naive-bayes-classification

April 11, 2025

[1]:
```
import numpy as np
import matplotlib.pyplot as mtp
import pandas as pd
```

[2]:
```
import os
os.getcwd()
```

[2]:
```
'/content'
```

[3]:
```
#importing the dataset
dataset = pd.read_csv('User_Data.csv')
```

[4]:
```
x=dataset.iloc[:,[2,3]].values
x
```

[4]:
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```

[5]:
```
y=dataset.iloc[:,4].values
y
```

[5]:
```
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```

[6]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.
 ↪25,random_state=0)

#feature Scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
```

[7]:
```
print(x_train)
print(x_test)
```

```
[[ 0.58164944 -0.88670699]
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 [-0.01254409 -0.5677824 ]
 [-0.60673761  1.89663484]
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 [-0.01254409 -0.24885782]
```

```
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[-1.79512465  0.35999821]
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[-1.59706014 -1.49556302]
[-0.50770535 -0.53878926]
[ 0.48261718  1.83864855]
[-1.39899564 -1.089659  ]
[ 0.77971394 -1.37959044]
[-0.30964085 -0.42281668]
[ 1.57197197  0.99784738]
[ 0.97777845  1.43274454]
[-0.30964085 -0.48080297]
[-0.11157634  2.15757314]
[-1.49802789 -0.1038921 ]
[-0.11157634  1.95462113]
[-0.70576986 -0.33583725]
[-0.50770535 -0.8287207 ]
[ 0.68068169 -1.37959044]
[-0.80480212 -1.58254245]
[-1.89415691 -1.46656987]
```

```
[ 1.07681071  0.12805305]
[ 0.08648817  1.51972397]
[-0.30964085  0.09905991]
[ 0.08648817  0.04107362]
[-1.39899564 -1.3505973 ]
[ 0.28455268  0.07006676]
[-0.90383437  0.38899135]
[ 1.57197197 -1.26361786]
[-0.30964085 -0.74174127]
[-0.11157634  0.1570462 ]
[-0.90383437 -0.65476184]
[-0.70576986 -0.04590581]
[ 0.38358493 -0.45180983]
[-0.80480212  1.89663484]
[ 1.37390747  1.28777882]
[ 1.17584296 -0.97368642]
[ 1.77003648  1.83864855]
[-0.90383437 -0.24885782]
[-0.80480212  0.56295021]
[-1.20093113 -1.5535493 ]
[-0.50770535 -1.11865214]
[ 0.28455268  0.07006676]
[-0.21060859 -1.06066585]
[ 1.67100423  1.6067034 ]
[ 0.97777845  1.78066227]
[ 0.28455268  0.04107362]
[-0.80480212 -0.21986468]
[-0.11157634  0.07006676]
[ 0.28455268 -0.19087153]
[ 1.96810099 -0.65476184]
[-0.80480212  1.3457651 ]
[-1.79512465 -0.59677555]
[-0.11157634  0.12805305]
[ 0.28455268 -0.30684411]
[ 1.07681071  0.56295021]
[-1.00286662  0.27301877]
[ 1.47293972  0.35999821]
[ 0.18552042 -0.3648304 ]
[ 2.1661655  -1.03167271]
[-0.30964085  1.11381995]
[-1.6960924   0.07006676]
[-0.01254409  0.04107362]
[ 0.08648817  1.05583366]
[-0.11157634 -0.3648304 ]
[-1.20093113  0.07006676]
[-0.30964085 -1.3505973 ]
[ 1.57197197  1.11381995]
[-0.80480212 -1.52455616]
```

```
[ 0.08648817  1.8676417 ]
[-0.90383437 -0.77073441]
[-0.50770535 -0.77073441]
[-0.30964085 -0.91570013]
[ 0.28455268 -0.71274813]
[ 0.28455268  0.07006676]
[ 0.08648817  1.8676417 ]
[-1.10189888  1.95462113]
[-1.6960924  -1.5535493 ]
[-1.20093113 -1.089659  ]
[-0.70576986 -0.1038921 ]
[ 0.08648817  0.09905991]
[ 0.28455268  0.27301877]
[ 0.8787462  -0.5677824 ]
[ 0.28455268 -1.14764529]
[-0.11157634  0.67892279]
[ 2.1661655  -0.68375498]
[-1.29996338 -1.37959044]
[-1.00286662 -0.94469328]
[-0.01254409 -0.42281668]
[-0.21060859 -0.45180983]
[-1.79512465 -0.97368642]
[ 1.77003648  0.99784738]
[ 0.18552042 -0.3648304 ]
[ 0.38358493  1.11381995]
[-1.79512465 -1.3505973 ]
[ 0.18552042 -0.13288524]
[ 0.8787462  -1.43757673]
[-1.99318916  0.47597078]
[-0.30964085  0.27301877]
[ 1.86906873 -1.06066585]
[-0.4086731   0.07006676]
[ 1.07681071 -0.88670699]
[-1.10189888 -1.11865214]
[-1.89415691  0.01208048]
[ 0.08648817  0.27301877]
[-1.20093113  0.33100506]
[-1.29996338  0.30201192]
[-1.00286662  0.44697764]
[ 1.67100423 -0.88670699]
[ 1.17584296  0.53395707]
[ 1.07681071  0.53395707]
[ 1.37390747  2.331532  ]
[-0.30964085 -0.13288524]
[ 0.38358493 -0.45180983]
[-0.4086731  -0.77073441]
[-0.11157634 -0.50979612]
[ 0.97777845 -1.14764529]
```

```
 [-0.90383437 -0.77073441]
 [-0.21060859 -0.50979612]
 [-1.10189888 -0.45180983]
 [-1.20093113  1.40375139]]
[[-0.80480212  0.50496393]
 [-0.01254409 -0.5677824 ]
 [-0.30964085  0.1570462 ]
 [-0.80480212  0.27301877]
 [-0.30964085 -0.5677824 ]
 [-1.10189888 -1.43757673]
 [-0.70576986 -1.58254245]
 [-0.21060859  2.15757314]
 [-1.99318916 -0.04590581]
 [ 0.8787462  -0.77073441]
 [-0.80480212 -0.59677555]
 [-1.00286662 -0.42281668]
 [-0.11157634 -0.42281668]
 [ 0.08648817  0.21503249]
 [-1.79512465  0.47597078]
 [-0.60673761  1.37475825]
 [-0.11157634  0.21503249]
 [-1.89415691  0.44697764]
 [ 1.67100423  1.75166912]
 [-0.30964085 -1.37959044]
 [-0.30964085 -0.65476184]
 [ 0.8787462   2.15757314]
 [ 0.28455268 -0.53878926]
 [ 0.8787462   1.02684052]
 [-1.49802789 -1.20563157]
 [ 1.07681071  2.07059371]
 [-1.00286662  0.50496393]
 [-0.90383437  0.30201192]
 [-0.11157634 -0.21986468]
 [-0.60673761  0.47597078]
 [-1.6960924   0.53395707]
 [-0.11157634  0.27301877]
 [ 1.86906873 -0.27785096]
 [-0.11157634 -0.48080297]
 [-1.39899564 -0.33583725]
 [-1.99318916 -0.50979612]
 [-1.59706014  0.33100506]
 [-0.4086731  -0.77073441]
 [-0.70576986 -1.03167271]
 [ 1.07681071 -0.97368642]
 [-1.10189888  0.53395707]
 [ 0.28455268 -0.50979612]
 [-1.10189888  0.41798449]
 [-0.30964085 -1.43757673]
```

```
[ 0.48261718  1.22979253]
[-1.10189888 -0.33583725]
[-0.11157634  0.30201192]
[ 1.37390747  0.59194336]
[-1.20093113 -1.14764529]
[ 1.07681071  0.47597078]
[ 1.86906873  1.51972397]
[-0.4086731  -1.29261101]
[-0.30964085 -0.3648304 ]
[-0.4086731   1.31677196]
[ 2.06713324  0.53395707]
[ 0.68068169 -1.089659  ]
[-0.90383437  0.38899135]
[-1.20093113  0.30201192]
[ 1.07681071 -1.20563157]
[-1.49802789 -1.43757673]
[-0.60673761 -1.49556302]
[ 2.1661655  -0.79972756]
[-1.89415691  0.18603934]
[-0.21060859  0.85288166]
[-1.89415691 -1.26361786]
[ 2.1661655   0.38899135]
[-1.39899564  0.56295021]
[-1.10189888 -0.33583725]
[ 0.18552042 -0.65476184]
[ 0.38358493  0.01208048]
[-0.60673761  2.331532  ]
[-0.30964085  0.21503249]
[-1.59706014 -0.19087153]
[ 0.68068169 -1.37959044]
[-1.10189888  0.56295021]
[-1.99318916  0.35999821]
[ 0.38358493  0.27301877]
[ 0.18552042 -0.27785096]
[ 1.47293972 -1.03167271]
[ 0.8787462   1.08482681]
[ 1.96810099  2.15757314]
[ 2.06713324  0.38899135]
[-1.39899564 -0.42281668]
[-1.20093113 -1.00267957]
[ 1.96810099 -0.91570013]
[ 0.38358493  0.30201192]
[ 0.18552042  0.1570462 ]
[ 2.06713324  1.75166912]
[ 0.77971394 -0.8287207 ]
[ 0.28455268 -0.27785096]
[ 0.38358493 -0.16187839]
[-0.11157634  2.21555943]
```

```
 [-1.49802789 -0.62576869]
 [-1.29996338 -1.06066585]
 [-1.39899564  0.41798449]
 [-1.10189888  0.76590222]
 [-1.49802789 -0.19087153]
 [ 0.97777845 -1.06066585]
 [ 0.97777845  0.59194336]
 [ 0.38358493  0.99784738]]
```

[8]:
```
#fitting Naive Bayes to the training set
from sklearn.naive_bayes import GaussianNB
classifier = GaussianNB()
classifier.fit(x_train,y_train)
```

[8]:
```
GaussianNB()
```

[9]:
```
print(x_test)
```

```
[[-0.80480212  0.50496393]
 [-0.01254409 -0.5677824 ]
 [-0.30964085  0.1570462 ]
 [-0.80480212  0.27301877]
 [-0.30964085 -0.5677824 ]
 [-1.10189888 -1.43757673]
 [-0.70576986 -1.58254245]
 [-0.21060859  2.15757314]
 [-1.99318916 -0.04590581]
 [ 0.8787462  -0.77073441]
 [-0.80480212 -0.59677555]
 [-1.00286662 -0.42281668]
 [-0.11157634 -0.42281668]
 [ 0.08648817  0.21503249]
 [-1.79512465  0.47597078]
 [-0.60673761  1.37475825]
 [-0.11157634  0.21503249]
 [-1.89415691  0.44697764]
 [ 1.67100423  1.75166912]
 [-0.30964085 -1.37959044]
 [-0.30964085 -0.65476184]
 [ 0.8787462   2.15757314]
 [ 0.28455268 -0.53878926]
 [ 0.8787462   1.02684052]
 [-1.49802789 -1.20563157]
 [ 1.07681071  2.07059371]
 [-1.00286662  0.50496393]
 [-0.90383437  0.30201192]
 [-0.11157634 -0.21986468]
 [-0.60673761  0.47597078]
```

```
[-1.6960924   0.53395707]
[-0.11157634  0.27301877]
[ 1.86906873 -0.27785096]
[-0.11157634 -0.48080297]
[-1.39899564 -0.33583725]
[-1.99318916 -0.50979612]
[-1.59706014  0.33100506]
[-0.4086731  -0.77073441]
[-0.70576986 -1.03167271]
[ 1.07681071 -0.97368642]
[-1.10189888  0.53395707]
[ 0.28455268 -0.50979612]
[-1.10189888  0.41798449]
[-0.30964085 -1.43757673]
[ 0.48261718  1.22979253]
[-1.10189888 -0.33583725]
[-0.11157634  0.30201192]
[ 1.37390747  0.59194336]
[-1.20093113 -1.14764529]
[ 1.07681071  0.47597078]
[ 1.86906873  1.51972397]
[-0.4086731  -1.29261101]
[-0.30964085 -0.3648304 ]
[-0.4086731   1.31677196]
[ 2.06713324  0.53395707]
[ 0.68068169 -1.089659  ]
[-0.90383437  0.38899135]
[-1.20093113  0.30201192]
[ 1.07681071 -1.20563157]
[-1.49802789 -1.43757673]
[-0.60673761 -1.49556302]
[ 2.1661655  -0.79972756]
[-1.89415691  0.18603934]
[-0.21060859  0.85288166]
[-1.89415691 -1.26361786]
[ 2.1661655   0.38899135]
[-1.39899564  0.56295021]
[-1.10189888 -0.33583725]
[ 0.18552042 -0.65476184]
[ 0.38358493  0.01208048]
[-0.60673761  2.331532  ]
[-0.30964085  0.21503249]
[-1.59706014 -0.19087153]
[ 0.68068169 -1.37959044]
[-1.10189888  0.56295021]
[-1.99318916  0.35999821]
[ 0.38358493  0.27301877]
[ 0.18552042 -0.27785096]
```

```
[ 1.47293972 -1.03167271]
[ 0.8787462   1.08482681]
[ 1.96810099  2.15757314]
[ 2.06713324  0.38899135]
[-1.39899564 -0.42281668]
[-1.20093113 -1.00267957]
[ 1.96810099 -0.91570013]
[ 0.38358493  0.30201192]
[ 0.18552042  0.1570462 ]
[ 2.06713324  1.75166912]
[ 0.77971394 -0.8287207 ]
[ 0.28455268 -0.27785096]
[ 0.38358493 -0.16187839]
[-0.11157634  2.21555943]
[-1.49802789 -0.62576869]
[-1.29996338 -1.06066585]
[-1.39899564  0.41798449]
[-1.10189888  0.76590222]
[-1.49802789 -0.19087153]
[ 0.97777845 -1.06066585]
[ 0.97777845  0.59194336]
[ 0.38358493  0.99784738]]
```

[10]:
```
#predicting the test set results
y_pred = classifier.predict(x_test)
y_pred
```

[10]:
```
array([0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 1,
       0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,
       1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1,
       0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1,
       0, 0, 0, 1, 0, 0, 0, 0, 0, 1, 1, 1])
```

[11]:
```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test,y_pred)
cm
```

[11]:
```
array([[65,  3],
       [ 7, 25]])
```

[12]:
```
y_pred=classifier.predict([[0.38358493,0.99784738]])
print(y_pred)
```

```
[1]
```