In [23]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [24]:
```
#importing the dataset
dataset = pd.read_csv("D://anaapps//ML//Machine_Learning_AZ_Template_Folder//Machine Learning A-Z Template Folder//Part 8 - Deep Learning//Section 39 - Artificial Neural Networks (ANN)//Churn-Modelling.csv")
dataset.head()
x = dataset.iloc[:,3:13].values
print(X)
y = dataset.iloc[:,13].values
print(y)
```

```
[[619 'France' 'Female' ..., 1 1 101348.88]
 [608 'Spain' 'Female' ..., 0 1 112542.58]
 [502 'France' 'Female' ..., 1 0 113931.57]
 ...,
 [709 'France' 'Female' ..., 0 1 42085.58]
 [772 'Germany' 'Male' ..., 1 0 92888.52]
 [792 'France' 'Female' ..., 1 0 38190.78]]
[1 0 1 ..., 1 1 0]
```

In [31]:
```
#convert txt into numerical values(Encoding Categorial Data)
from sklearn.preprocessing import LabelEncoder , OneHotEncoder
labelencoder_x_1=LabelEncoder()
#column to be converted
x[:,1] = labelencoder_x_1.fit_transform(x[:,1])
labelencoder_x_2=LabelEncoder()
x[:,2] = labelencoder_x_2.fit_transform(x[:,2])
onehotencoder=OneHotEncoder(categorical_features=[1])
x = onehotencoder.fit_transform(x).toarray()
print(x)
#x = x[:,1:]
```

```
[[  1.00000000e+00   0.00000000e+00   6.19000000e+02 ...,   1.00000000e+00
    1.00000000e+00   1.01348880e+05]
 [  1.00000000e+00   0.00000000e+00   6.08000000e+02 ...,   0.00000000e+00
    1.00000000e+00   1.12542580e+05]
 [  1.00000000e+00   0.00000000e+00   5.02000000e+02 ...,   1.00000000e+00
    0.00000000e+00   1.13931570e+05]
 ...,
 [  1.00000000e+00   0.00000000e+00   7.09000000e+02 ...,   0.00000000e+00
    1.00000000e+00   4.20855800e+04]
 [  0.00000000e+00   1.00000000e+00   7.72000000e+02 ...,   1.00000000e+00
    0.00000000e+00   9.28885200e+04]
 [  1.00000000e+00   0.00000000e+00   7.92000000e+02 ...,   1.00000000e+00
    0.00000000e+00   3.81907800e+04]]
```

In [21]:
```
#splitting the dataset into Training and Test set
from sklearn.cross_validation import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.2,random_s
tate=0)
x_train, x_test, y_train, y_test
```

Out[21]:
```
(array([[667, 0, 'Female', ..., 1, 0, 163830.64],
        [427, 1, 'Male', ..., 1, 1, 57098.0],
        [535, 0, 'Female', ..., 1, 0, 185630.76],
        ...,
        [738, 1, 'Male', ..., 1, 0, 181429.87],
        [590, 0, 'Female', ..., 1, 1, 148750.16],
        [623, 0, 'Female', ..., 1, 0, 118855.26]], dtype=object),
 array([[597, 0, 'Female', ..., 1, 1, 192852.67],
        [523, 0, 'Female', ..., 1, 0, 128702.1],
        [706, 0, 'Female', ..., 1, 1, 75732.25],
        ...,
        [578, 1, 'Male', ..., 1, 0, 141533.19],
        [650, 1, 'Male', ..., 1, 1, 11276.48],
        [573, 1, 'Male', ..., 1, 0, 192950.6]], dtype=object),
 array([0, 0, 0, ..., 0, 0, 1], dtype=int64),
 array([0, 1, 0, ..., 0, 0, 0], dtype=int64))
```

In [33]:
```
#feature scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-33-8fe228387c2b> in <module>()
      2 from sklearn.preprocessing import StandardScaler
      3 sc = StandardScaler()
----> 4 x_train = sc.fit_transform(x_train)
      5 x_test = sc.transform(x_test)

~\AppData\Local\Continuum\anaconda3\lib\site-packages\sklearn\base.py in fit_
transform(self, X, y, **fit_params)
    515         if y is None:
    516             # fit method of arity 1 (unsupervised transformation)
--> 517             return self.fit(X, **fit_params).transform(X)
    518         else:
    519             # fit method of arity 2 (supervised transformation)

~\AppData\Local\Continuum\anaconda3\lib\site-packages\sklearn\preprocessing\d
ata.py in fit(self, X, y)
    588         # Reset internal state before fitting
    589         self._reset()
--> 590         return self.partial_fit(X, y)
    591
    592     def partial_fit(self, X, y=None):

~\AppData\Local\Continuum\anaconda3\lib\site-packages\sklearn\preprocessing\d
ata.py in partial_fit(self, X, y)
    610         """
    611         X = check_array(X, accept_sparse=('csr', 'csc'), copy=self.co
py,
--> 612                         warn_on_dtype=True, estimator=self, dtype=FLO
AT_DTYPES)
    613
    614         # Even in the case of `with_mean=False`, we update the mean a
nyway

~\AppData\Local\Continuum\anaconda3\lib\site-packages\sklearn\utils\validatio
n.py in check_array(array, accept_sparse, dtype, order, copy, force_all_finit
e, ensure_2d, allow_nd, ensure_min_samples, ensure_min_features, warn_on_dtyp
e, estimator)
    431                                       force_all_finite)
    432     else:
--> 433         array = np.array(array, dtype=dtype, order=order, copy=copy)
    434
    435         if ensure_2d:

ValueError: could not convert string to float: 'Female'
```

In [35]:
```
#Making of ANN
#Import libraries
import keras
from keras.models import Sequential
from keras.models import Dense
```

```
---------------------------------------------------------------------------
ModuleNotFoundError                       Traceback (most recent call last)
<ipython-input-35-e121ef2277fc> in <module>()
      1 #Making of ANN
      2 #Import libraries
----> 3 import keras
      4 from keras.models import Sequential
      5 from keras.models import Dense

ModuleNotFoundError: No module named 'keras'
```

In [36]:
```
#initialisng the ANN
classifier = Sequential()
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-36-e8f4894941c7> in <module>()
      1 #initialisng the ANN
----> 2 classifier = Sequential()

NameError: name 'Sequential' is not defined
```

In [37]:
```
#Adding the input layer and the first hidden layer
classifier.add(Dense(output_dim = 6, init = 'uniform', activation = 'relu', in
put_dim = 11))
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-37-11533012c1ed> in <module>()
      1 #Adding the input layer and the first hidden layer
----> 2 classifier.add(Dense(output_dim = 6, init = 'uniform', activation =
'relu', input_dim = 11))

NameError: name 'classifier' is not defined
```

In [38]:
```
#Adding the 2nd hidden layer
classifier.add(Dense(output_dim = 6, init = 'uniform', activation = 'relu'))
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-38-eee987d67827> in <module>()
      1 #Adding the 2nd hidden layer
----> 2 classifier.add(Dense(output_dim = 6, init = 'uniform', activation =
'relu',))

NameError: name 'classifier' is not defined
```

In [ ]:
```
#Adding the Output layer
classifier.add(Dense(output_dim = 1, init = 'uniform', activation = 'sigmoid'
))
```

In [39]:
```
#compile the ANN
classifier.compile(optimizer = 'adam', loss =  'binary_crossentropy', metrics
= ['accuracy'])
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-39-14e84071353b> in <module>()
      1 #compile the ANN
----> 2 classifier.compile(optimizer = 'adam', loss =  'binary_crossentropy',
 metrics = ['accuracy'])

NameError: name 'classifier' is not defined
```

In [40]:
```
#fitting the ANN to the Training Set
classifier.fit(x_train, y_train, batch_size=10,nb_epoch=100)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-40-15d654614884> in <module>()
      1 #fitting the ANN to the Training Set
----> 2 classifier.fit(x_train, y_train, batch_size=10,nb_epoch=100)

NameError: name 'classifier' is not defined
```

In [41]:
```
#making the prediction and evaluting the model
#Predicting the test set results
y_pred  = classifier.predict(x_test)
y_pred  = (y_pred>0.5)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-41-ee81b7d90450> in <module>()
      1 #making the prediction and evaluting the model
      2 #Predicting the test set results
----> 3 y_pred  = classifier.predict(x_test)
      4 y_pred  = (y_pred>0.5)

NameError: name 'classifier' is not defined
```

In [42]:
```
#making the Confusion matrix
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test,y_pred)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-42-640c1829d860> in <module>()
      1 #making the Confusion matrix
      2 from sklearn.metrics import confusion_matrix
----> 3 cm = confusion_matrix(y_test,y_pred)

NameError: name 'y_pred' is not defined
```