28_February_EDA

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3 EDA lab

3.1 28 February

3.2 Outlier detection on the Wine dataset after applying PCA

3.2.1 Importing the necessary libraries

[2]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.datasets import load_wine
from sklearn.preprocessing import StandardScaler
from sklearn.decomposition import PCA
from scipy.stats import zscore
```

3.2.2 Loading the dataset

[3]:

```
wine = load_wine()

## Creating dataframe with feature names
df = pd.DataFrame(wine.data,columns = wine.feature_names)
df['target'] = wine.target

df
```

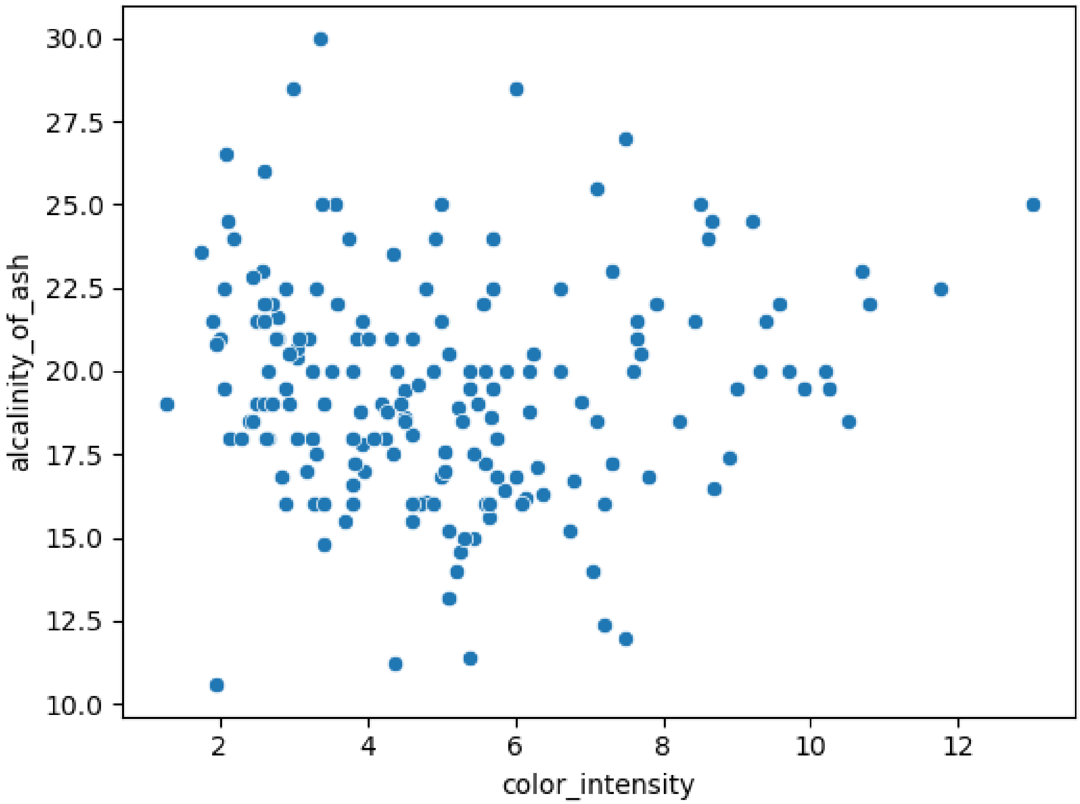
[3]:

```
     alcohol  malic_acid   ash  alcalinity_of_ash  magnesium  total_phenols  \
0      14.23        1.71  2.43               15.6      127.0           2.80
1      13.20        1.78  2.14               11.2      100.0           2.65
2      13.16        2.36  2.67               18.6      101.0           2.80
3      14.37        1.95  2.50               16.8      113.0           3.85
4      13.24        2.59  2.87               21.0      118.0           2.80
```

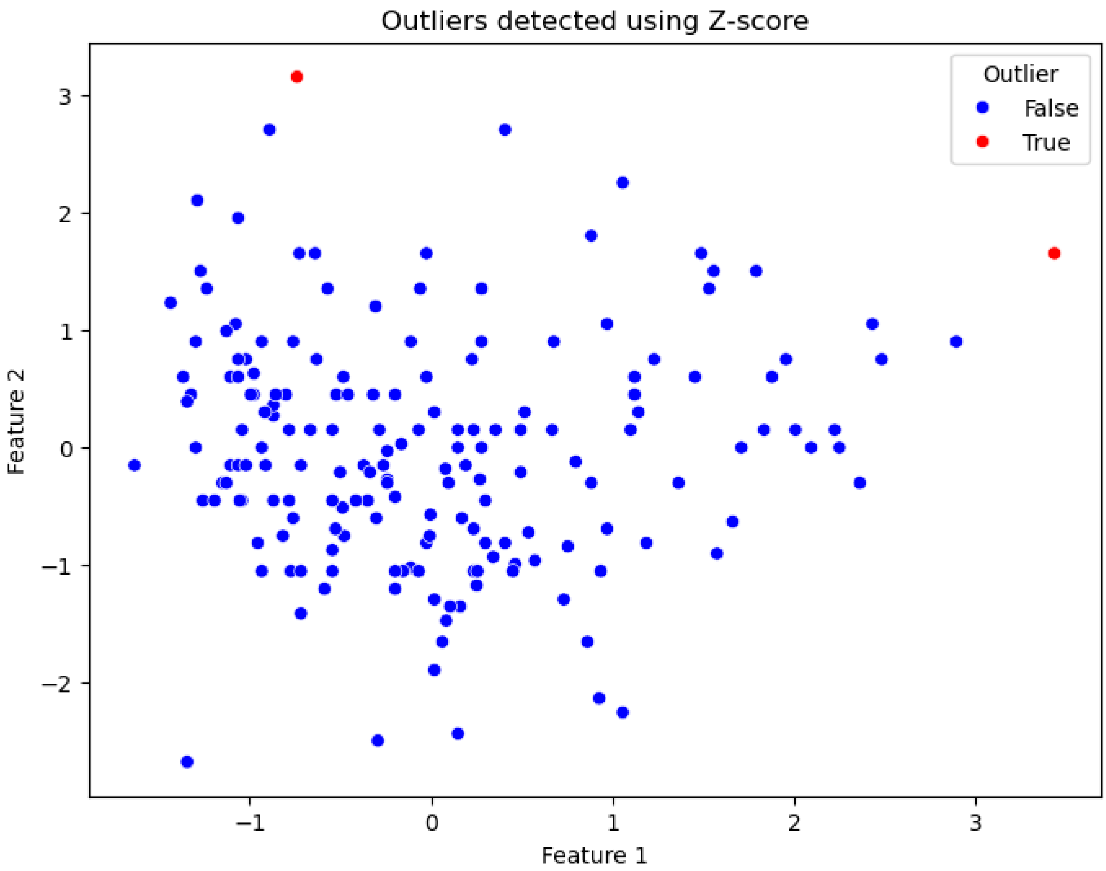
```
..        …         …   …                …        …            …
173    13.71        5.65  2.45               20.5       95.0           1.68
174    13.40        3.91  2.48               23.0      102.0           1.80
175    13.27        4.28  2.26               20.0      120.0           1.59
176    13.17        2.59  2.37               20.0      120.0           1.65
177    14.13        4.10  2.74               24.5       96.0           2.05

     flavanoids  nonflavanoid_phenols  proanthocyanins  color_intensity   hue  \
0          3.06                  0.28             2.29             5.64  1.04
1          2.76                  0.26             1.28             4.38  1.05
2          3.24                  0.30             2.81             5.68  1.03
3          3.49                  0.24             2.18             7.80  0.86
4          2.69                  0.39             1.82             4.32  1.04
..          …                   …               …              …   …
173        0.61                  0.52             1.06             7.70  0.64
174        0.75                  0.43             1.41             7.30  0.70
175        0.69                  0.43             1.35            10.20  0.59
176        0.68                  0.53             1.46             9.30  0.60
177        0.76                  0.56             1.35             9.20  0.61

     od280/od315_of_diluted_wines  proline  target
0                            3.92   1065.0       0
1                            3.40   1050.0       0
2                            3.17   1185.0       0
3                            3.45   1480.0       0
4                            2.93    735.0       0
..                             …      …     …
173                          1.74    740.0       2
174                          1.56    750.0       2
175                          1.56    835.0       2
176                          1.62    840.0       2
177                          1.60    560.0       2

[178 rows x 14 columns]
```

[4]:

```
## selecting 2 features color_intensity and alcalinity_of_ash

sns.scatterplot(x = 'color_intensity', y = 'alcalinity_of_ash', data = df)
plt.show()
```



[5]:
```
df_ = df.copy()

df_['Z_Feature1'] = zscore(df_['color_intensity'])
df_['Z_Feature2'] = zscore(df_['alcalinity_of_ash'])

# identifying outliers: Flag a data point as an outlier if the z-score is␣
 ↪greater than 3
df_['Outlier_Z'] = ((df_['Z_Feature1'].abs()>3) | (df_['Z_Feature2'].abs()>3))

#plot the data points and highlight the outliers
plt.figure(figsize=(8,6))
sns.scatterplot(x = 'Z_Feature1',y  = 'Z_Feature2',data = df_,hue =␣
 ↪'Outlier_Z', palette = {False:'blue',True:'red'})
plt.title("Outliers detected using Z-score")
plt.xlabel("Feature 1")
plt.ylabel("Feature 2")
plt.legend(title = 'Outlier')
plt.show()

# print the number of outliers detected using the Z-score method
print("Z-score method detected outlier:",df_['Outlier_Z'].sum())
```



```
Z-score method detected outlier: 2
```

3.2.3 Extracting the feature and target

[12]:
```
features = wine.feature_names
x = df.loc[:,features].values
y = df.loc[:,['target']].values

## Standardising the features
scaler = StandardScaler()
x_std = scaler.fit_transform(x)
```

[13]:
```
### Initializing PCA to reduce the data to 2 components

pca = PCA(n_components=2)
principalcomponents = pca.fit_transform(x_std)

## Creating dataframe for the two principal components
principaldf = pd.DataFrame(data = principalcomponents, columns=['PC1','PC2'])
```

```
## Concatenate the target variable for plotting

final_df = pd.concat([principaldf,df[['target']]],axis = 1)

final_df
```

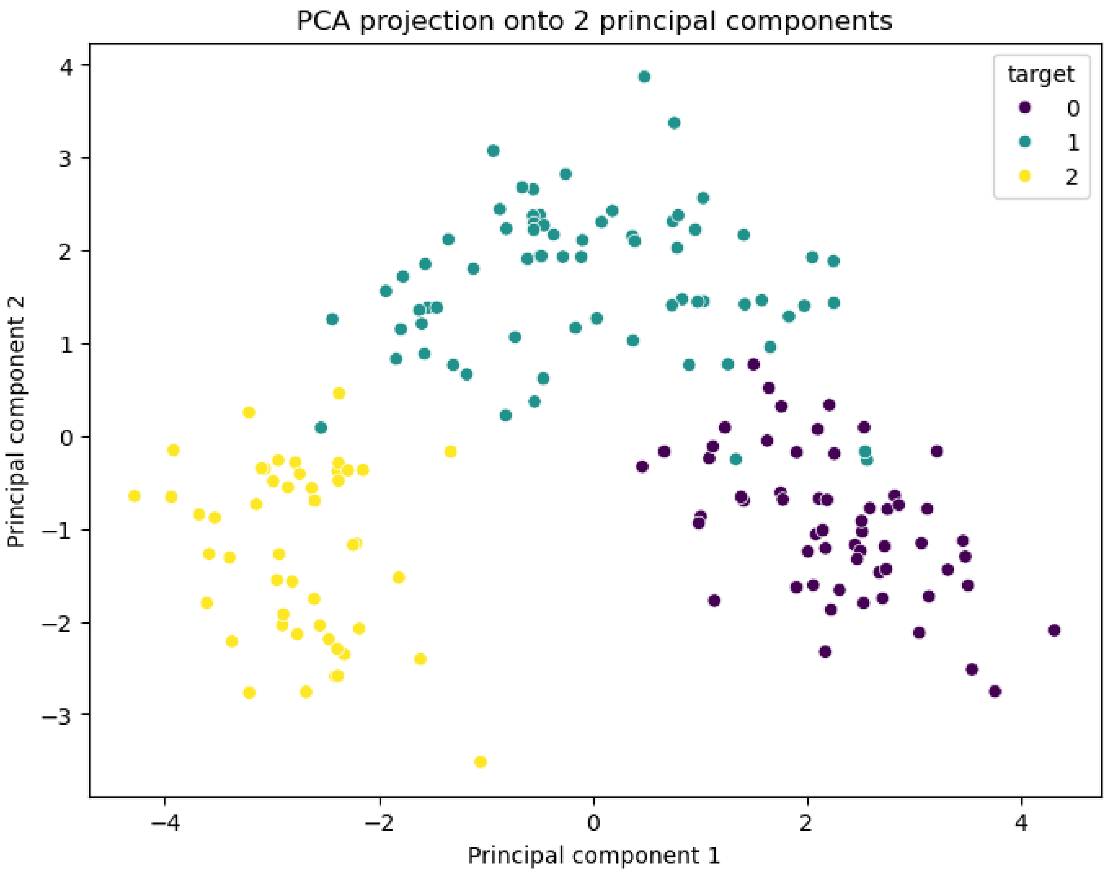
[13]:

```
          PC1       PC2  target
0    3.316751 -1.443463       0
1    2.209465  0.333393       0
2    2.516740 -1.031151       0
3    3.757066 -2.756372       0
4    1.008908 -0.869831       0
..        …         …     …
173 -3.370524 -2.216289       2
174 -2.601956 -1.757229       2
175 -2.677839 -2.760899       2
176 -2.387017 -2.297347       2
177 -3.208758 -2.768920       2

[178 rows x 3 columns]
```

3.3 Visualizing the result

[16]:

```
plt.figure(figsize=(8,6))
sns.scatterplot(x='PC1',y = 'PC2', hue = 'target', data = final_df, palette =␣
 ↪'viridis')
plt.title("PCA projection onto 2 principal components")
plt.xlabel("Principal component 1")
plt.ylabel("Principal component 2")
plt.legend(title='target')
plt.show()
```



```
[19]: ## Saving the updated dimention reduced dataset
      final_df.to_csv("final_df.csv",index = False)
```

3.4 Loading the updated dataset

```
[20]: data = pd.read_csv("final_df.csv")
```

```
[28]: data
```

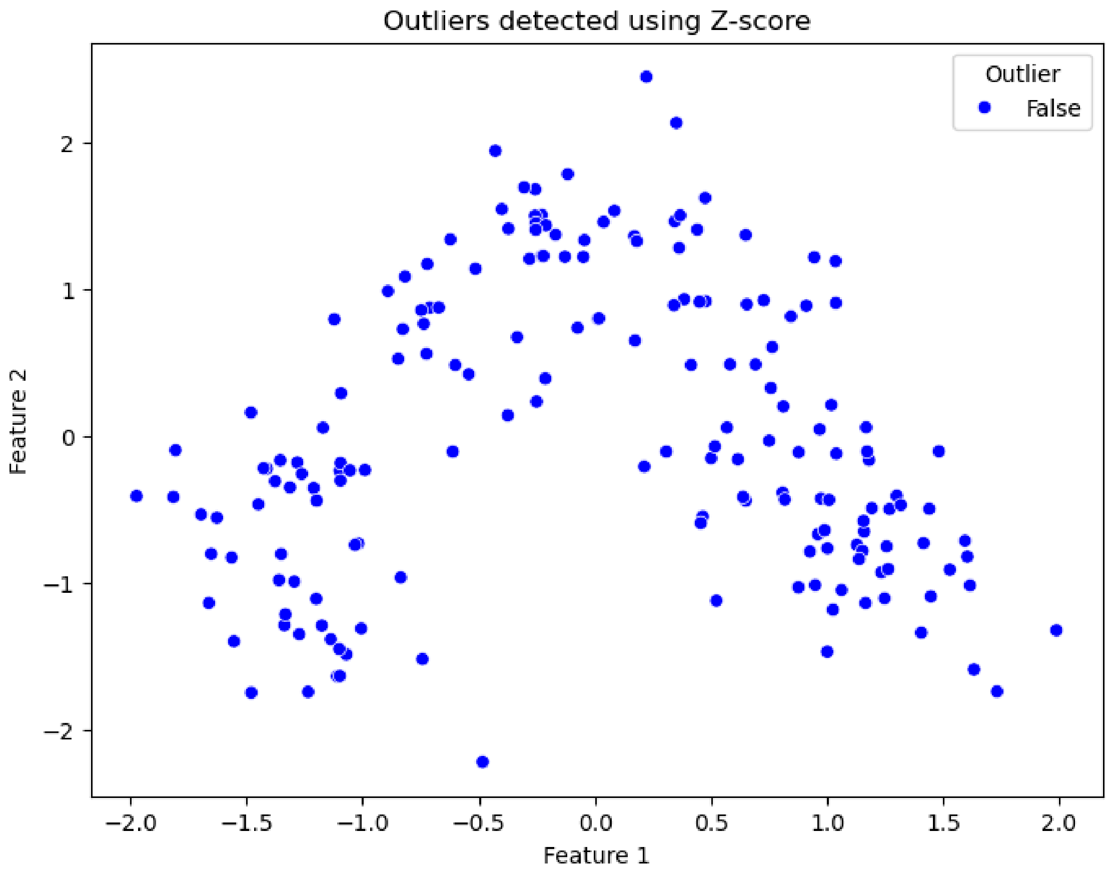
```
[28]:           PC1       PC2  target
      0    3.316751 -1.443463       0
      1    2.209465  0.333393       0
      2    2.516740 -1.031151       0
      3    3.757066 -2.756372       0
      4    1.008908 -0.869831       0
      ..        …         …     …
      173 -3.370524 -2.216289       2
      174 -2.601956 -1.757229       2
      175 -2.677839 -2.760899       2
```

```
176 -2.387017 -2.297347       2
177 -3.208758 -2.768920       2

[178 rows x 3 columns]
```

3.4.1 Outlier detection using the zscore method

[34]:

```
df_z = data.copy()

df_z['Z_Feature1'] = zscore(df_z['PC1'])
df_z['Z_Feature2'] = zscore(df_z['PC2'])

# identifying outliers: Flag a data point as an outlier if the z-score is␣
  ↪greater than 3
df_z['Outlier_Z'] = ((df_z['Z_Feature1'].abs()>3) | (df_z['Z_Feature2'].
  ↪abs()>3))

#plot the data points and highlight the outliers
plt.figure(figsize=(8,6))
sns.scatterplot(x = 'Z_Feature1',y  = 'Z_Feature2',data = df_z,hue =␣
  ↪'Outlier_Z', palette = {False:'blue',True:'red'})
plt.title("Outliers detected using Z-score")
plt.xlabel("Feature 1")
plt.ylabel("Feature 2")
plt.legend(title = 'Outlier')
plt.show()

# print the number of outliers detected using the Z-score method
print("Z-score method detected outlier:",df_z['Outlier_Z'].sum())
```



```
Z-score method detected outlier: 0
```

3.5 No outlier detected by Zscore method