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RollNo:19

Support Vector Machine

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.svm import SVC
from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
```

In [2]:

```
df=pd.read_csv('D:\\vk\\TRIM 3\\ML\\DATASET\\bill_authentication.csv')
```

In [3]:

```
df
```

Out[3]:

	Variance	Skewness	Curtosis	Entropy	Class
0	3.62160	8.66610	-2.8073	-0.44699	0
1	4.54590	8.16740	-2.4586	-1.46210	0
2	3.86600	-2.63830	1.9242	0.10645	0
3	3.45660	9.52280	-4.0112	-3.59440	0
4	0.32924	-4.45520	4.5718	-0.98880	0
...	...	...	...	...	...
1367	0.40614	1.34920	-1.4501	-0.55949	1
1368	-1.38870	-4.87730	6.4774	0.34179	1
1369	-3.75030	-13.45860	17.5932	-2.77710	1
1370	-3.56370	-8.38270	12.3930	-1.28230	1
1371	-2.54190	-0.65804	2.6842	1.19520	1

1372 rows × 5 columns

In [4]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1372 entries, 0 to 1371
Data columns (total 5 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   Variance  1372 non-null   float64
 1   Skewness  1372 non-null   float64
 2   Curtosis  1372 non-null   float64
 3   Entropy   1372 non-null   float64
 4   Class     1372 non-null   int64  
dtypes: float64(4), int64(1)
memory usage: 53.7 KB
```

In [5]:
```
df.head()
```

Out[5]:

	Variance	Skewness	Curtosis	Entropy	Class
0	3.62160	8.6661	-2.8073	-0.44699	0
1	4.54590	8.1674	-2.4586	-1.46210	0
2	3.86600	-2.6383	1.9242	0.10645	0
3	3.45660	9.5228	-4.0112	-3.59440	0
4	0.32924	-4.4552	4.5718	-0.98880	0

In [6]:
```
df.describe()
```

Out[6]:

	Variance	Skewness	Curtosis	Entropy	Class
count	1372.000000	1372.000000	1372.000000	1372.000000	1372.000000
mean	0.433735	1.922353	1.397627	-1.191657	0.444606
std	2.842763	5.869047	4.310030	2.101013	0.497103
min	-7.042100	-13.773100	-5.286100	-8.548200	0.000000
25%	-1.773000	-1.708200	-1.574975	-2.413450	0.000000
50%	0.496180	2.319650	0.616630	-0.586650	0.000000
75%	2.821475	6.814625	3.179250	0.394810	1.000000
max	6.824800	12.951600	17.927400	2.449500	1.000000

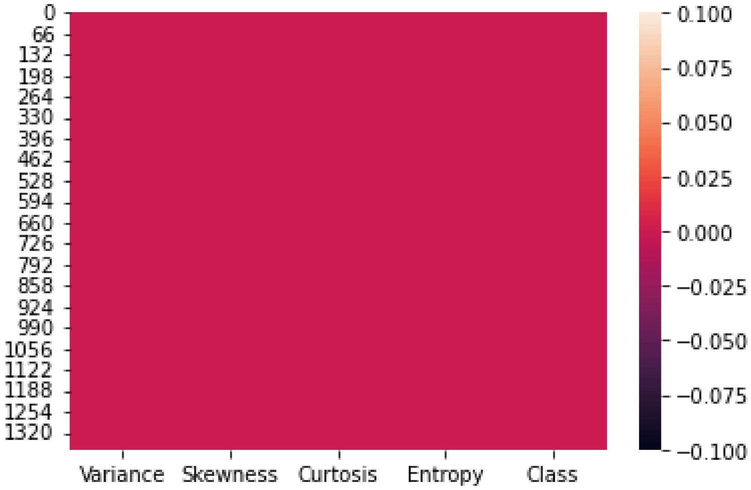
In [7]:
```
df.tail()
```

Out[7]:

	Variance	Skewness	Curtosis	Entropy	Class
1367	0.40614	1.34920	-1.4501	-0.55949	1
1368	-1.38870	-4.87730	6.4774	0.34179	1
1369	-3.75030	-13.45860	17.5932	-2.77710	1
1370	-3.56370	-8.38270	12.3930	-1.28230	1
1371	-2.54190	-0.65804	2.6842	1.19520	1

In [8]:
```
sns.heatmap(df.isnull())
```

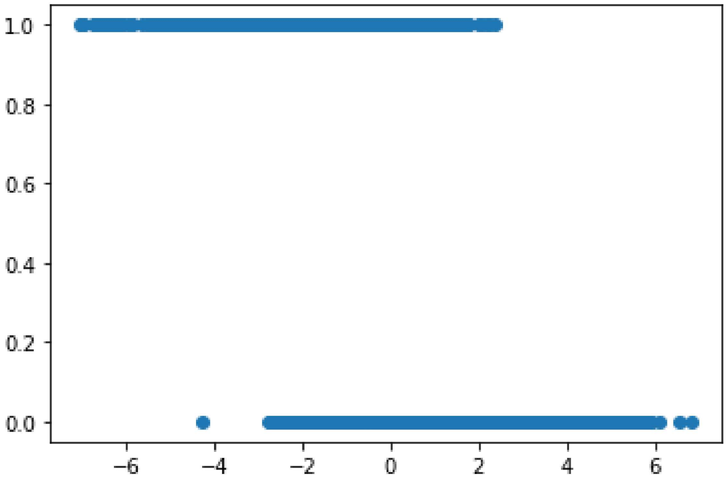
Out[8]:
```
<AxesSubplot:>
```



NO NULL VALUES

In [9]:
```
plt.scatter(df.Variance,df.Class)
```

Out[9]:
```
<matplotlib.collections.PathCollection at 0x1fd9f345fd0>
```



In [10]:
```
X=df.drop('Class',axis=1)
```

In [11]:
```
Y=df['Class']
```

In [12]:
```
X
```

Out[12]:

	Variance	Skewness	Curtosis	Entropy
0	3.62160	8.66610	-2.8073	-0.44699
1	4.54590	8.16740	-2.4586	-1.46210
2	3.86600	-2.63830	1.9242	0.10645
3	3.45660	9.52280	-4.0112	-3.59440
4	0.32924	-4.45520	4.5718	-0.98880
...	...	...	...	...
1367	0.40614	1.34920	-1.4501	-0.55949
1368	-1.38870	-4.87730	6.4774	0.34179
1369	-3.75030	-13.45860	17.5932	-2.77710
1370	-3.56370	-8.38270	12.3930	-1.28230
1371	-2.54190	-0.65804	2.6842	1.19520

1372 rows × 4 columns

In [13]:

```
Y
```

Out[13]:

```
0       0
1       0
2       0
3       0
4       0
       ..
1367    1
1368    1
1369    1
1370    1
1371    1
Name: Class, Length: 1372, dtype: int64
```

In [14]:

```
X_train,X_test,y_train,y_test=train_test_split(X,Y,test_size=0.20)
```

In [15]:

```
svclassifier = SVC(kernel='linear')
svclassifier.fit(X_train,y_train)
```

Out[15]:

```
SVC(kernel='linear')
```

In [16]:

```
y_pred=svclassifier.predict(X_test)
```

In [17]:

```
y_pred
```

Out[17]:

```
array([0, 0, 0, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 1,
       1, 1, 1, 0, 0, 0, 0, 0, 1, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0,
       1, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 1, 0,
       0, 1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 0,
       1, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1,
       1, 1, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 0,
       0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 1,
       0, 0, 1, 1, 1, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1,
       0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0, 0, 0, 0,
       0, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 1, 0, 0, 0,
       0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 1, 0, 1, 1, 1, 1, 1, 0,
       1, 1, 1, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0,
       0, 0, 1, 1, 1, 1, 1, 1, 1, 0, 1], dtype=int64)
```

In [18]:

```
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       0.99      0.99      0.99       156
           1       0.98      0.98      0.98       119

    accuracy                           0.99       275
   macro avg       0.99      0.99      0.99       275
weighted avg       0.99      0.99      0.99       275
```

In [21]:

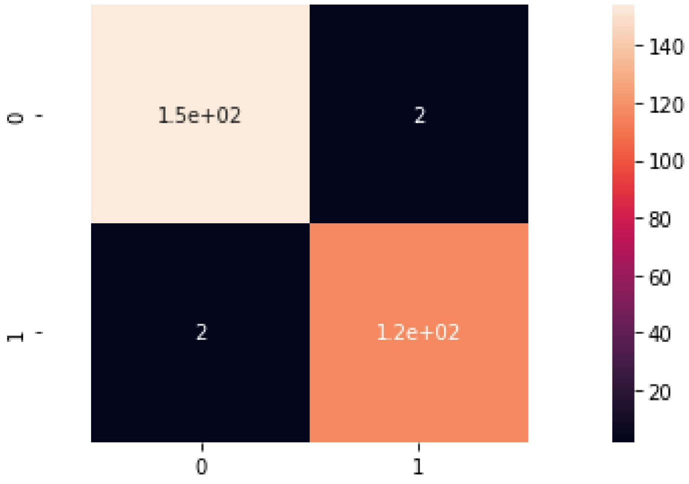
```
cf=confusion_matrix(y_test,y_pred)
cf
```

Out[21]:

```
array([[154,   2],
       [  2, 117]], dtype=int64)
```

In [22]:

```
sns.heatmap(cf,annot=True)
plt.axis('equal')
plt.show()
```



In [ ]: