPool2D())
model.add(Conv2D(filters=128, kernel_size=(3,3), padding='same', activation='
model.add(MaxPool2D())
model.add(Conv2D(filters=32, kernel_size=(3,3), padding='same', activation='r
model.add(MaxPool2D())
model.add(Flatten())

model.add(Dense(128, activation='relu'))
model.add(Dropout(0.3))
model.add(Dense(64, activation='relu'))
model.add(Dropout(0.3))
model.add(Dense(1, activation='sigmoid'))
model.compile(optimizer='adam', loss='binary_crossentropy', metrics=['accurac
```

In [22]:
```
from keras.preprocessing.image import ImageDataGenerator
```

In [23]:
```
from keras.preprocessing.image import ImageDataGenerator

train_datagen = ImageDataGenerator(rescale = 1./255,
                                   shear_range = 0.2,
                                   zoom_range = 0.2,
                                   horizontal_flip = True)

test_datagen = ImageDataGenerator(rescale = 1./255)

training_set = train_datagen.flow_from_directory('training_set',
                                                 target_size = (128, 128),
                                                 batch_size = 32,
                                                 class_mode = 'binary')

test_set = test_datagen.flow_from_directory('test_set',
                                            target_size = (128, 128),
                                            batch_size = 32,
                                            class_mode = 'binary', shuffle=Fa
```

```
Found 8000 images belonging to 2 classes.
Found 2000 images belonging to 2 classes.
```

In [24]:
```
from keras.callbacks import EarlyStopping
early_stop = EarlyStopping(patience=3)
```

In [25]:
```
model.fit_generator(training_set,
                         steps_per_epoch = 4000,
                         epochs = 10,
                         validation_data = test_set, callbacks=[early_stop])
```

```
Epoch 1/10
4000/4000 [==============================] - 8825s 2s/step - loss: 0.5466 -
accuracy: 0.7063 - val_loss: 0.3599 - val_accuracy: 0.7930
Epoch 2/10
4000/4000 [==============================] - 8893s 2s/step - loss: 0.3334 -
accuracy: 0.8544 - val_loss: 0.5987 - val_accuracy: 0.8405
Epoch 3/10
4000/4000 [==============================] - 8905s 2s/step - loss: 0.2321 -
accuracy: 0.9040 - val_loss: 0.4697 - val_accuracy: 0.8405
Epoch 4/10
4000/4000 [==============================] - 8789s 2s/step - loss: 0.1782 -
accuracy: 0.9277 - val_loss: 0.6420 - val_accuracy: 0.8400
```

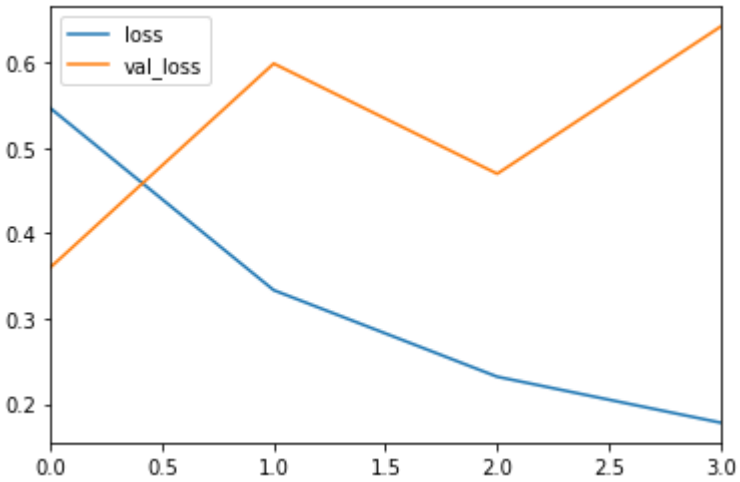
Out[25]: <keras.callbacks.callbacks.History at 0x1558b7d0fc8>

Model Training History

In [26]:
```
model_hist = pd.DataFrame(model.history.history)
```

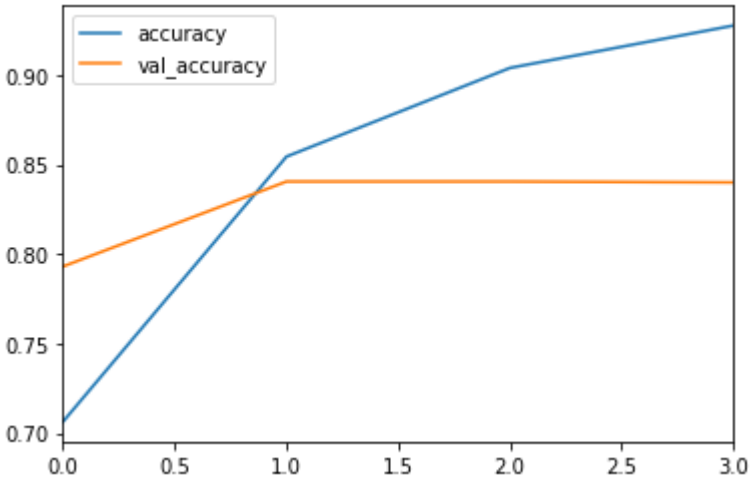
In [27]:
```
model_hist[['loss','val_loss']].plot()
```

Out[27]: <matplotlib.axes._subplots.AxesSubplot at 0x15587fcb588>



In [28]:
```
model_hist[['accuracy','val_accuracy']].plot()
```

Out[28]: <matplotlib.axes._subplots.AxesSubplot at 0x155ffd82308>



Model Evaluation

In [29]:
```
model.evaluate_generator(test_set)
```

Out[29]: [0.642022430896759, 0.8399999737739563]

In [30]:
```
pred = model.predict_generator(test_set)
```

In [31]:
```
pred = pd.DataFrame(pred)
pred
```

Out[31]:

	0
0	0.052483
1	0.005684
2	0.001497
3	0.044680
4	0.000062
...	...
1995	1.000000
1996	0.999994
1997	0.060692
1998	0.999714
1999	0.999985

2000 rows × 1 columns

In [32]:
```
y_pred = pred>0.5
```

In [33]:
```
from sklearn.metrics import classification_report, confusion_matrix
```

In [34]:
```
y_test = test_set.classes
```

In [35]:
```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.86      0.81      0.84      1000
           1       0.82      0.87      0.84      1000

    accuracy                           0.84      2000
   macro avg       0.84      0.84      0.84      2000
weighted avg       0.84      0.84      0.84      2000
```

In [36]:
```
print(confusion_matrix(y_test, y_pred))
```

```
[[812 188]
 [132 868]]
```