Aim:- Write a Program to implement PCA on Iris Dataset.

Objective:- Applying PCA algorithm on iris to dataset to reduce dimensinality.

```
import pandas as pd
from sklearn.decomposition import PCA
from sklearn.preprocessing import StandardScaler
from sklearn.datasets import load_iris

iris = load_iris()
df = pd.DataFrame(data=iris.data, columns=iris.feature_names)

df.head()
```

```
   sepal length (cm)  sepal width (cm)  petal length (cm)  petal width
(cm)
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
```

```
scaler = StandardScaler()
df_scaled = scaler.fit_transform(df)

df_scaled
```

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pca = PCA(n_components=2)  # Reduce to 2 dimensions
df_pca = pca.fit_transform(df_scaled)

df_pca

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       [-1.85812246, -2.33741516],
       [-2.5536384 , -0.47910069],
       [-1.96444768,  0.47232667],
       [-2.13705901,  1.14222926],
       [-2.0697443 , -0.71105273],
       [-2.38473317,  1.1204297 ],
       [-2.39437631, -0.38624687],
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       [ 1.24097932,  0.61629765],
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```

```
       [ 0.74652974,  0.77301931],
       [-0.48732274, -1.85242909],
       [ 0.92790164,  0.03222608],
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       [-0.11019628, -2.65407282],
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       [ 0.71956189, -0.18622461],
       [-0.0333547 , -0.43900321],
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       [ 1.2341781 , -0.93332573],
       [ 0.6328582 , -0.41638772],
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       [ 1.35840512,  0.33131168],
       [ 0.66480037, -0.22592785],
       [-0.04025861, -1.05871855],
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       [ 0.27907778, -1.12002852],
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       [ 0.33653037, -0.98840402],
       [-0.36218338, -2.01923787],
       [ 0.28858624, -0.85573032],
       [ 0.09136066, -0.18119213],
       [ 0.22771687, -0.38492008],
       [ 0.57638829, -0.1548736 ],
       [-0.44766702, -1.54379203],
       [ 0.25673059, -0.5988518 ],
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       [ 2.20526679,  0.56201048],
       [ 1.44015066, -0.04698759],
       [ 1.86781222,  0.29504482],
```

```
       [ 2.75187334,  0.8004092 ],
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       [ 2.00668647, -0.71143865],
       [ 2.25977735,  1.92101038],
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       [ 1.60267867, -0.42170045],
       [ 1.8839007 ,  0.41924965],
       [ 1.2601151 , -1.16226042],
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       [ 1.26376667, -1.70674538],
       [ 2.0377163 ,  0.91046741],
       [ 0.97798073, -0.57176432],
       [ 2.89765149,  0.41364106],
       [ 1.33323218, -0.48181122],
       [ 1.7007339 ,  1.01392187],
       [ 1.95432671,  1.0077776 ],
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       [ 1.02095055,  0.06434603],
       [ 1.78834992, -0.18736121],
       [ 1.86364755,  0.56229073],
       [ 2.43595373,  0.25928443],
       [ 2.30492772,  2.62632347],
       [ 1.86270322, -0.17854949],
       [ 1.11414774, -0.29292262],
       [ 1.2024733 , -0.81131527],
       [ 2.79877045,  0.85680333],
       [ 1.57625591,  1.06858111],
       [ 1.3462921 ,  0.42243061],
       [ 0.92482492,  0.0172231 ],
       [ 1.85204505,  0.67612817],
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       [ 1.15788161, -0.69886986],
       [ 2.04055823,  0.8675206 ],
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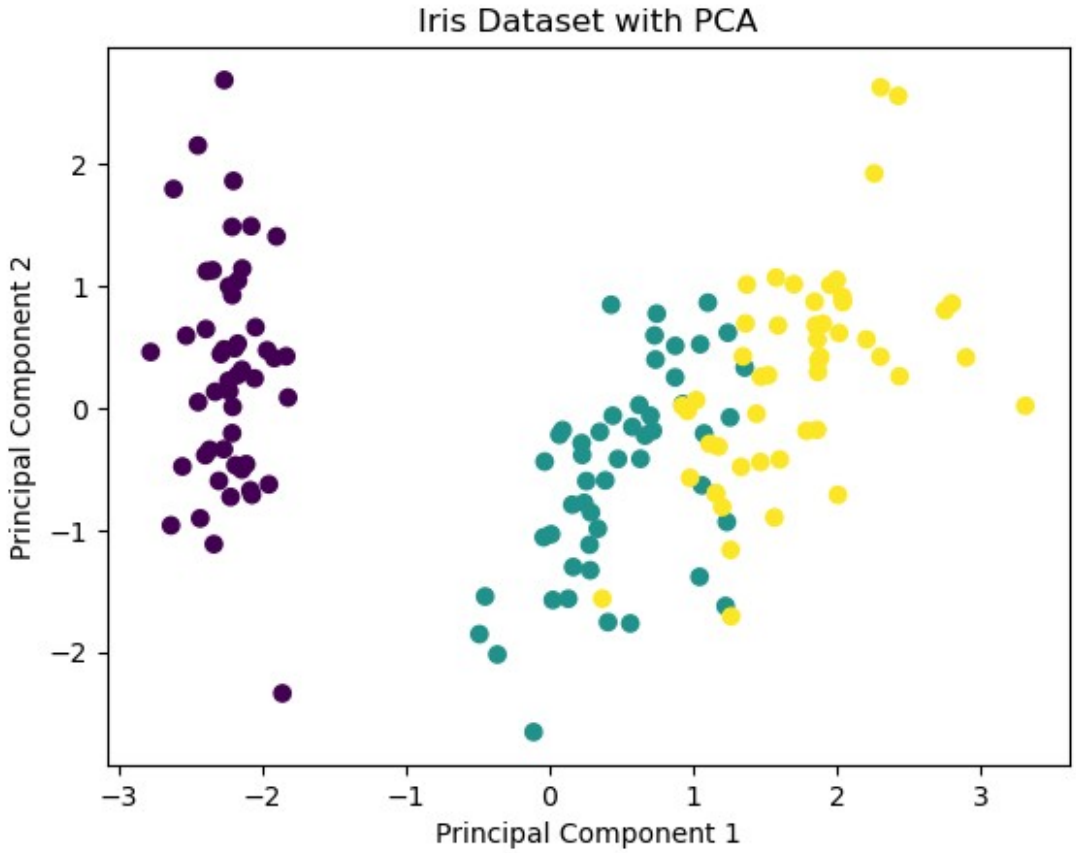
       [ 1.87050329,  0.38696608],
       [ 1.56458048, -0.89668681],
       [ 1.5211705 ,  0.26906914],
       [ 1.37278779,  1.01125442],
       [ 0.96065603, -0.02433167]])

df_pca = pd.DataFrame(data=df_pca, columns=['PC1', 'PC2'])

import matplotlib.pyplot as plt
```

```
plt.scatter(df_pca['PC1'], df_pca['PC2'], c=iris.target)
plt.xlabel('Principal Component 1')
plt.ylabel('Principal Component 2')
plt.title('Iris Dataset with PCA')
plt.show()
```



Learning Outcomes:-

1. Learn How to implement pca algorithm on iris dataset.
2. Understand about PCA techniques for reduce dimensionality.

```
import pandas as pd
from sklearn.decomposition import PCA
from sklearn.preprocessing import StandardScaler
from sklearn.datasets import load_breast_cancer

data = load_breast_cancer()
df = pd.DataFrame(data=data.data, columns=data.feature_names)

df.head()
```

```
   mean radius  mean texture  mean perimeter  mean area  mean
smoothness  \
0        17.99         10.38          122.80     1001.0
0.11840
1        20.57         17.77          132.90     1326.0
0.08474
2        19.69         21.25          130.00     1203.0
0.10960
3        11.42         20.38           77.58      386.1
0.14250
4        20.29         14.34          135.10     1297.0
0.10030

   mean compactness  mean concavity  mean concave points  mean
symmetry  \
0           0.27760          0.3001              0.14710
0.2419
1           0.07864          0.0869              0.07017
0.1812
2           0.15990          0.1974              0.12790
0.2069
3           0.28390          0.2414              0.10520
0.2597
4           0.13280          0.1980              0.10430
0.1809

   mean fractal dimension  ...  worst radius  worst texture  worst
perimeter  \
0                 0.07871  ...         25.38          17.33
184.60
1                 0.05667  ...         24.99          23.41
158.80
2                 0.05999  ...         23.57          25.53
152.50
3                 0.09744  ...         14.91          26.50
98.87
4                 0.05883  ...         22.54          16.67
152.20

   worst area  worst smoothness  worst compactness  worst concavity  \
0      2019.0            0.1622             0.6656           0.7119
1      1956.0            0.1238             0.1866           0.2416
2      1709.0            0.1444             0.4245           0.4504
3       567.7            0.2098             0.8663           0.6869
4      1575.0            0.1374             0.2050           0.4000

   worst concave points  worst symmetry  worst fractal dimension
0                0.2654          0.4601                  0.11890
1                0.1860          0.2750                  0.08902
2                0.2430          0.3613                  0.08758
```

```
3                0.2575           0.6638                 0.17300
4                0.1625           0.2364                 0.07678

[5 rows x 30 columns]
```

```
scaler = StandardScaler()
df_scaled = scaler.fit_transform(df)

df_scaled
```

```
array([[ 1.09706398, -2.07333501,  1.26993369, ...,  2.29607613,
         2.75062224,  1.93701461],
       [ 1.82982061, -0.35363241,  1.68595471, ...,  1.0870843 ,
        -0.24388967,  0.28118999],
       [ 1.57988811,  0.45618695,  1.56650313, ...,  1.95500035,
         1.152255  ,  0.20139121],
       ...,
       [ 0.70228425,  2.0455738 ,  0.67267578, ...,  0.41406869,
        -1.10454895, -0.31840916],
       [ 1.83834103,  2.33645719,  1.98252415, ...,  2.28998549,
         1.91908301,  2.21963528],
       [-1.80840125,  1.22179204, -1.81438851, ..., -1.74506282,
        -0.04813821, -0.75120669]])
```

```
pca = PCA(n_components=2)  # Reduce to 2 dimensions
df_pca = pca.fit_transform(df_scaled)

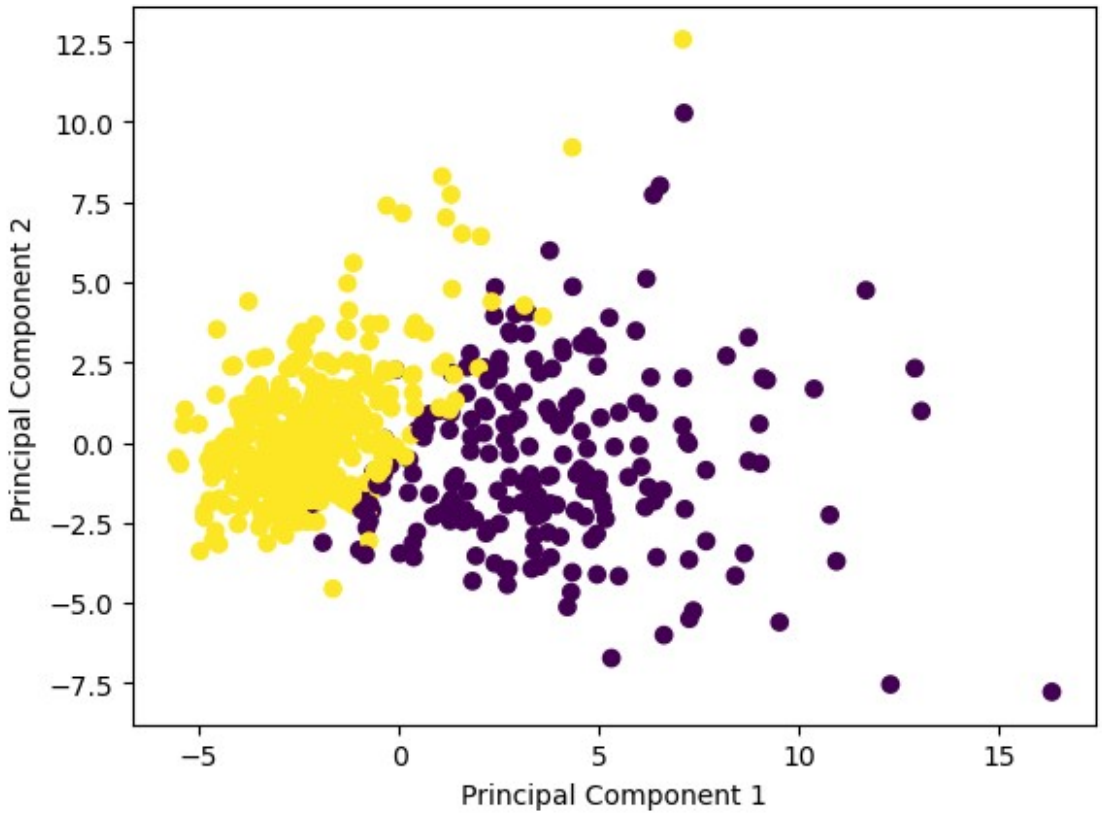
df_pca
```

```
array([[ 9.19283683,  1.94858307],
       [ 2.3878018 , -3.76817174],
       [ 5.73389628, -1.0751738 ],
       ...,
       [ 1.25617928, -1.90229671],
       [10.37479406,  1.67201011],
       [-5.4752433 , -0.67063679]])
```

```
df_pca = pd.DataFrame(data=df_pca, columns=['PC1', 'PC2'])

import matplotlib.pyplot as plt

plt.scatter(df_pca[:, 0], df_pca[:, 1], c=data.target)
plt.xlabel('Principal Component 1')
plt.ylabel('Principal Component 2')
plt.show()
```




```
print("The End")
```

```
The End
```