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Lab-7

Assignment-6

Q1 Investigate the use of Logistic Regression on a subset of the Kaggle Credit Card Fraud Data set (www.kaggle.com/dalpozz/creditcardfraud). Note that in this data set, the number of fraud data are much smaller than the normal data.

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import StandardScaler
from sklearn.model_selection import StratifiedKFold
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix, classification_report, roc_curve, roc_auc_s
core
import itertools
```

In [2]:

```
data=pd.read_csv('creditcard.csv')
data.head()
```

Out[2]:

	Time	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	V21	V22	
0	0.0	-1.359807	-0.072781	2.536347	1.378155	-0.338321	0.462388	0.239599	0.098698	0.363787	...	-0.018307	0.277838	0.
1	0.0	1.191857	0.266151	0.166480	0.448154	0.060018	-0.082361	-0.078803	0.085102	-0.255425	...	-0.225775	-0.638672	0.
2	1.0	-1.358354	-1.340163	1.773209	0.379780	-0.503198	1.800499	0.791461	0.247676	-1.514654	...	0.247998	0.771679	0.
3	1.0	-0.966272	-0.185226	1.792993	-0.863291	-0.010309	1.247203	0.237609	0.377436	-1.387024	...	-0.108300	0.005274	0.
4	2.0	-1.158233	0.877737	1.548718	0.403034	-0.407193	0.095921	0.592941	-0.270533	0.817739	...	-0.009431	0.798278	0.

5 rows × 31 columns

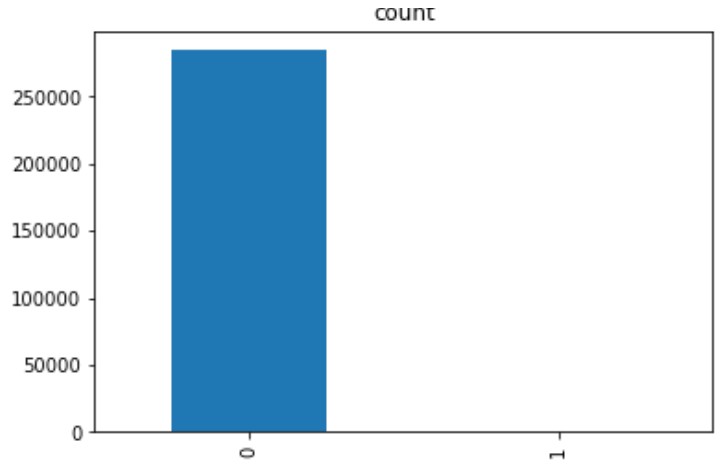
In [3]:

```
res=data['Class'].value_counts()
print('Class 0 : ',res[0])
print('Class 1 : ',res[1])
res.plot(kind='bar',title='count')
```

```
Class 0 :  284315
Class 1 :  492
```

Out[3]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x208d568a5b0>
```



In [4]:

```
#we can observe that count of class 1 is less so we store it here
cnt=res[1]
data_0=data[data['Class']==0]
print("dimentions of data with class 0 : ",data_0.shape)
data_0.head()
```

```
dimentions of data with class 0 :  (284315, 31)
```

Out[4]:

	Time	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	V21	V22	
0	0.0	-1.359807	-0.072781	2.536347	1.378155	-0.338321	0.462388	0.239599	0.098698	0.363787	...	-0.018307	0.277838	0.
1	0.0	1.191857	0.266151	0.166480	0.448154	0.060018	-0.082361	-0.078803	0.085102	-0.255425	...	-0.225775	-0.638672	0.
2	1.0	-1.358354	-1.340163	1.773209	0.379780	-0.503198	1.800499	0.791461	0.247676	-1.514654	...	0.247998	0.771679	0.
3	1.0	-0.966272	-0.185226	1.792993	-0.863291	-0.010309	1.247203	0.237609	0.377436	-1.387024	...	-0.108300	0.005274	0.
4	2.0	-1.158233	0.877737	1.548718	0.403034	-0.407193	0.095921	0.592941	-0.270533	0.817739	...	-0.009431	0.798278	0.

5 rows × 31 columns

In [5]:

```
data_1=data[data['Class']==1]
print("dimentions of data with class 0 : ",data_1.shape)
data_1.head()
```

```
dimentions of data with class 0 :  (492, 31)
```

Out[5]:

	Time	V1	V2	V3	V4	V5	V6	V7	V8	V9	...	V21	V2
541	406.0	-2.312227	1.951992	-1.609851	3.997906	-0.522188	-1.426545	-2.537387	1.391657	-2.770089	...	0.517232	0.03504
623	472.0	-3.043541	-3.157307	1.088463	2.288644	1.359805	-1.064823	0.325574	-0.067794	-0.270953	...	0.661696	0.43547
4920	4462.0	-2.303350	1.759247	-0.359745	2.330243	-0.821628	-0.075788	0.562320	-0.399147	-0.238253	...	-0.294166	0.93239
6108	6986.0	-4.397974	1.358367	-2.592844	2.679787	-1.128131	-1.706536	-3.496197	-0.248778	-0.247768	...	0.573574	0.17696
6329	7519.0	1.234235	3.019740	-4.304597	4.732795	3.624201	-1.357746	1.713445	-0.496358	-1.282858	...	-0.379068	0.70418

5 rows × 31 columns

Logistic regression function

In [6]:

```
def estimate(X,Y,st):
    clf=LogisticRegression()
    X_train, X_test, Y_train, Y_test = train_test_split(X,Y,test_size=0.2)
    clf.fit(X_train,Y_train)
    prediction = clf.predict(X_test)
    score = clf.score(X_test, Y_test)
    #accuracy = accuracy_score(Y_test,prediction)
    #print(prediction)
    #print("accuracy =",accuracy*100)
    matrix=confusion_matrix(Y_test,prediction)
    print(f'**************{st}***********')
    print("Accuracy is " ,score)
    plt.figure(figsize=(9,9))
    sns.heatmap(matrix, annot=True, fmt=".3f", linewidths=.5, square = True, cmap = 'Blu
es_r');
    plt.ylabel('Actual label');
    plt.xlabel('Predicted label');
    all_sample_title = 'Accuracy Score: {0}'.format(score)
    plt.title(all_sample_title, size = 15);
```

For 100k subset

In [7]:

```
# as given in the question
# we need to consider fraud data as much as possible we consider it fully
# so we found the count of class 1 data
X1_1=data_1.iloc[:,:-1].values
X1_0=data_0.iloc[:100000-cnt,:-1].values
X1=np.concatenate((X1_1,X1_0),axis=0)
Y1_1=data_1.iloc[:,-1].values
Y1_0=data_0.iloc[:100000- cnt,-1].values
Y1=np.concatenate((Y1_1,Y1_0), axis =0)
print('size of x1 : ',X1.shape)
print('size of y1 :',Y1.shape)
```

```
size of x1 :  (100000, 30)
size of y1 : (100000,)
```

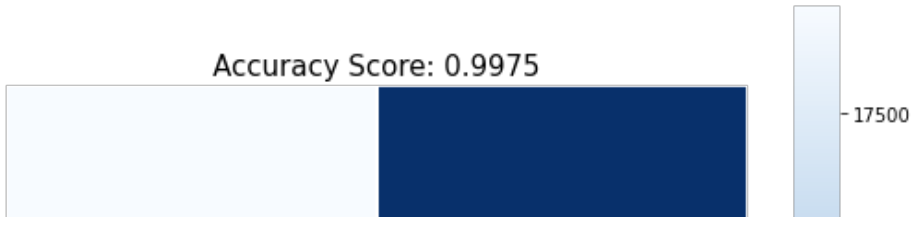
In [8]:

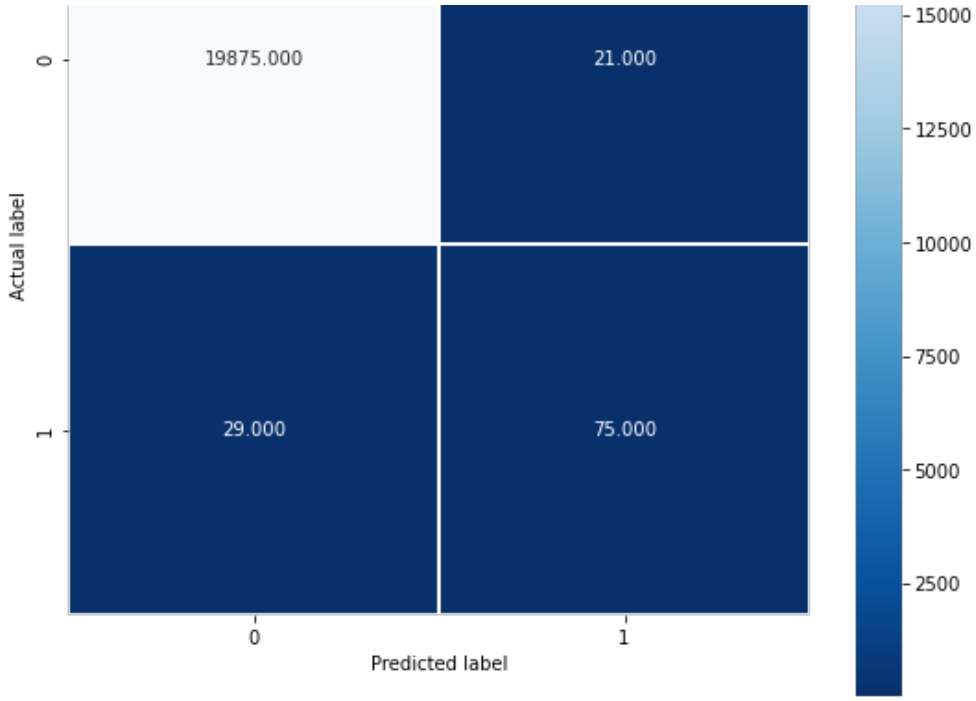
```
estimate(X1,Y1,'100k subset')
```

```
**************100k subset***********
Accuracy is  0.9975
```

```
C:\Users\avina\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:762: Converg
enceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```





20k subset

In [9]:

```
# as given in the question
# we need to consider fraud data as much as possible we consider it fully
# so we found the count of class 1 data
X2_1=data_1.iloc[:,:-1].values
X2_0=data_0.iloc[:20000-cnt,:-1].values
X2=np.concatenate((X2_1,X2_0),axis=0)
Y2_1=data_1.iloc[:,-1].values
Y2_0=data_0.iloc[:20000- cnt,-1].values
Y2=np.concatenate((Y2_1,Y2_0), axis =0)
print('size of x2 : ',X2.shape)
print('size of y2 :',Y2.shape)
```

```
size of x2 :  (20000, 30)
size of y2 : (20000,)
```

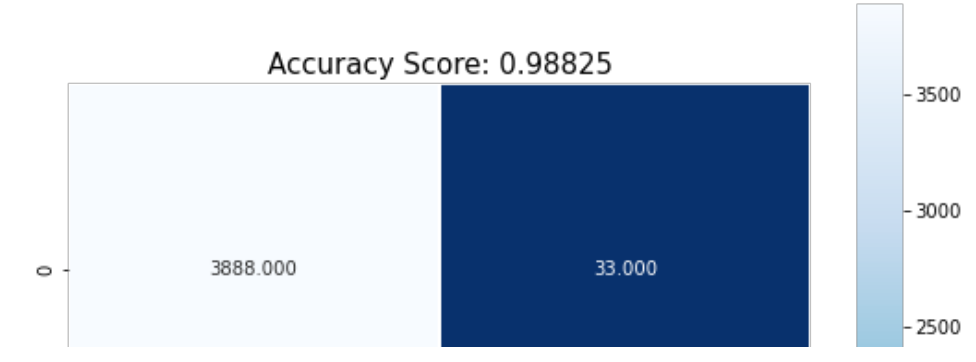
In [10]:

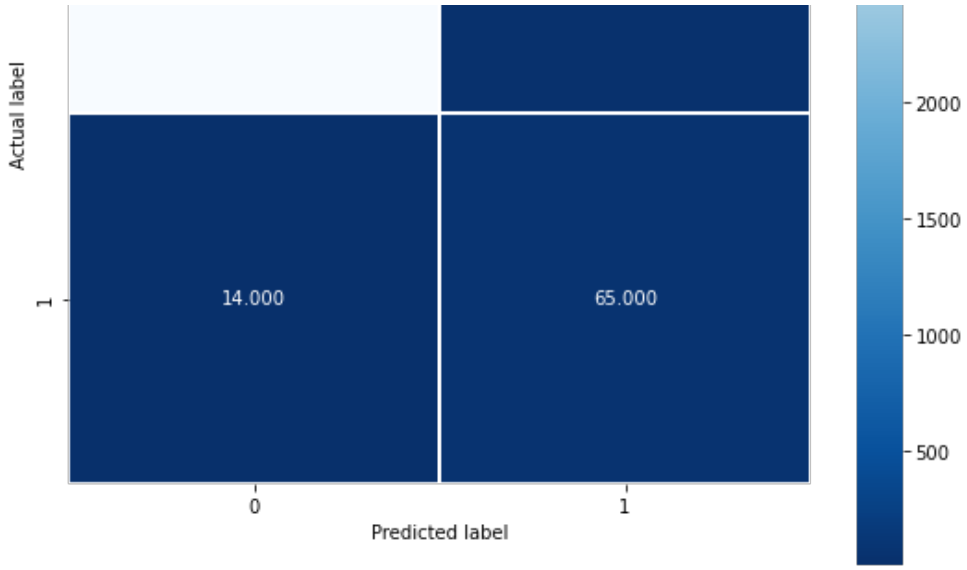
```
estimate(X2,Y2,'20k subset')
```

```
**************20k subset***********
Accuracy is  0.98825
```

```
C:\Users\avina\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:762: Converg
enceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```





for 10k subset

In [11]:

```
# as given in the question
# we need to consider fraud data as much as possible we consider it fully
# so we found the count of class 1 data
X3_1=data_1.iloc[:,:-1].values
X3_0=data_0.iloc[:20000-cnt,:-1].values
X3=np.concatenate((X3_1,X3_0),axis=0)
Y3_1=data_1.iloc[:,-1].values
Y3_0=data_0.iloc[:20000- cnt,-1].values
Y3=np.concatenate((Y3_1,Y3_0), axis =0)
print('size of x3 : ',X3.shape)
print('size of y3 :',Y3.shape)
```

```
size of x3 :  (20000, 30)
size of y3 : (20000,)
```

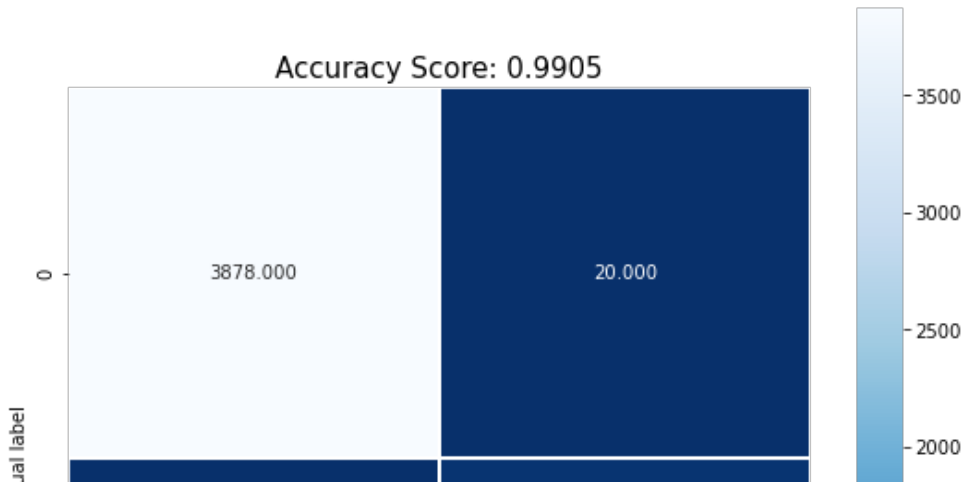
In [12]:

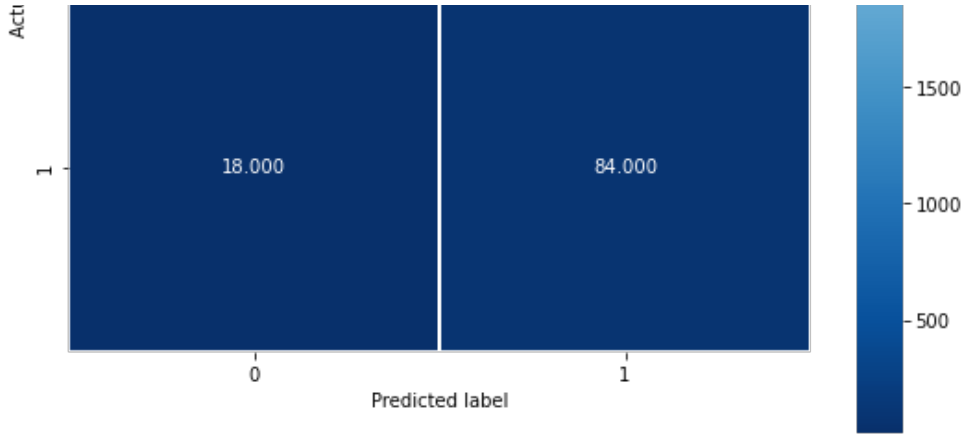
```
estimate(X2,Y2,'10k subset')
```

```
**************10k subset***********
Accuracy is  0.9905
```

```
C:\Users\avina\anaconda3\lib\site-packages\sklearn\linear_model\_logistic.py:762: Converg
enceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression
  n_iter_i = _check_optimize_result(
```





Q2 . Implement the logistic regression model on the Smarket.csv dataset. Use all the attribute as variables. And as output I need all the learned coefficients, and the scatter plot, and the classification graph generated by the logistic regression.

In [13]:

```
mdata = pd.read_csv('Smarket.csv')
mdata.head()
```

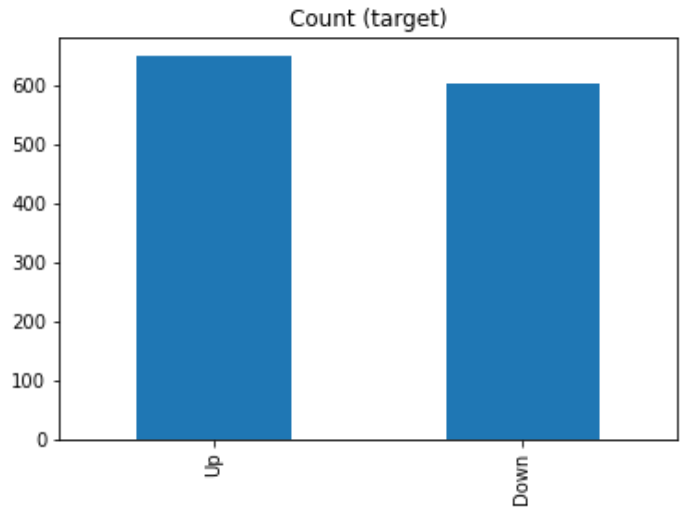
Out[13]:

	Year	Lag1	Lag2	Lag3	Lag4	Lag5	Volume	Today	Direction
0	2001	0.381	-0.192	-2.624	-1.055	5.010	1.1913	0.959	Up
1	2001	0.959	0.381	-0.192	-2.624	-1.055	1.2965	1.032	Up
2	2001	1.032	0.959	0.381	-0.192	-2.624	1.4112	-0.623	Down
3	2001	-0.623	1.032	0.959	0.381	-0.192	1.2760	0.614	Up
4	2001	0.614	-0.623	1.032	0.959	0.381	1.2057	0.213	Up

In [14]:

```
target_count = mdata['Direction'].value_counts()
print('Class 0:', target_count[0])
print('Class 1:', target_count[1])
print('Proportion:', round(target_count[0] / target_count[1], 2), ': 1')
cnt= target_count[1]
target_count.plot(kind='bar', title='Count (target)');
```

```
Class 0: 648
Class 1: 602
Proportion: 1.08 : 1
```



In [15]:

```
label_mapping ={'Up':1, 'Down':0}
```

```
mdata['Direction']= mdata['Direction'].map(label_mapping)
mdata.head()
```

Out[15]:

	Year	Lag1	Lag2	Lag3	Lag4	Lag5	Volume	Today	Direction
0	2001	0.381	-0.192	-2.624	-1.055	5.010	1.1913	0.959	1
1	2001	0.959	0.381	-0.192	-2.624	-1.055	1.2965	1.032	1
2	2001	1.032	0.959	0.381	-0.192	-2.624	1.4112	-0.623	0
3	2001	-0.623	1.032	0.959	0.381	-0.192	1.2760	0.614	1
4	2001	0.614	-0.623	1.032	0.959	0.381	1.2057	0.213	1

In [16]:

```
X= mdata.iloc[:,1:-1].values
y = mdata.iloc[:,-1].values
print(X.shape)
print(y.shape)
```

```
(1250, 7)
(1250,)
```

In [17]:

```
clf = LogisticRegression()
X_train, X_test, y_train, y_test = train_test_split(X,y,test_size=0.2)
clf.fit(X_train,y_train)
print("The Parameters are as follows  -")
print(clf.coef_)
```

```
The Parameters are as follows  -
[[1.03606858e-04 6.84371973e-02 7.24481271e-02 2.13508540e-02
  8.12102722e-02 2.85676557e-01 8.93472435e+00]]
```

In [ ]:

```

```