In [3]:

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

```
<frozen importlib._bootstrap>:219: RuntimeWarning: numpy.ndarray size changed,
may indicate binary incompatibility. Expected 80 from C header, got 96 from PyO
bject
```

In [4]:

```
df = pd.read_csv('Churn_Modelling.csv')
df.head()
```

Out[4]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	T
0	1	15634602	Hargrave	619	France	Female	42	
1	2	15647311	Hill	608	Spain	Female	41	
2	3	15619304	Onio	502	France	Female	42	
3	4	15701354	Boni	699	France	Female	39	
4	5	15737888	Mitchell	850	Spain	Female	43	

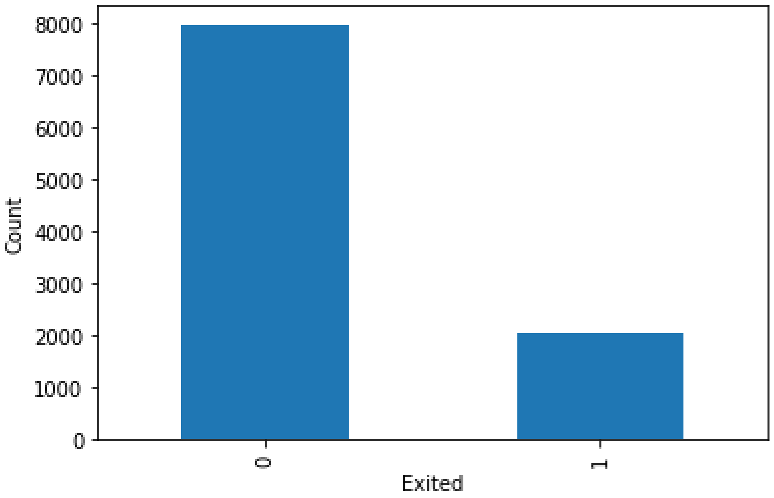
In [5]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 14 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   RowNumber        10000 non-null  int64  
 1   CustomerId       10000 non-null  int64  
 2   Surname          10000 non-null  object 
 3   CreditScore      10000 non-null  int64  
 4   Geography        10000 non-null  object 
 5   Gender           10000 non-null  object 
 6   Age              10000 non-null  int64  
 7   Tenure           10000 non-null  int64  
 8   Balance          10000 non-null  float64
 9   NumOfProducts    10000 non-null  int64  
 10  HasCrCard        10000 non-null  int64  
 11  IsActiveMember   10000 non-null  int64  
 12  EstimatedSalary  10000 non-null  float64
 13  Exited           10000 non-null  int64  
dtypes: float64(2), int64(9), object(3)
memory usage: 1.1+ MB
```

In [6]:

```
plt.xlabel('Exited')
plt.ylabel('Count')
df['Exited'].value_counts().plot.bar()
plt.show()
```



```
In [7]: df['Geography'].value_counts()
```

```
Out[7]: France     5014
        Germany    2509
        Spain      2477
        Name: Geography, dtype: int64
```

```
In [8]: df = pd.concat([df,pd.get_dummies(df['Geography'],prefix='Geo')],axis=1)
```

```
In [9]: df = pd.concat([df,pd.get_dummies(df['Gender'])],axis=1)
```

```
In [10]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10000 entries, 0 to 9999
Data columns (total 19 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   RowNumber        10000 non-null  int64  
 1   CustomerId       10000 non-null  int64  
 2   Surname          10000 non-null  object 
 3   CreditScore      10000 non-null  int64  
 4   Geography        10000 non-null  object 
 5   Gender           10000 non-null  object 
 6   Age              10000 non-null  int64  
 7   Tenure           10000 non-null  int64  
 8   Balance          10000 non-null  float64
 9   NumOfProducts    10000 non-null  int64  
 10  HasCrCard        10000 non-null  int64  
 11  IsActiveMember   10000 non-null  int64  
 12  EstimatedSalary  10000 non-null  float64
 13  Exited           10000 non-null  int64  
 14  Geo_France       10000 non-null  uint8  
 15  Geo_Germany      10000 non-null  uint8  
 16  Geo_Spain        10000 non-null  uint8  
 17  Female           10000 non-null  uint8  
 18  Male             10000 non-null  uint8  
dtypes: float64(2), int64(9), object(3), uint8(5)
memory usage: 1.1+ MB
```

In [11]:

```
df.drop(columns=['RowNumber','CustomerId','Surname','Geography','Gender'],inpl
```

In [12]:

```
df.head()
```

Out[12]:

	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	IsActiveMe
0	619	42	2	0.00	1	1	
1	608	41	1	83807.86	1	0	
2	502	42	8	159660.80	3	1	
3	699	39	1	0.00	2	0	
4	850	43	2	125510.82	1	1	

Splitting Data

In [13]:

```
y = df['Exited'].values
x = df.loc[:,df.columns != 'Exited'].values
```

In [14]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y,random_state=20,test_size
```

Scaling Data

In [15]:
```
from sklearn.preprocessing import StandardScaler
std_x = StandardScaler()
x_train = std_x.fit_transform(x_train)
x_test = std_x.transform(x_test)
```

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

Out[16]:
```
(7500, 13)
```

Tensorflow Model - Neural Network Classifier

In [17]:
```
import tensorflow as tf
from tensorflow.keras.layers import Dense,Conv1D,Flatten
from tensorflow.keras.models import Sequential, Model
```

In [18]:
```
model=Sequential()
model.add(Flatten(input_shape=(13,)))
model.add(Dense(100,activation='relu'))
model.add(Dense(1,activation='sigmoid'))
```

In [19]:
```
model.compile(optimizer='adam',metrics=['accuracy'],loss='BinaryCrossentropy')
```

In [20]:
```
model.fit(x_train,y_train,batch_size=64,validation_split=0.1,epochs=100)
```

```
Epoch 1/100
106/106 [==============================] - 2s 2ms/step - loss: 0.4951 - accurac
y: 0.7816 - val_loss: 0.4189 - val_accuracy: 0.8267
Epoch 2/100
106/106 [==============================] - 0s 1ms/step - loss: 0.4271 - accurac
y: 0.8121 - val_loss: 0.3973 - val_accuracy: 0.8413
Epoch 3/100
106/106 [==============================] - 0s 1ms/step - loss: 0.4093 - accurac
y: 0.8239 - val_loss: 0.3797 - val_accuracy: 0.8400
Epoch 4/100
106/106 [==============================] - 0s 982us/step - loss: 0.3929 - accur
acy: 0.8326 - val_loss: 0.3654 - val_accuracy: 0.8560
Epoch 5/100
106/106 [==============================] - 0s 952us/step - loss: 0.3792 - accur
acy: 0.8397 - val_loss: 0.3482 - val_accuracy: 0.8627
Epoch 6/100
106/106 [==============================] - 0s 993us/step - loss: 0.3683 - accur
acy: 0.8431 - val_loss: 0.3421 - val_accuracy: 0.8787
Epoch 7/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3620 - accurac
y: 0.8479 - val_loss: 0.3311 - val_accuracy: 0.8720
Epoch 8/100
106/106 [==============================] - 0s 975us/step - loss: 0.3564 - accur
acy: 0.8508 - val_loss: 0.3316 - val_accuracy: 0.8747
Epoch 9/100
106/106 [==============================] - 0s 975us/step - loss: 0.3534 - accur
acy: 0.8532 - val_loss: 0.3232 - val_accuracy: 0.8733
Epoch 10/100
106/106 [==============================] - 0s 933us/step - loss: 0.3507 - accur
acy: 0.8553 - val_loss: 0.3258 - val_accuracy: 0.8787
Epoch 11/100
106/106 [==============================] - 0s 977us/step - loss: 0.3485 - accur
acy: 0.8557 - val_loss: 0.3198 - val_accuracy: 0.8787
Epoch 12/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3466 - accurac
y: 0.8591 - val_loss: 0.3172 - val_accuracy: 0.8720
Epoch 13/100
106/106 [==============================] - 0s 994us/step - loss: 0.3452 - accur
acy: 0.8570 - val_loss: 0.3170 - val_accuracy: 0.8827
Epoch 14/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3448 - accurac
y: 0.8561 - val_loss: 0.3203 - val_accuracy: 0.8773
Epoch 15/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3425 - accurac
y: 0.8597 - val_loss: 0.3159 - val_accuracy: 0.8787
Epoch 16/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3411 - accurac
y: 0.8578 - val_loss: 0.3169 - val_accuracy: 0.8773
Epoch 17/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3411 - accurac
y: 0.8585 - val_loss: 0.3155 - val_accuracy: 0.8747
Epoch 18/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3398 - accurac
y: 0.8579 - val_loss: 0.3195 - val_accuracy: 0.8747
```

```
Epoch 19/100
106/106 [==============================] - 0s 982us/step - loss: 0.3386 - accur
acy: 0.8604 - val_loss: 0.3146 - val_accuracy: 0.8827
Epoch 20/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3377 - accurac
y: 0.8601 - val_loss: 0.3171 - val_accuracy: 0.8827
Epoch 21/100
106/106 [==============================] - 0s 983us/step - loss: 0.3377 - accur
acy: 0.8610 - val_loss: 0.3184 - val_accuracy: 0.8747
Epoch 22/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3372 - accurac
y: 0.8597 - val_loss: 0.3155 - val_accuracy: 0.8800
Epoch 23/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3363 - accurac
y: 0.8610 - val_loss: 0.3185 - val_accuracy: 0.8760
Epoch 24/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3346 - accurac
y: 0.8604 - val_loss: 0.3147 - val_accuracy: 0.8800
Epoch 25/100
106/106 [==============================] - 0s 979us/step - loss: 0.3348 - accur
acy: 0.8599 - val_loss: 0.3160 - val_accuracy: 0.8773
Epoch 26/100
106/106 [==============================] - 0s 987us/step - loss: 0.3346 - accur
acy: 0.8603 - val_loss: 0.3152 - val_accuracy: 0.8853
Epoch 27/100
106/106 [==============================] - 0s 970us/step - loss: 0.3338 - accur
acy: 0.8641 - val_loss: 0.3153 - val_accuracy: 0.8827
Epoch 28/100
106/106 [==============================] - 0s 981us/step - loss: 0.3328 - accur
acy: 0.8609 - val_loss: 0.3122 - val_accuracy: 0.8840
Epoch 29/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3326 - accurac
y: 0.8622 - val_loss: 0.3204 - val_accuracy: 0.8693
Epoch 30/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3321 - accurac
y: 0.8631 - val_loss: 0.3143 - val_accuracy: 0.8787
Epoch 31/100
106/106 [==============================] - 0s 977us/step - loss: 0.3316 - accur
acy: 0.8633 - val_loss: 0.3184 - val_accuracy: 0.8800
Epoch 32/100
106/106 [==============================] - 0s 995us/step - loss: 0.3309 - accur
acy: 0.8619 - val_loss: 0.3129 - val_accuracy: 0.8813
Epoch 33/100
106/106 [==============================] - 0s 993us/step - loss: 0.3314 - accur
acy: 0.8641 - val_loss: 0.3202 - val_accuracy: 0.8760
Epoch 34/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3299 - accurac
y: 0.8659 - val_loss: 0.3144 - val_accuracy: 0.8840
Epoch 35/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3294 - accurac
y: 0.8621 - val_loss: 0.3172 - val_accuracy: 0.8747
Epoch 36/100
106/106 [==============================] - 0s 974us/step - loss: 0.3305 - accur
acy: 0.8625 - val_loss: 0.3140 - val_accuracy: 0.8773
```

```
Epoch 37/100
106/106 [==============================] - 0s 960us/step - loss: 0.3286 - accur
acy: 0.8647 - val_loss: 0.3143 - val_accuracy: 0.8773
Epoch 38/100
106/106 [==============================] - 0s 958us/step - loss: 0.3289 - accur
acy: 0.8656 - val_loss: 0.3209 - val_accuracy: 0.8707
Epoch 39/100
106/106 [==============================] - 0s 958us/step - loss: 0.3285 - accur
acy: 0.8630 - val_loss: 0.3190 - val_accuracy: 0.8787
Epoch 40/100
106/106 [==============================] - 0s 996us/step - loss: 0.3288 - accur
acy: 0.8630 - val_loss: 0.3148 - val_accuracy: 0.8800
Epoch 41/100
106/106 [==============================] - 0s 960us/step - loss: 0.3266 - accur
acy: 0.8643 - val_loss: 0.3103 - val_accuracy: 0.8867
Epoch 42/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3273 - accurac
y: 0.8653 - val_loss: 0.3151 - val_accuracy: 0.8787
Epoch 43/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3271 - accurac
y: 0.8658 - val_loss: 0.3149 - val_accuracy: 0.8787
Epoch 44/100
106/106 [==============================] - 0s 984us/step - loss: 0.3259 - accur
acy: 0.8673 - val_loss: 0.3196 - val_accuracy: 0.8707
Epoch 45/100
106/106 [==============================] - 0s 962us/step - loss: 0.3259 - accur
acy: 0.8671 - val_loss: 0.3196 - val_accuracy: 0.8773
Epoch 46/100
106/106 [==============================] - 0s 960us/step - loss: 0.3250 - accur
acy: 0.8656 - val_loss: 0.3145 - val_accuracy: 0.8827
Epoch 47/100
106/106 [==============================] - 0s 976us/step - loss: 0.3246 - accur
acy: 0.8679 - val_loss: 0.3102 - val_accuracy: 0.8813
Epoch 48/100
106/106 [==============================] - 0s 992us/step - loss: 0.3245 - accur
acy: 0.8670 - val_loss: 0.3181 - val_accuracy: 0.8840
Epoch 49/100
106/106 [==============================] - 0s 995us/step - loss: 0.3246 - accur
acy: 0.8668 - val_loss: 0.3167 - val_accuracy: 0.8773
Epoch 50/100
106/106 [==============================] - 0s 958us/step - loss: 0.3236 - accur
acy: 0.8643 - val_loss: 0.3197 - val_accuracy: 0.8733
Epoch 51/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3230 - accurac
y: 0.8668 - val_loss: 0.3130 - val_accuracy: 0.8787
Epoch 52/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3227 - accurac
y: 0.8664 - val_loss: 0.3142 - val_accuracy: 0.8800
Epoch 53/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3225 - accurac
y: 0.8665 - val_loss: 0.3105 - val_accuracy: 0.8840
Epoch 54/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3226 - accurac
y: 0.8664 - val_loss: 0.3181 - val_accuracy: 0.8773
```

```
Epoch 55/100
106/106 [==============================] - 0s 976us/step - loss: 0.3219 - accur
acy: 0.8661 - val_loss: 0.3144 - val_accuracy: 0.8813
Epoch 56/100
106/106 [==============================] - 0s 964us/step - loss: 0.3220 - accur
acy: 0.8698 - val_loss: 0.3190 - val_accuracy: 0.8733
Epoch 57/100
```

```
106/106 [==============================] - 0s 1ms/step - loss: 0.3217 - accurac
y: 0.8664 - val_loss: 0.3128 - val_accuracy: 0.8800
Epoch 58/100
106/106 [==============================] - 0s 967us/step - loss: 0.3208 - accur
acy: 0.8692 - val_loss: 0.3240 - val_accuracy: 0.8733
Epoch 59/100
106/106 [==============================] - 0s 972us/step - loss: 0.3199 - accur
acy: 0.8665 - val_loss: 0.3254 - val_accuracy: 0.8653
Epoch 60/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3197 - accurac
y: 0.8698 - val_loss: 0.3177 - val_accuracy: 0.8800
Epoch 61/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3196 - accurac
y: 0.8681 - val_loss: 0.3106 - val_accuracy: 0.8787
Epoch 62/100
106/106 [==============================] - 0s 983us/step - loss: 0.3197 - accur
acy: 0.8692 - val_loss: 0.3194 - val_accuracy: 0.8707
Epoch 63/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3196 - accurac
y: 0.8670 - val_loss: 0.3156 - val_accuracy: 0.8853
Epoch 64/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3177 - accurac
y: 0.8695 - val_loss: 0.3168 - val_accuracy: 0.8747
Epoch 65/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3189 - accurac
y: 0.8686 - val_loss: 0.3176 - val_accuracy: 0.8747
Epoch 66/100
106/106 [==============================] - 0s 974us/step - loss: 0.3183 - accur
acy: 0.8662 - val_loss: 0.3155 - val_accuracy: 0.8827
Epoch 67/100
106/106 [==============================] - 0s 998us/step - loss: 0.3171 - accur
acy: 0.8699 - val_loss: 0.3154 - val_accuracy: 0.8827
Epoch 68/100
106/106 [==============================] - 0s 986us/step - loss: 0.3169 - accur
acy: 0.8683 - val_loss: 0.3215 - val_accuracy: 0.8733
Epoch 69/100
106/106 [==============================] - 0s 976us/step - loss: 0.3161 - accur
acy: 0.8649 - val_loss: 0.3193 - val_accuracy: 0.8707
Epoch 70/100
106/106 [==============================] - 0s 983us/step - loss: 0.3164 - accur
acy: 0.8720 - val_loss: 0.3187 - val_accuracy: 0.8813
Epoch 71/100
106/106 [==============================] - 0s 973us/step - loss: 0.3159 - accur
acy: 0.8704 - val_loss: 0.3193 - val_accuracy: 0.8773
Epoch 72/100
106/106 [==============================] - 0s 999us/step - loss: 0.3148 - accur
acy: 0.8710 - val_loss: 0.3163 - val_accuracy: 0.8813
Epoch 73/100
106/106 [==============================] - 0s 993us/step - loss: 0.3151 - accur
acy: 0.8707 - val_loss: 0.3193 - val_accuracy: 0.8733
Epoch 74/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3142 - accurac
y: 0.8704 - val_loss: 0.3145 - val_accuracy: 0.8800
Epoch 75/100
```

```
106/106 [==============================] - 0s 995us/step - loss: 0.3150 - accur
acy: 0.8690 - val_loss: 0.3197 - val_accuracy: 0.8773
Epoch 76/100
106/106 [==============================] - 0s 975us/step - loss: 0.3132 - accur
acy: 0.8704 - val_loss: 0.3139 - val_accuracy: 0.8800
Epoch 77/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3138 - accurac
y: 0.8714 - val_loss: 0.3149 - val_accuracy: 0.8827
Epoch 78/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3126 - accurac
y: 0.8735 - val_loss: 0.3173 - val_accuracy: 0.8733
Epoch 79/100
106/106 [==============================] - 0s 993us/step - loss: 0.3124 - accur
acy: 0.8720 - val_loss: 0.3214 - val_accuracy: 0.8747
Epoch 80/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3121 - accurac
y: 0.8724 - val_loss: 0.3169 - val_accuracy: 0.8787
Epoch 81/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3120 - accurac
y: 0.8705 - val_loss: 0.3157 - val_accuracy: 0.8760
Epoch 82/100
106/106 [==============================] - 0s 992us/step - loss: 0.3112 - accur
acy: 0.8730 - val_loss: 0.3220 - val_accuracy: 0.8693
Epoch 83/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3109 - accurac
y: 0.8699 - val_loss: 0.3220 - val_accuracy: 0.8640
Epoch 84/100
106/106 [==============================] - 0s 994us/step - loss: 0.3100 - accur
acy: 0.8713 - val_loss: 0.3203 - val_accuracy: 0.8787
Epoch 85/100
106/106 [==============================] - 0s 975us/step - loss: 0.3100 - accur
acy: 0.8747 - val_loss: 0.3192 - val_accuracy: 0.8827
Epoch 86/100
106/106 [==============================] - 0s 957us/step - loss: 0.3107 - accur
acy: 0.8736 - val_loss: 0.3216 - val_accuracy: 0.8733
Epoch 87/100
106/106 [==============================] - 0s 953us/step - loss: 0.3091 - accur
acy: 0.8729 - val_loss: 0.3158 - val_accuracy: 0.8813
Epoch 88/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3088 - accurac
y: 0.8730 - val_loss: 0.3256 - val_accuracy: 0.8733
Epoch 89/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3090 - accurac
y: 0.8744 - val_loss: 0.3178 - val_accuracy: 0.8693
Epoch 90/100
106/106 [==============================] - 0s 974us/step - loss: 0.3079 - accur
acy: 0.8736 - val_loss: 0.3209 - val_accuracy: 0.8720
Epoch 91/100
106/106 [==============================] - 0s 993us/step - loss: 0.3072 - accur
acy: 0.8744 - val_loss: 0.3149 - val_accuracy: 0.8747
Epoch 92/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3077 - accurac
y: 0.8705 - val_loss: 0.3243 - val_accuracy: 0.8667
Epoch 93/100
```

```
106/106 [==============================] - 0s 992us/step - loss: 0.3069 - accur
acy: 0.8720 - val_loss: 0.3204 - val_accuracy: 0.8680
Epoch 94/100
106/106 [==============================] - 0s 989us/step - loss: 0.3062 - accur
acy: 0.8747 - val_loss: 0.3175 - val_accuracy: 0.8760
Epoch 95/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3060 - accurac
y: 0.8741 - val_loss: 0.3171 - val_accuracy: 0.8733
Epoch 96/100
106/106 [==============================] - 0s 997us/step - loss: 0.3052 - accur
acy: 0.8736 - val_loss: 0.3198 - val_accuracy: 0.8733
Epoch 97/100
106/106 [==============================] - 0s 970us/step - loss: 0.3042 - accur
acy: 0.8741 - val_loss: 0.3363 - val_accuracy: 0.8707
Epoch 98/100
106/106 [==============================] - 0s 982us/step - loss: 0.3056 - accur
acy: 0.8750 - val_loss: 0.3190 - val_accuracy: 0.8747
Epoch 99/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3041 - accurac
y: 0.8724 - val_loss: 0.3175 - val_accuracy: 0.8827
Epoch 100/100
106/106 [==============================] - 0s 1ms/step - loss: 0.3043 - accurac
y: 0.8724 - val_loss: 0.3212 - val_accuracy: 0.8760
```

Out[20]:
```
<keras.callbacks.History at 0x7f488811da00>
```

In [21]:
```python
pred = model.predict(x_test)
```

```
79/79 [==============================] - 0s 567us/step
```

In [22]:
```python
y_pred = []
for val in pred:
    if val > 0.5:
        y_pred.append(1)
    else:
        y_pred.append(0)
```

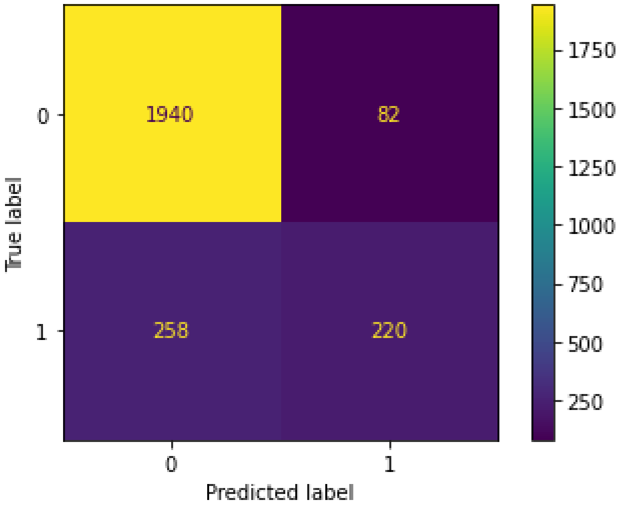
In [23]:
```python
from sklearn.metrics import accuracy_score,confusion_matrix,ConfusionMatrixDis
```

In [24]:
```python
accuracy_score(y_test,y_pred)
```

Out[24]:
```
0.864
```

In [25]:
```python
cm = confusion_matrix(y_test,y_pred)
display = ConfusionMatrixDisplay(cm)
display.plot()
```

Out[25]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x7f487c0f3
8e0>
```



```
In [26]: from sklearn.neural_network import MLPClassifier
```

```
In [49]: nn_classifier = MLPClassifier(hidden_layer_sizes=(100),activation='logistic',m
         nn_classifier.fit(x_train,y_train)
```

```
/home/pratik/.local/lib/python3.8/site-packages/sklearn/neural_network/_multila
yer_perceptron.py:702: ConvergenceWarning: Stochastic Optimizer: Maximum iterat
ions (300) reached and the optimization hasn't converged yet.
  warnings.warn(
```

```
Out[49]: ▾                         MLPClassifier
         MLPClassifier(activation='logistic', hidden_layer_sizes=100, max_ite
         r=300)
```

```
In [50]: y_pred2 = nn_classifier.predict(x_test)
```

```
In [51]: accuracy_score(y_pred=y_pred2,y_true=y_test)
```

```
Out[51]: 0.862
```

```
In [52]: nn_classifier.score(x_test,y_test)
```

```
Out[52]: 0.862
```

```
In [ ]:
```