practical-exam-08

May 23, 2023

[1]:
```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount("/content/drive", force_remount=True).
```

1 Problem Statement 8

Implement Simple Naïve Bayes classification algorithm using Python/R on iris.csv dataset. Compute Confusion matrix to find TP, FP, TN, FN, Accuracy, Error rate, Precision, Recall on the given dataset.

[3]:
```
import pandas as pd
```

[106]:
```
data = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/exam_datasets/
↪5-8-13-14.iris.csv')
```

```
<IPython.core.display.HTML object>
```

[109]:
```
data.info()
```

```
<IPython.core.display.HTML object>
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   sepal.length  150 non-null    float64
 1   sepal.width   150 non-null    float64
 2   petal.length  150 non-null    float64
 3   petal.width   150 non-null    float64
 4   variety       150 non-null    object
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

[120]:
```
x = data.iloc[:,:4].values
y = data['variety'].values
```

```
x
```

```
<IPython.core.display.HTML object>
```

[120]:
```
array([[5.1, 3.5, 1.4, 0.2],
       [4.9, 3. , 1.4, 0.2],
       [4.7, 3.2, 1.3, 0.2],
       [4.6, 3.1, 1.5, 0.2],
       [5. , 3.6, 1.4, 0.2],
       [5.4, 3.9, 1.7, 0.4],
       [4.6, 3.4, 1.4, 0.3],
       [5. , 3.4, 1.5, 0.2],
       [4.4, 2.9, 1.4, 0.2],
       [4.9, 3.1, 1.5, 0.1],
       [5.4, 3.7, 1.5, 0.2],
       [4.8, 3.4, 1.6, 0.2],
       [4.8, 3. , 1.4, 0.1],
       [4.3, 3. , 1.1, 0.1],
       [5.8, 4. , 1.2, 0.2],
       [5.7, 4.4, 1.5, 0.4],
       [5.4, 3.9, 1.3, 0.4],
       [5.1, 3.5, 1.4, 0.3],
       [5.7, 3.8, 1.7, 0.3],
       [5.1, 3.8, 1.5, 0.3],
       [5.4, 3.4, 1.7, 0.2],
       [5.1, 3.7, 1.5, 0.4],
       [4.6, 3.6, 1. , 0.2],
       [5.1, 3.3, 1.7, 0.5],
       [4.8, 3.4, 1.9, 0.2],
       [5. , 3. , 1.6, 0.2],
       [5. , 3.4, 1.6, 0.4],
       [5.2, 3.5, 1.5, 0.2],
       [5.2, 3.4, 1.4, 0.2],
       [4.7, 3.2, 1.6, 0.2],
       [4.8, 3.1, 1.6, 0.2],
       [5.4, 3.4, 1.5, 0.4],
       [5.2, 4.1, 1.5, 0.1],
       [5.5, 4.2, 1.4, 0.2],
       [4.9, 3.1, 1.5, 0.2],
       [5. , 3.2, 1.2, 0.2],
       [5.5, 3.5, 1.3, 0.2],
       [4.9, 3.6, 1.4, 0.1],
       [4.4, 3. , 1.3, 0.2],
       [5.1, 3.4, 1.5, 0.2],
       [5. , 3.5, 1.3, 0.3],
       [4.5, 2.3, 1.3, 0.3],
```

```
[4.4, 3.2, 1.3, 0.2],
[5. , 3.5, 1.6, 0.6],
[5.1, 3.8, 1.9, 0.4],
[4.8, 3. , 1.4, 0.3],
[5.1, 3.8, 1.6, 0.2],
[4.6, 3.2, 1.4, 0.2],
[5.3, 3.7, 1.5, 0.2],
[5. , 3.3, 1.4, 0.2],
[7. , 3.2, 4.7, 1.4],
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[6.3, 3.3, 4.7, 1.6],
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[5.2, 2.7, 3.9, 1.4],
[5. , 2. , 3.5, 1. ],
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[6.6, 3. , 4.4, 1.4],
[6.8, 2.8, 4.8, 1.4],
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[6. , 2.9, 4.5, 1.5],
[5.7, 2.6, 3.5, 1. ],
[5.5, 2.4, 3.8, 1.1],
[5.5, 2.4, 3.7, 1. ],
[5.8, 2.7, 3.9, 1.2],
[6. , 2.7, 5.1, 1.6],
[5.4, 3. , 4.5, 1.5],
[6. , 3.4, 4.5, 1.6],
[6.7, 3.1, 4.7, 1.5],
[6.3, 2.3, 4.4, 1.3],
[5.6, 3. , 4.1, 1.3],
```

```
[5.5, 2.5, 4. , 1.3],
[5.5, 2.6, 4.4, 1.2],
[6.1, 3. , 4.6, 1.4],
[5.8, 2.6, 4. , 1.2],
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[6.2, 2.9, 4.3, 1.3],
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[5.7, 2.8, 4.1, 1.3],
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[5.8, 2.7, 5.1, 1.9],
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[6.3, 2.9, 5.6, 1.8],
[6.5, 3. , 5.8, 2.2],
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[7.3, 2.9, 6.3, 1.8],
[6.7, 2.5, 5.8, 1.8],
[7.2, 3.6, 6.1, 2.5],
[6.5, 3.2, 5.1, 2. ],
[6.4, 2.7, 5.3, 1.9],
[6.8, 3. , 5.5, 2.1],
[5.7, 2.5, 5. , 2. ],
[5.8, 2.8, 5.1, 2.4],
[6.4, 3.2, 5.3, 2.3],
[6.5, 3. , 5.5, 1.8],
[7.7, 3.8, 6.7, 2.2],
[7.7, 2.6, 6.9, 2.3],
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[6.9, 3.2, 5.7, 2.3],
[5.6, 2.8, 4.9, 2. ],
[7.7, 2.8, 6.7, 2. ],
[6.3, 2.7, 4.9, 1.8],
[6.7, 3.3, 5.7, 2.1],
[7.2, 3.2, 6. , 1.8],
[6.2, 2.8, 4.8, 1.8],
[6.1, 3. , 4.9, 1.8],
[6.4, 2.8, 5.6, 2.1],
[7.2, 3. , 5.8, 1.6],
[7.4, 2.8, 6.1, 1.9],
[7.9, 3.8, 6.4, 2. ],
[6.4, 2.8, 5.6, 2.2],
[6.3, 2.8, 5.1, 1.5],
[6.1, 2.6, 5.6, 1.4],
[7.7, 3. , 6.1, 2.3],
```

```
       [6.3, 3.4, 5.6, 2.4],
       [6.4, 3.1, 5.5, 1.8],
       [6. , 3. , 4.8, 1.8],
       [6.9, 3.1, 5.4, 2.1],
       [6.7, 3.1, 5.6, 2.4],
       [6.9, 3.1, 5.1, 2.3],
       [5.8, 2.7, 5.1, 1.9],
       [6.8, 3.2, 5.9, 2.3],
       [6.7, 3.3, 5.7, 2.5],
       [6.7, 3. , 5.2, 2.3],
       [6.3, 2.5, 5. , 1.9],
       [6.5, 3. , 5.2, 2. ],
       [6.2, 3.4, 5.4, 2.3],
       [5.9, 3. , 5.1, 1.8]])
```

[113]:
```
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=42)
```

```
<IPython.core.display.HTML object>
```

[114]:
```
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
x_train = sc.fit_transform(x_train)
x_test = sc.transform(x_test)
```

```
<IPython.core.display.HTML object>
```

[116]:
```
from sklearn.naive_bayes import GaussianNB
classifier = GaussianNB()
classifier.fit(x_train, y_train)
```

```
<IPython.core.display.HTML object>
```

[116]:
```
GaussianNB()
```

[117]:
```
y_pred = classifier.predict(x_test)
y_pred
```

```
<IPython.core.display.HTML object>
```

[117]:
```
array(['Versicolor', 'Setosa', 'Virginica', 'Versicolor', 'Versicolor',
       'Setosa', 'Versicolor', 'Virginica', 'Versicolor', 'Versicolor',
       'Virginica', 'Setosa', 'Setosa', 'Setosa', 'Setosa', 'Versicolor',
       'Virginica', 'Versicolor', 'Versicolor', 'Virginica', 'Setosa',
       'Virginica', 'Setosa', 'Virginica', 'Virginica', 'Virginica',
       'Virginica', 'Virginica', 'Setosa', 'Setosa'], dtype='<U10')
```

[132]:
```
from sklearn.metrics import confusion_matrix
cm = confusion_matrix(y_test, y_pred)
from sklearn.metrics import accuracy_score, precision_score,recall_score

accuracy = accuracy_score(y_test, y_pred)
error_rate = 1 - accuracy
precision = precision_score(y_test, y_pred, average='weighted')
recall = recall_score(y_test, y_pred, average='weighted')

print(f"Accuracy: {accuracy}")
print(f"Error Rate: {error_rate}")
print(f"Precision: {precision}")
print(f"Recall: {recall}")
```

```
<IPython.core.display.HTML object>
```

```
Accuracy: 1.0
Error Rate: 0.0
Precision: 1.0
Recall: 1.0
Accuracy :  1.0
```

[122]:
```
df = pd.DataFrame({'Real Values':y_test, 'Predicted Values':y_pred})
df
```

```
<IPython.core.display.HTML object>
```

[122]:

	Real Values	Predicted Values
0	Versicolor	Versicolor
1	Setosa	Setosa
2	Virginica	Virginica
3	Versicolor	Versicolor
4	Versicolor	Versicolor
5	Setosa	Setosa
6	Versicolor	Versicolor
7	Virginica	Virginica
8	Versicolor	Versicolor
9	Versicolor	Versicolor
10	Virginica	Virginica
11	Setosa	Setosa
12	Setosa	Setosa
13	Setosa	Setosa
14	Setosa	Setosa
15	Versicolor	Versicolor
16	Virginica	Virginica
17	Versicolor	Versicolor
18	Versicolor	Versicolor
19	Virginica	Virginica

```
20      Setosa          Setosa
21   Virginica       Virginica
22      Setosa          Setosa
23   Virginica       Virginica
24   Virginica       Virginica
25   Virginica       Virginica
26   Virginica       Virginica
27   Virginica       Virginica
28      Setosa          Setosa
29      Setosa          Setosa
```