```
#importing the libraries
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
```

**Wine Dataset:**

- These data are the results of a chemical analysis of wines grown in the same region in Italy but derived from three different cultivars. The analysis determined the quantities of 13 constituents found in each of the **three types of wines**.

```
#importing the datasets
df=pd.read_csv("/content/Wine.csv")
df.head()
```

| | Alcohol | Malic_Acid | Ash | Ash_Alcanity | Magnesium | Total_Phenols | Flavanoids | Nonflavanoid_Phenols | Pro |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 14.23 | 1.71 | 2.43 | 15.6 | 127 | 2.80 | 3.06 | 0.28 | |
| **1** | 13.20 | 1.78 | 2.14 | 11.2 | 100 | 2.65 | 2.76 | 0.26 | |
| **2** | 13.16 | 2.36 | 2.67 | 18.6 | 101 | 2.80 | 3.24 | 0.30 | |
| **3** | 14.37 | 1.95 | 2.50 | 16.8 | 113 | 3.85 | 3.49 | 0.24 | |
| **4** | 13.24 | 2.59 | 2.87 | 21.0 | 118 | 2.80 | 2.69 | 0.39 | |

```
#Checking for null values
df.isnull().sum()
```

```
Alcohol                 0
Malic_Acid              0
Ash                     0
Ash_Alcanity            0
Magnesium               0
Total_Phenols           0
Flavanoids              0
Nonflavanoid_Phenols    0
Proanthocyanins         0
Color_Intensity         0
Hue                     0
OD280                   0
Proline                 0
Customer_Segment        0
dtype: int64
```

```
df.describe()
```

| | Alcohol | Malic_Acid | Ash | Ash_Alcanity | Magnesium | Total_Phenols | Flavanoids | Nonflavanoi |
|---|---|---|---|---|---|---|---|---|
| **count** | 178.000000 | 178.000000 | 178.000000 | 178.000000 | 178.000000 | 178.000000 | 178.000000 | 1 |
| **mean** | 13.000618 | 2.336348 | 2.366517 | 19.494944 | 99.741573 | 2.295112 | 2.029270 | |
| **std** | 0.811827 | 1.117146 | 0.274344 | 3.339564 | 14.282484 | 0.625851 | 0.998859 | |
| **min** | 11.030000 | 0.740000 | 1.360000 | 10.600000 | 70.000000 | 0.980000 | 0.340000 | |
| **25%** | 12.362500 | 1.602500 | 2.210000 | 17.200000 | 88.000000 | 1.742500 | 1.205000 | |
| **50%** | 13.050000 | 1.865000 | 2.360000 | 19.500000 | 98.000000 | 2.355000 | 2.135000 | |
| **75%** | 13.677500 | 3.082500 | 2.557500 | 21.500000 | 107.000000 | 2.800000 | 2.875000 | |
| **max** | 14.830000 | 5.800000 | 3.230000 | 30.000000 | 162.000000 | 3.880000 | 5.080000 | |

```
df.columns
```

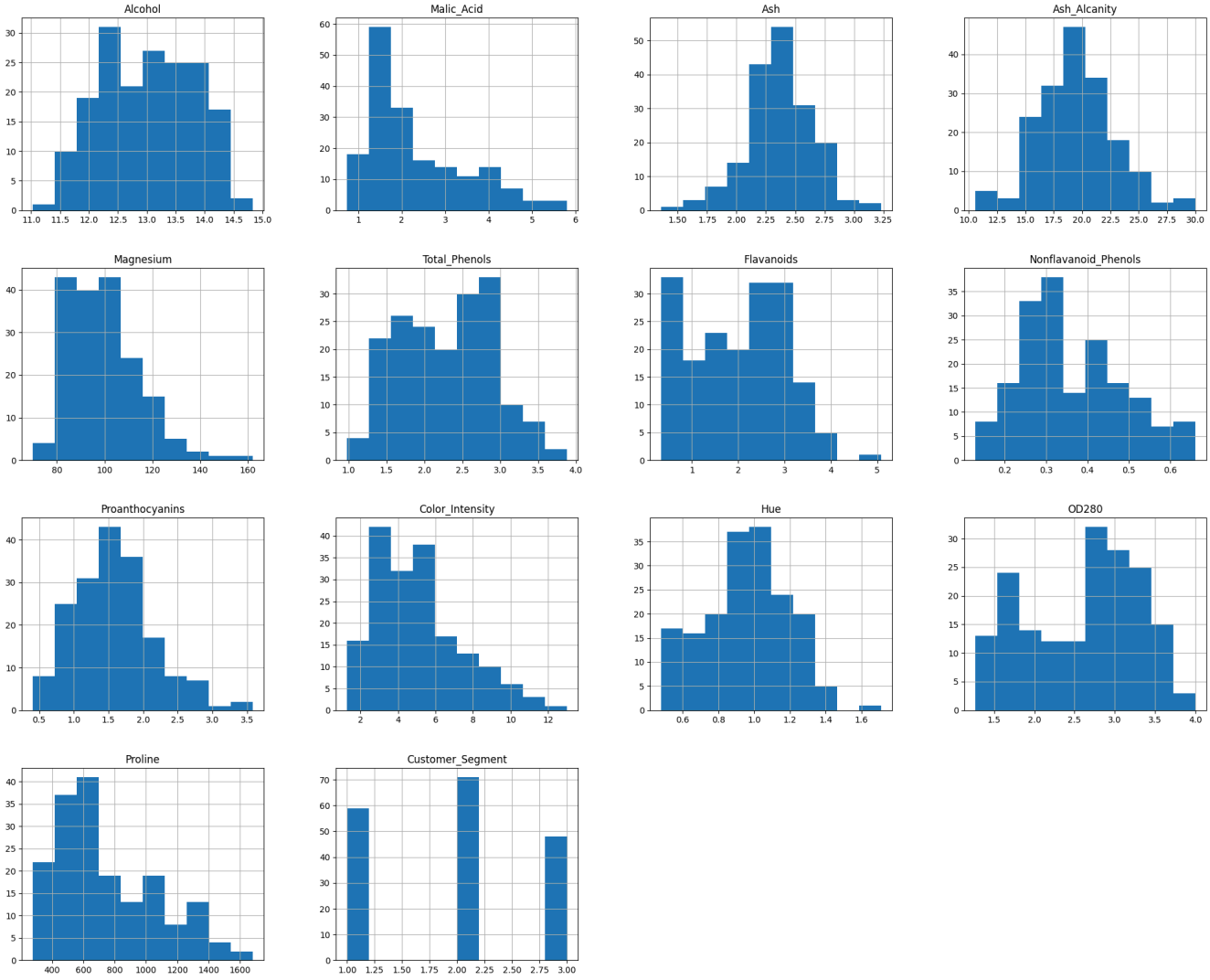
```
Index(['Alcohol', 'Malic_Acid', 'Ash', 'Ash_Alcanity', 'Magnesium',
       'Total_Phenols', 'Flavanoids', 'Nonflavanoid_Phenols',
       'Proanthocyanins', 'Color_Intensity', 'Hue', 'OD280', 'Proline',
       'Customer_Segment'],
      dtype='object')
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 178 entries, 0 to 177
Data columns (total 14 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Alcohol               178 non-null    float64
 1   Malic_Acid            178 non-null    float64
 2   Ash                   178 non-null    float64
 3   Ash_Alcanity          178 non-null    float64
 4   Magnesium             178 non-null    int64  
 5   Total_Phenols         178 non-null    float64
 6   Flavanoids            178 non-null    float64
 7   Nonflavanoid_Phenols  178 non-null    float64
 8   Proanthocyanins       178 non-null    float64
 9   Color_Intensity       178 non-null    float64
 10  Hue                   178 non-null    float64
 11  OD280                 178 non-null    float64
 12  Proline               178 non-null    int64  
 13  Customer_Segment      178 non-null    int64  
dtypes: float64(11), int64(3)
memory usage: 19.6 KB
```

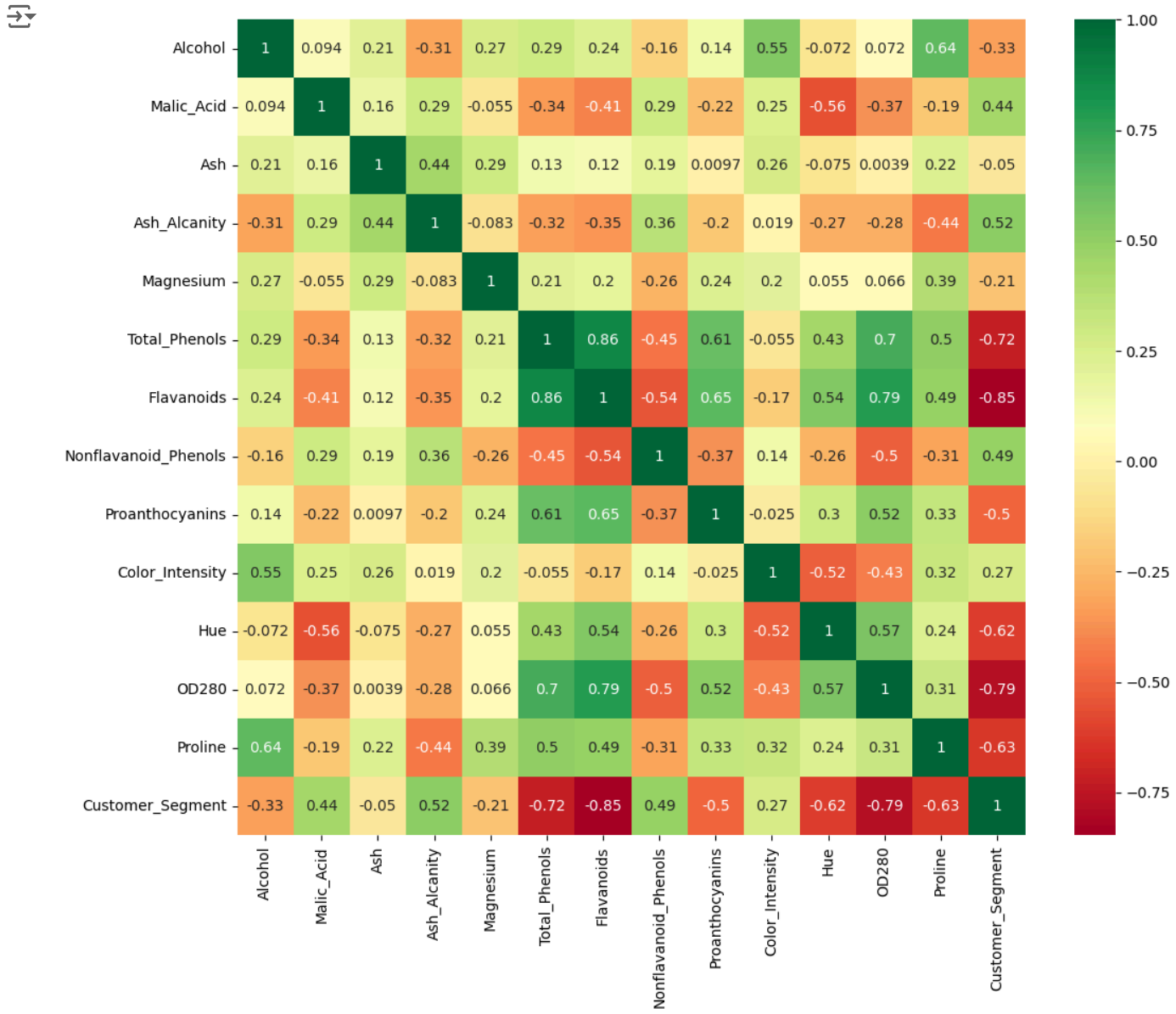
```
df.hist(figsize=(25,20))
```

```
array([[<Axes: title={'center': 'Alcohol'}>,
        <Axes: title={'center': 'Malic_Acid'}>,
        <Axes: title={'center': 'Ash'}>,
        <Axes: title={'center': 'Ash_Alcanity'}>],
       [<Axes: title={'center': 'Magnesium'}>,
        <Axes: title={'center': 'Total_Phenols'}>,
        <Axes: title={'center': 'Flavanoids'}>,
        <Axes: title={'center': 'Nonflavanoid_Phenols'}>],
       [<Axes: title={'center': 'Proanthocyanins'}>,
        <Axes: title={'center': 'Color_Intensity'}>,
        <Axes: title={'center': 'Hue'}>,
        <Axes: title={'center': 'OD280'}>],
       [<Axes: title={'center': 'Proline'}>,
        <Axes: title={'center': 'Customer_Segment'}>, <Axes: >, <Axes: >]],
      dtype=object)
```

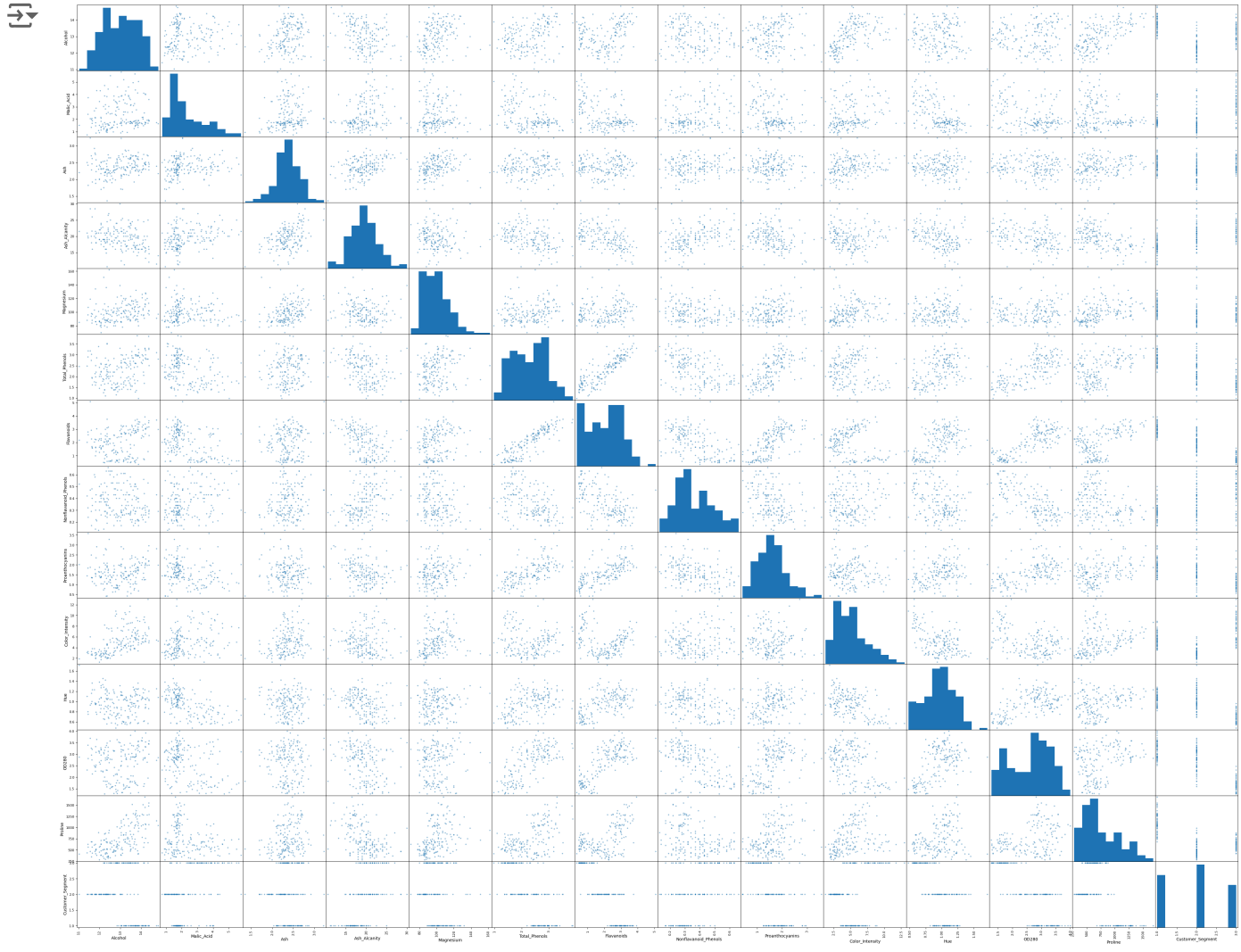



Start coding or generate with AI.

```
plt.figure(figsize=(12,10))
p=sns.heatmap(df.corr(), annot=True,cmap ='RdYlGn')
```

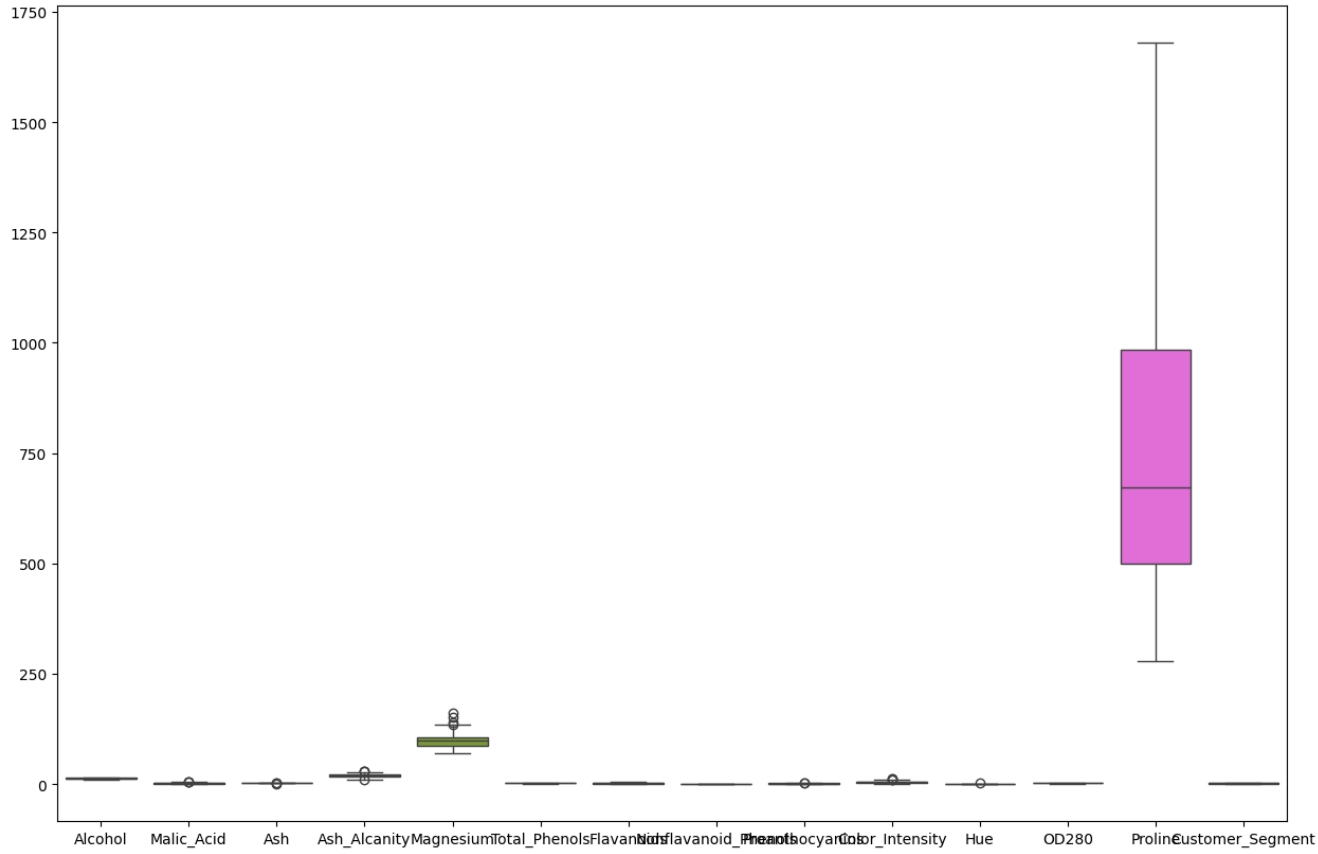



```
from pandas.plotting import scatter_matrix
p=scatter_matrix(df,figsize=(50,40))
```




```
plt.figure(figsize=(15,10))
sns.boxplot(df)
```

<Axes: >




```
x=df.iloc[:,:-1]
x
```

| | Alcohol | Malic_Acid | Ash | Ash_Alcanity | Magnesium | Total_Phenols | Flavanoids | Nonflavanoid_Phenols | F |
|---|---|---|---|---|---|---|---|---|---|
| **0** | 14.23 | 1.71 | 2.43 | 15.6 | 127 | 2.80 | 3.06 | 0.28 | |
| **1** | 13.20 | 1.78 | 2.14 | 11.2 | 100 | 2.65 | 2.76 | 0.26 | |
| **2** | 13.16 | 2.36 | 2.67 | 18.6 | 101 | 2.80 | 3.24 | 0.30 | |
| **3** | 14.37 | 1.95 | 2.50 | 16.8 | 113 | 3.85 | 3.49 | 0.24 | |
| **4** | 13.24 | 2.59 | 2.87 | 21.0 | 118 | 2.80 | 2.69 | 0.39 | |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | |
| **173** | 13.71 | 5.65 | 2.45 | 20.5 | 95 | 1.68 | 0.61 | 0.52 | |
| **174** | 13.40 | 3.91 | 2.48 | 23.0 | 102 | 1.80 | 0.75 | 0.43 | |
| **175** | 13.27 | 4.28 | 2.26 | 20.0 | 120 | 1.59 | 0.69 | 0.43 | |
| **176** | 13.17 | 2.59 | 2.37 | 20.0 | 120 | 1.65 | 0.68 | 0.53 | |
| **177** | 14.13 | 4.10 | 2.74 | 24.5 | 96 | 2.05 | 0.76 | 0.56 | |

178 rows × 13 columns

```
y=df.iloc[:,-1]
y
```

```
0      1
1      1
2      1
3      1
4      1
      ..
173    3
174    3
175    3
176    3
177    3
Name: Customer_Segment, Length: 178, dtype: int64
```

```
## split data into train and test data set

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)


from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
x_train=sc.fit_transform(x_train)
x_test=sc.transform(x_test)


from  sklearn.discriminant_analysis import LinearDiscriminantAnalysis as LDA
lda= LDA(n_components= 2)
x_train = lda.fit_transform(x_train,y_train)
x_test= lda.transform(x_test)


x_train
```

```
array([[ 3.57315552,  1.94018924],
       [ 0.85475898, -2.08182977],
       [ 0.62173655, -3.06234453],
       [ 4.80786412,  2.00638739],
       [-3.8579759 ,  0.14987256],
       [-3.59455458,  1.24961706],
       [-0.53772906, -3.0852704 ],
       [ 0.04058577, -2.47312446],
       [ 0.99835348, -3.36989668],
       [-3.74095658,  1.94844242],
       [ 3.76035226,  0.82126218],
       [-0.15106412, -1.86820292],
       [ 3.62762899,  2.05460026],
       [-3.94229781,  2.80328429],
       [ 3.33429017,  0.73627798],
       [ 3.90206871,  1.03276135],
       [-3.55835472,  0.18783108],
       [ 5.63175281,  2.40524214],
       [-5.56217254,  0.85694946],
       [ 0.23296188, -3.94615581],
       [ 5.03141997,  3.23313754],
       [ 3.52861651,  0.94605778],
       [-1.17815662, -2.17294825],
       [ 3.58320131,  0.67947364],
       [ 5.21649905,  2.41090952],
       [-3.01647841,  1.24411621],
       [ 1.86178658, -0.47484926],
       [ 3.93816398, -0.2204059 ],
       [-1.0836235 , -3.32496762],
       [ 1.8691488 , -0.63362283],
       [ 3.27717205,  1.51263542],
       [-0.47842302, -1.16766723],
       [-4.14433134,  1.37391708],
       [ 2.45009727, -2.49336285],
       [-1.20844631, -2.30679956],
```

```
            [ 2.55631466, -0.98550214],
            [-1.6091476 ,  0.55066705],
            [-5.52462148,  2.19178828],
            [-2.44685583, -2.28937848],
            [-1.95474568, -2.02963924],
            [ 5.54394234,  1.5236766 ],
            [ 5.74409562,  1.85156779],
            [ 1.13553056, -3.93865462],
            [-1.2483554 , -3.08106324],
            [-0.00961488, -3.62708415],
            [ 5.21418108,  2.66981962],
            [ 4.2290474 ,  0.3886969 ],
            [-3.94237521,  0.76214343],
            [ 5.30822458,  2.18894363],
            [-0.20862902, -3.05785486],
            [ 0.47295413, -2.560251  ],
            [ 0.46692465, -1.86886738],
            [-1.05818513, -2.61576658],
            [ 0.33551985, -3.26643922],
            [-4.74777848,  2.23081211],
            [-2.80968166,  1.32816126],
            [-1.02804047, -2.60107642],
            [-6.15432728,  2.12945198],
```

```
from sklearn.linear_model import LogisticRegression
classifier=LogisticRegression(random_state=0)
classifier.fit(x_train,y_train)
y_pred=classifier.predict(x_test)
y_pred
```

```
array([1, 3, 2, 1, 2, 2, 1, 3, 2, 2, 3, 3, 1, 2, 3, 2, 1, 1, 2, 1, 2, 1,
       1, 2, 2, 2, 2, 2, 2, 3, 1, 1, 2, 1, 1, 1])
```

```
from sklearn.metrics import confusion_matrix
```