practical-6

March 10, 2024

[ ]:
```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn.naive_bayes import GaussianNB
from sklearn.metrics import confusion_matrix
from sklearn.metrics import accuracy_score
from sklearn.metrics import recall_score
```

[ ]:
```
df= pd.read_csv("/content/Iris.csv")
```

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

[ ]:

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	Species
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa

[ ]:
```
x_data = df[['SepalLengthCm', 'SepalWidthCm', 'PetalLengthCm','PetalWidthCm']]␣
↪#X_data=df.drop()
y_data = df['Species']
```

[ ]:
```
x_data
```

[ ]:

	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
0	5.1	3.5	1.4	0.2
1	4.9	3.0	1.4	0.2
2	4.7	3.2	1.3	0.2
3	4.6	3.1	1.5	0.2
4	5.0	3.6	1.4	0.2
..	…	…	…	…
145	6.7	3.0	5.2	2.3
146	6.3	2.5	5.0	1.9
147	6.5	3.0	5.2	2.0
148	6.2	3.4	5.4	2.3

```
149            5.9           3.0            5.1           1.8

[150 rows x 4 columns]
```

[ ]:
```
y_data
```

[ ]:
```
0         Iris-setosa
1         Iris-setosa
2         Iris-setosa
3         Iris-setosa
4         Iris-setosa
             …
145    Iris-virginica
146    Iris-virginica
147    Iris-virginica
148    Iris-virginica
149    Iris-virginica
Name: Species, Length: 150, dtype: object
```

[ ]:
```
x_train, x_test, y_train, y_test = train_test_split(x_data, y_data ,test_size =␣
↪0.2, shuffle=False)
```

[ ]:
```
x_train
```

[ ]:
```
     SepalLengthCm  SepalWidthCm  PetalLengthCm  PetalWidthCm
0              5.1           3.5            1.4           0.2
1              4.9           3.0            1.4           0.2
2              4.7           3.2            1.3           0.2
3              4.6           3.1            1.5           0.2
4              5.0           3.6            1.4           0.2
..             …             …              …             …
115            6.4           3.2            5.3           2.3
116            6.5           3.0            5.5           1.8
117            7.7           3.8            6.7           2.2
118            7.7           2.6            6.9           2.3
119            6.0           2.2            5.0           1.5

[120 rows x 4 columns]
```

[ ]:
```
x_test
```

[ ]:
```
     SepalLengthCm  SepalWidthCm  PetalLengthCm  PetalWidthCm
120            6.9           3.2            5.7           2.3
121            5.6           2.8            4.9           2.0
122            7.7           2.8            6.7           2.0
123            6.3           2.7            4.9           1.8
124            6.7           3.3            5.7           2.1
```

```
125           7.2           3.2           6.0           1.8
126           6.2           2.8           4.8           1.8
127           6.1           3.0           4.9           1.8
128           6.4           2.8           5.6           2.1
129           7.2           3.0           5.8           1.6
130           7.4           2.8           6.1           1.9
131           7.9           3.8           6.4           2.0
132           6.4           2.8           5.6           2.2
133           6.3           2.8           5.1           1.5
134           6.1           2.6           5.6           1.4
135           7.7           3.0           6.1           2.3
136           6.3           3.4           5.6           2.4
137           6.4           3.1           5.5           1.8
138           6.0           3.0           4.8           1.8
139           6.9           3.1           5.4           2.1
140           6.7           3.1           5.6           2.4
141           6.9           3.1           5.1           2.3
142           5.8           2.7           5.1           1.9
143           6.8           3.2           5.9           2.3
144           6.7           3.3           5.7           2.5
145           6.7           3.0           5.2           2.3
146           6.3           2.5           5.0           1.9
147           6.5           3.0           5.2           2.0
148           6.2           3.4           5.4           2.3
149           5.9           3.0           5.1           1.8
```

[ ]:
```
y_train
```

[ ]:
```
0         Iris-setosa
1         Iris-setosa
2         Iris-setosa
3         Iris-setosa
4         Iris-setosa
             …
115    Iris-virginica
116    Iris-virginica
117    Iris-virginica
118    Iris-virginica
119    Iris-virginica
Name: Species, Length: 120, dtype: object
```

[ ]:
```
y_test
```

[ ]:
```
120    Iris-virginica
121    Iris-virginica
122    Iris-virginica
123    Iris-virginica
```

```
124    Iris-virginica
125    Iris-virginica
126    Iris-virginica
127    Iris-virginica
128    Iris-virginica
129    Iris-virginica
130    Iris-virginica
131    Iris-virginica
132    Iris-virginica
133    Iris-virginica
134    Iris-virginica
135    Iris-virginica
136    Iris-virginica
137    Iris-virginica
138    Iris-virginica
139    Iris-virginica
140    Iris-virginica
141    Iris-virginica
142    Iris-virginica
143    Iris-virginica
144    Iris-virginica
145    Iris-virginica
146    Iris-virginica
147    Iris-virginica
148    Iris-virginica
149    Iris-virginica
Name: Species, dtype: object
```

[ ]:
```
sc = StandardScaler()
X_train = sc.fit_transform(x_train)
X_test = sc.transform(x_test)
```

[ ]:
```
classifier = GaussianNB()
classifier.fit(X_train, y_train)
```

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

[ ]:
```
y_pred = classifier.predict(X_test)
y_pred
```

[ ]:
```
array(['Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-versicolor', 'Iris-versicolor',
       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
       'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
```

```
        'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
        'Iris-virginica', 'Iris-virginica', 'Iris-virginica',
        'Iris-virginica', 'Iris-virginica', 'Iris-virginica'], dtype='<U15')
```

[ ]:
```
cm = confusion_matrix(y_test, y_pred)
print ("Accuracy : ", accuracy_score(y_test, y_pred))
cm
```

```
Accuracy :  0.9333333333333333
```

[ ]:
```
array([[ 0,  0],
       [ 2, 28]])
```

[ ]:
```
from sklearn.metrics import precision_score
```

[ ]:
```
print('Precision:', precision_score(y_test, y_pred,average='weighted'))
```

```
Precision: 1.0
```

[ ]:
```
recall = recall_score(y_test, y_pred, average='weighted')
print('Recall:' , recall)
```

```
Recall: 0.9333333333333333

/usr/local/lib/python3.10/dist-packages/sklearn/metrics/_classification.py:1344:
UndefinedMetricWarning: Recall is ill-defined and being set to 0.0 in labels
with no true samples. Use `zero_division` parameter to control this behavior.
  _warn_prf(average, modifier, msg_start, len(result))
```