Ishan Gupta - RBF Kernal SVM - 19BCE7467

[6]

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
df = pd.read_csv('pulsar_data_train.csv')
df=pd.DataFrame(df)
```

[7]

```
df.columns =['IP Mean', 'IP Sd', 'IP Kurtosis', 'IP Skewness','DM-SNR Mean', 'DM-SNR Sd', 'DM-SNR Kurtosis', 'DM-SNRSkewness', 'target_class']
round(df.describe(),2)
```

	IP Mean	IP Sd	IP Kurtosis	IP Skewness	DM-SNR Mean	DM-SNR Sd	DM-SNR Kurtosis	DM-SNRSkewness	target_class
count	12528.00	12528.00	10793.00	12528.00	12528.00	11350.00	12528.00	11903.00	12528.00
mean	111.04	46.52	0.48	1.78	12.67	26.35	8.33	105.53	0.09
std	25.67	6.80	1.06	6.21	29.61	19.61	4.54	107.40	0.29
min	5.81	24.77	-1.74	-1.79	0.21	7.37	-3.14	-1.98	0.00
25%	100.87	42.36	0.02	-0.19	1.91	14.40	5.80	35.20	0.00
50%	115.18	46.93	0.22	0.20	2.79	18.41	8.45	83.13	0.00
75%	127.11	50.98	0.47	0.93	5.41	28.34	10.73	140.00	0.00
max	189.73	91.81	8.07	68.10	222.42	110.64	34.54	1191.00	1.00

[8]

```
df.isnull().sum()
```

```
IP Mean               0
IP Sd                 0
IP Kurtosis        1735
IP Skewness           0
DM-SNR Mean           0
DM-SNR Sd          1178
DM-SNR Kurtosis       0
DM-SNRSkewness      625
target_class          0
dtype: int64
```

[9]

```
df.dropna(subset = ["IP Kurtosis"], inplace=True)
df.dropna(subset = ["DM-SNRSkewness"], inplace=True)
df.dropna(subset=['DM-SNR Sd'],inplace=True)
df.isnull().sum()
```

```
IP Mean            0
IP Sd              0
IP Kurtosis        0
IP Skewness        0
DM-SNR Mean        0
DM-SNR Sd          0
DM-SNR Kurtosis    0
DM-SNRSkewness     0
target_class       0
dtype: int64
```

[10]

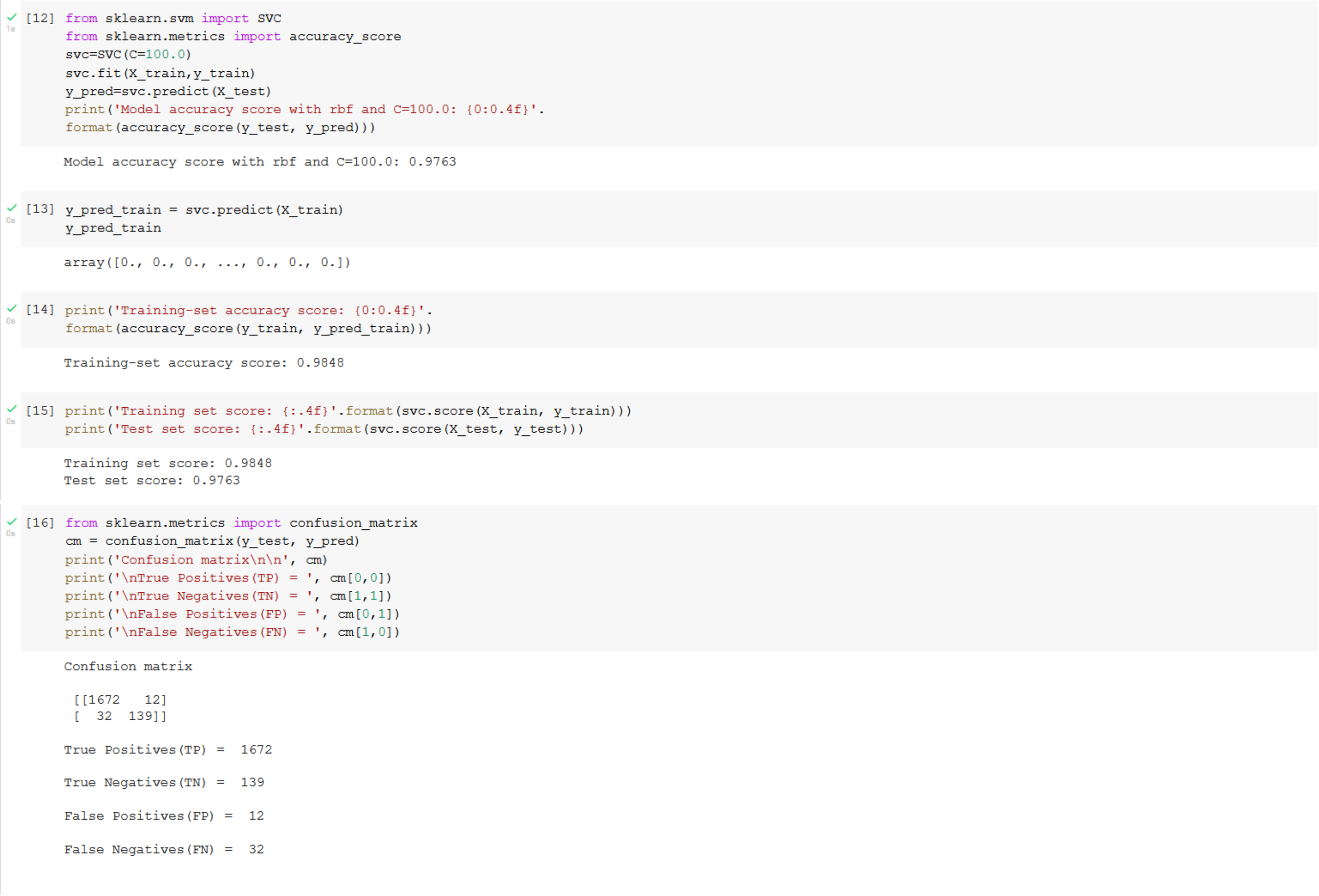
```
X = df.drop(['target_class'], axis=1)
y = df['target_class']
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2,
random_state = 0)
X_train.shape, X_test.shape
```

```
((7418, 8), (1855, 8))
```

[11]

```
cols = X_train.columns
from sklearn.preprocessing import StandardScaler
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_test = scaler.transform(X_test)
X_train = pd.DataFrame(X_train, columns=[cols])
X_test = pd.DataFrame(X_test, columns=[cols])
X_train.head(5)
```

	IP Mean	IP Sd	IP Kurtosis	IP Skewness	DM-SNR Mean	DM-SNR Sd	DM-SNR Kurtosis	DM-SNRSkewness
0	0.164798	0.907948	-0.032971	-0.269461	-0.313497	-0.405422	-0.220249	-0.374169
1	0.743130	-0.177942	-0.490658	-0.286519	-0.306883	-0.262643	-0.166121	-0.386149
2	0.606714	-0.760029	-0.186538	-0.083582	-0.377819	-0.714923	0.972838	0.913185
3	-0.254433	0.320053	-0.257150	-0.251679	-0.325306	-0.368962	-0.008550	-0.263124
4	0.303936	0.845016	-0.500837	-0.339807	-0.412308	-0.902511	3.430210	4.940553



```
[12] from sklearn.svm import SVC
     from sklearn.metrics import accuracy_score
     svc=SVC(C=100.0)
     svc.fit(X_train,y_train)
     y_pred=svc.predict(X_test)
     print('Model accuracy score with rbf and C=100.0: {0:0.4f}'.
     format(accuracy_score(y_test, y_pred)))
```

```
Model accuracy score with rbf and C=100.0: 0.9763
```

```
[13] y_pred_train = svc.predict(X_train)
     y_pred_train
```

```
array([0., 0., 0., ..., 0., 0., 0.])
```

```
[14] print('Training-set accuracy score: {0:0.4f}'.
     format(accuracy_score(y_train, y_pred_train)))
```

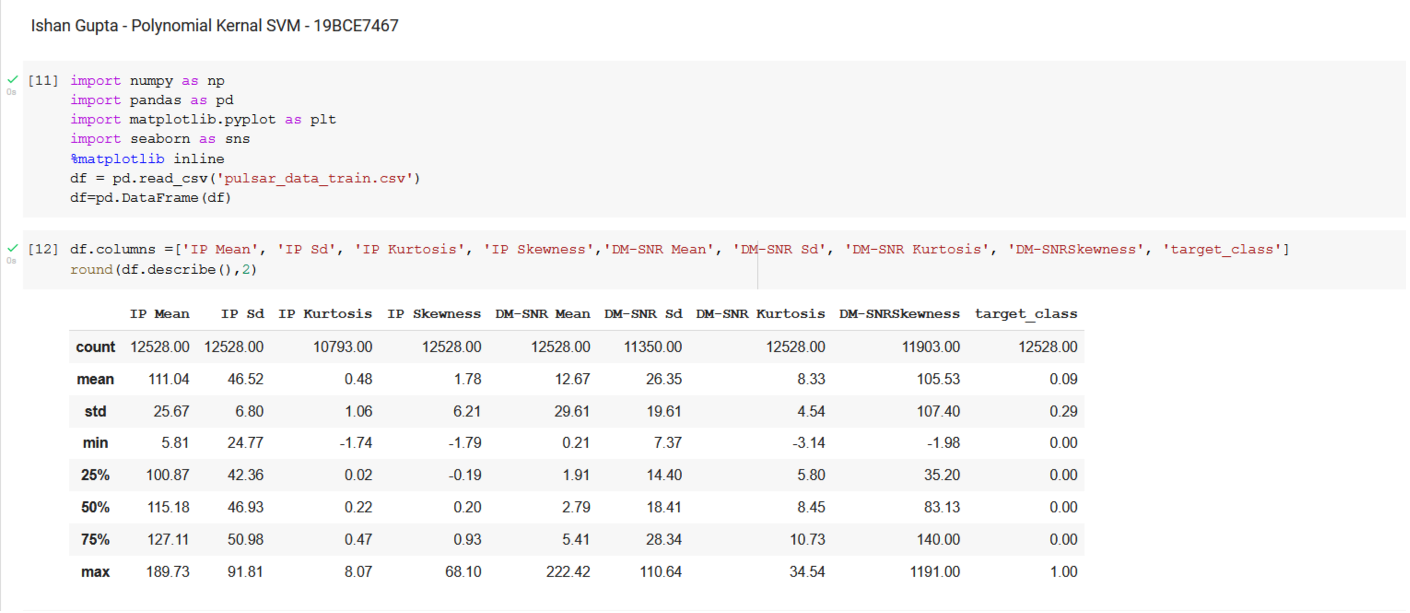
```
Training-set accuracy score: 0.9848
```

```
[15] print('Training set score: {:.4f}'.format(svc.score(X_train, y_train)))
     print('Test set score: {:.4f}'.format(svc.score(X_test, y_test)))
```

```
Training set score: 0.9848
Test set score: 0.9763
```

```
[16] from sklearn.metrics import confusion_matrix
     cm = confusion_matrix(y_test, y_pred)
     print('Confusion matrix\n\n', cm)
     print('\nTrue Positives(TP) = ', cm[0,0])
     print('\nTrue Negatives(TN) = ', cm[1,1])
     print('\nFalse Positives(FP) = ', cm[0,1])
     print('\nFalse Negatives(FN) = ', cm[1,0])
```

```
Confusion matrix

 [[1672   12]
 [  32  139]]

True Positives(TP) =  1672

True Negatives(TN) =  139

False Positives(FP) =  12

False Negatives(FN) =  32
```

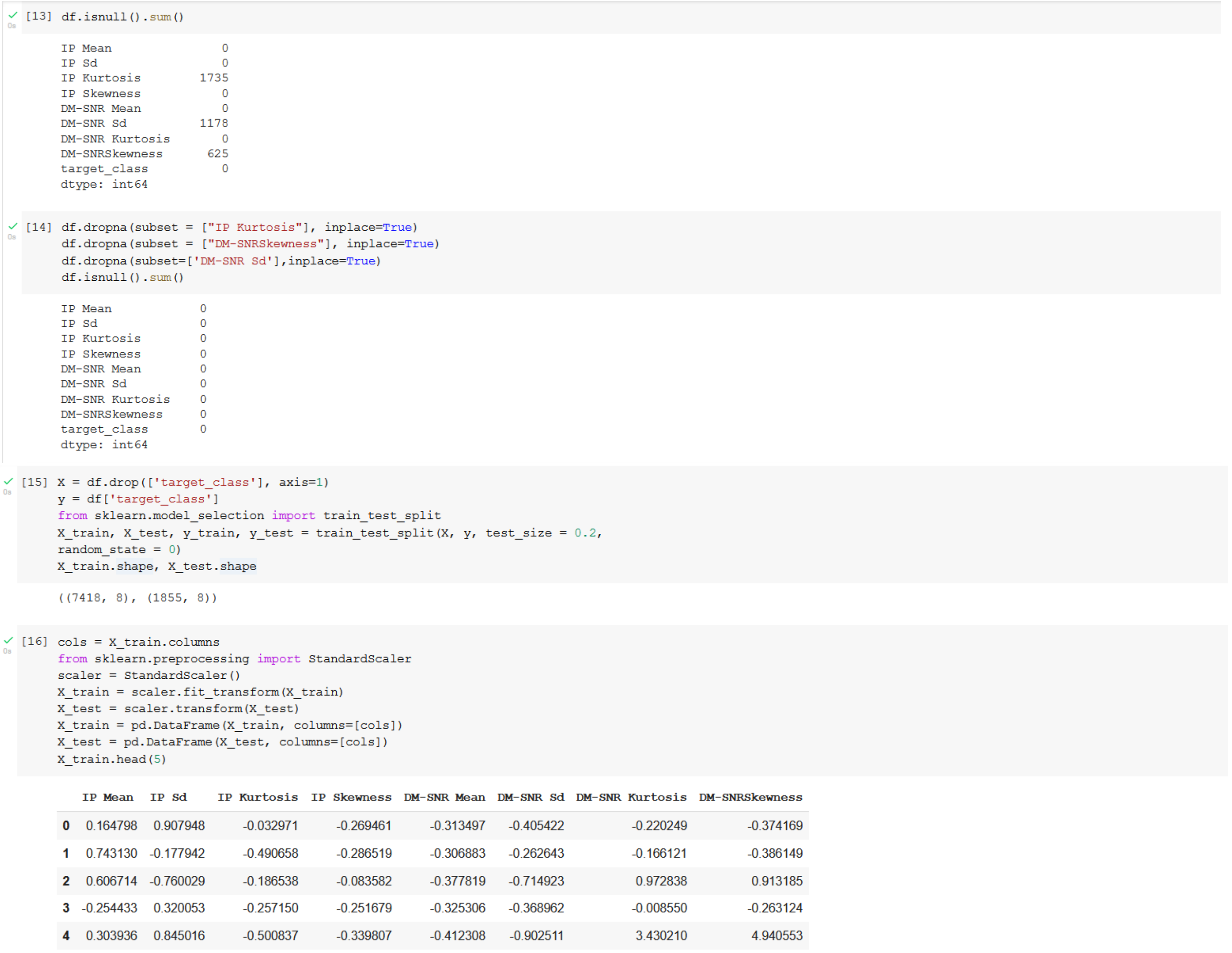


Ishan Gupta - Polynomial Kernal SVM - 19BCE7467

```
[11] import numpy as np
     import pandas as pd
     import matplotlib.pyplot as plt
     import seaborn as sns
     %matplotlib inline
     df = pd.read_csv('pulsar_data_train.csv')
     df=pd.DataFrame(df)
```

```
[12] df.columns =['IP Mean', 'IP Sd', 'IP Kurtosis', 'IP Skewness','DM-SNR Mean', 'DM-SNR Sd', 'DM-SNR Kurtosis', 'DM-SNRSkewness', 'target_class']
     round(df.describe(),2)
```

	IP Mean	IP Sd	IP Kurtosis	IP Skewness	DM-SNR Mean	DM-SNR Sd	DM-SNR Kurtosis	DM-SNRSkewness	target_class
count	12528.00	12528.00	10793.00	12528.00	12528.00	11350.00	12528.00	11903.00	12528.00
mean	111.04	46.52	0.48	1.78	12.67	26.35	8.33	105.53	0.09
std	25.67	6.80	1.06	6.21	29.61	19.61	4.54	107.40	0.29
min	5.81	24.77	-1.74	-1.79	0.21	7.37	-3.14	-1.98	0.00
25%	100.87	42.36	0.02	-0.19	1.91	14.40	5.80	35.20	0.00
50%	115.18	46.93	0.22	0.20	2.79	18.41	8.45	83.13	0.00
75%	127.11	50.98	0.47	0.93	5.41	28.34	10.73	140.00	0.00
max	189.73	91.81	8.07	68.10	222.42	110.64	34.54	1191.00	1.00



```
[13] df.isnull().sum()
```

```
IP Mean               0
IP Sd                 0
IP Kurtosis        1735
IP Skewness           0
DM-SNR Mean           0
DM-SNR Sd          1178
DM-SNR Kurtosis       0
DM-SNRSkewness      625
target_class          0
dtype: int64
```

```
[14] df.dropna(subset = ["IP Kurtosis"], inplace=True)
     df.dropna(subset = ["DM-SNRSkewness"], inplace=True)
     df.dropna(subset=['DM-SNR Sd'],inplace=True)
     df.isnull().sum()
```

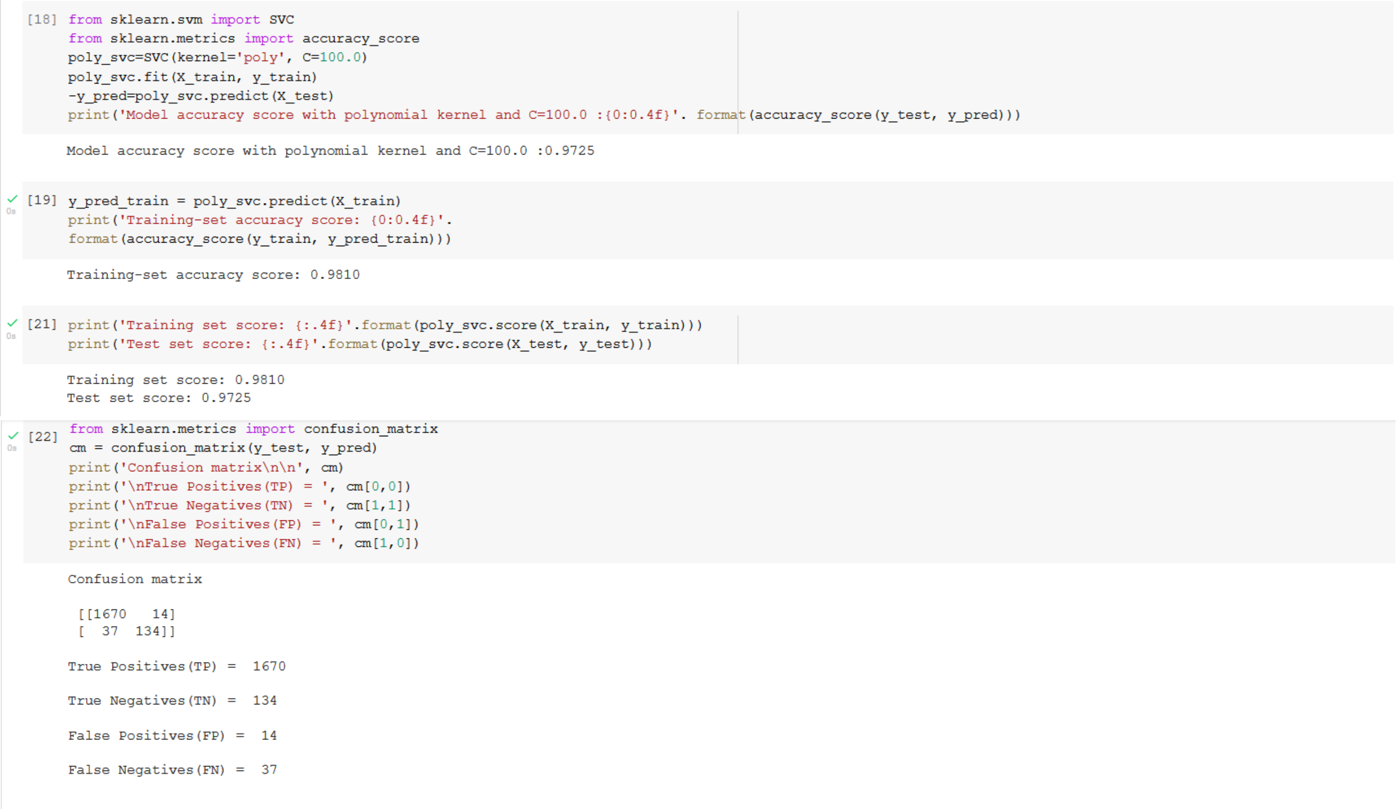
```
IP Mean            0
IP Sd              0
IP Kurtosis        0
IP Skewness        0
DM-SNR Mean        0
DM-SNR Sd          0
DM-SNR Kurtosis    0
DM-SNRSkewness     0
target_class       0
dtype: int64
```

```
[15] X = df.drop(['target_class'], axis=1)
     y = df['target_class']
     from sklearn.model_selection import train_test_split
     X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2,
     random_state = 0)
     X_train.shape, X_test.shape
```

```
((7418, 8), (1855, 8))
```

```
[16] cols = X_train.columns
     from sklearn.preprocessing import StandardScaler
     scaler = StandardScaler()
     X_train = scaler.fit_transform(X_train)
     X_test = scaler.transform(X_test)
     X_train = pd.DataFrame(X_train, columns=[cols])
     X_test = pd.DataFrame(X_test, columns=[cols])
     X_train.head(5)
```

	IP Mean	IP Sd	IP Kurtosis	IP Skewness	DM-SNR Mean	DM-SNR Sd	DM-SNR Kurtosis	DM-SNRSkewness
0	0.164798	0.907948	-0.032971	-0.269461	-0.313497	-0.405422	-0.220249	-0.374169
1	0.743130	-0.177942	-0.490658	-0.286519	-0.306883	-0.262643	-0.166121	-0.386149
2	0.606714	-0.760029	-0.186538	-0.083582	-0.377819	-0.714923	0.972838	0.913185
3	-0.254433	0.320053	-0.257150	-0.251679	-0.325306	-0.368962	-0.008550	-0.263124
4	0.303936	0.845016	-0.500837	-0.339807	-0.412308	-0.902511	3.430210	4.940553



```
[18] from sklearn.svm import SVC
     from sklearn.metrics import accuracy_score
     poly_svc=SVC(kernel='poly', C=100.0)
     poly_svc.fit(X_train, y_train)
     -y_pred=poly_svc.predict(X_test)
     print('Model accuracy score with polynomial kernel and C=100.0 :{0:0.4f}'. format(accuracy_score(y_test, y_pred)))
```

```
Model accuracy score with polynomial kernel and C=100.0 :0.9725
```

```
[19] y_pred_train = poly_svc.predict(X_train)
     print('Training-set accuracy score: {0:0.4f}'.
     format(accuracy_score(y_train, y_pred_train)))
```

```
Training-set accuracy score: 0.9810
```

```
[21] print('Training set score: {:.4f}'.format(poly_svc.score(X_train, y_train)))
     print('Test set score: {:.4f}'.format(poly_svc.score(X_test, y_test)))
```

```
Training set score: 0.9810
Test set score: 0.9725
```

```
[22] from sklearn.metrics import confusion_matrix
     cm = confusion_matrix(y_test, y_pred)
     print('Confusion matrix\n\n', cm)
     print('\nTrue Positives(TP) = ', cm[0,0])
     print('\nTrue Negatives(TN) = ', cm[1,1])
     print('\nFalse Positives(FP) = ', cm[0,1])
     print('\nFalse Negatives(FN) = ', cm[1,0])
```

```
Confusion matrix

 [[1670   14]
 [  37  134]]

True Positives(TP) =  1670

True Negatives(TN) =  134

False Positives(FP) =  14

False Negatives(FN) =  37
```