LabAssignment\_1 - Jupyter Notebook 07/12/22, 11:20 PM



In [5]: **import** matplotlib.pyplot **as** plt

**import** numpy **as** np

**import** pandas **as** pd

**import** seaborn **as** sns

**from** sklearn.datasets **import** load\_breast\_cancer data **=** load\_breast\_cancer() data.keys()

Out[5]: dict\_keys(['data', 'target', 'frame', 'target\_names', 'DESCR', 'fe ature\_names', 'filename', 'data\_module'])



In [6]: print(data['feature\_names'])

['mean radius' 'mean texture' 'mean perimeter' 'mean area' 'mean smoothness' 'mean compactness' 'mean concavity'

'mean concave points' 'mean symmetry' 'mean fractal dimension'

'radius error' 'texture error' 'perimeter error' 'area error'

'smoothness error' 'compactness error' 'concavity error'

'concave points error' 'symmetry error' 'fractal dimension error'

'worst radius' 'worst texture' 'worst perimeter' 'worst area'

'worst smoothness' 'worst compactness' 'worst concavity'

'worst concave points' 'worst symmetry' 'worst fractal dimension'

]



In [8]: df **=** pd.DataFrame(data['data'],columns **=** data['feature\_names'])

print(df)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| mean | radius | mean texture | mean perimeter | mean area mean sm |
| oothness | \ |  |  |  |
| 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 |  |  |  |  |
| .. | ... | ... | ... | ... |
| ... |  |  |  |  |
| 564 | 21.56 | 22.39 | 142.00 | 1479.0 |
| 0.11100 |  |  |  |  |
| 565 | 20.13 | 28.25 | 131.20 | 1261.0 |
| 0.09780 |  |  |  |  |
| 566 | 16.60 | 28.08 | 108.30 | 858.1 |
| 0.08455 |  |  |  |  |
| 567 | 20.60 | 29.33 | 140.10 | 1265.0 |
| 0.11780 |  |  |  |  |
| 568 | 7.76 | 24.54 | 47.92 | 181.0 |

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 0.05263 |  |  |  |  |  |
| mean compactness | | mean concavity | | mean concave points mean s | |
| ymmetry | \ |  |  |  |  |
| 0 | 0.27760 | 0.30010 | |  | 0.14710 |
| 0.2419 |  |  |  |  |  |
| 1 | 0.07864 | 0.08690 | |  | 0.07017 |
| 0.1812 |  |  |  |  |  |
| 2 | 0.15990 | 0.19740 | |  | 0.12790 |
| 0.2069 |  |  |  |  |  |
| 3 | 0.28390 | 0.24140 | |  | 0.10520 |
| 0.2597 |  |  |  |  |  |
| 4 | 0.13280 | 0.19800 | |  | 0.10430 |
| 0.1809 |  |  |  |  |  |
| .. | ... |  | ... |  | ... |
| ... |  |  |  |  |  |
| 564 | 0.11590 | 0.24390 | |  | 0.13890 |
| 0.1726 |  |  |  |  |  |
| 565 | 0.10340 | 0.14400 | |  | 0.09791 |
| 0.1752 |  |  |  |  |  |
| 566 | 0.10230 | 0.09251 | |  | 0.05302 |
| 0.1590 |  |  |  |  |  |
| 567 | 0.27700 | 0.35140 | |  | 0.15200 |
| 0.2397 |  |  |  |  |  |
| 568 | 0.04362 | 0.00000 | |  | 0.00000 |
| 0.1587 |  |  |  |  |  |
| mean fractal dimension ... | | | worst radius worst texture \ | | |
| 0 | 0.07871 ... | |  | 25.380 | 17.33 |
| 1 | 0.05667 ... | |  | 24.990 | 23.41 |
| 2 | 0.05999 ... | |  | 23.570 | 25.53 |
| 3 | 0.09744 ... | |  | 14.910 | 26.50 |
| 4 | 0.05883 ... | |  | 22.540 | 16.67 |
| .. |  | ... ... |  | ... | ... |
| 564 | 0.05623 ... | |  | 25.450 | 26.40 |
| 565 | 0.05533 ... | |  | 23.690 | 38.25 |
| 566 | 0.05648 ... | |  | 18.980 | 34.12 |
| 567 | 0.07016 ... | |  | 25.740 | 39.42 |
| 568 | 0.05884 ... | |  | 9.456 | 30.37 |
| worst perimeter | | worst area | worst smoothness | | worst compactn |
| ess \ |  |  |  |  |  |
| 0 | 184.60 | 2019.0 |  | 0.16220 | 0.66 |
| 560 |  |  |  |  |  |
| 1 | 158.80 | 1956.0 |  | 0.12380 | 0.18 |
| 660 |  |  |  |  |  |
| 2 | 152.50 | 1709.0 |  | 0.14440 | 0.42 |
| 450 |  |  |  |  |  |
| 3 | 98.87 | 567.7 |  | 0.20980 | 0.86 |
| 630 |  |  |  |  |  |
| 4 | 152.20 | 1575.0 |  | 0.13740 | 0.20 |
| 500 |  |  |  |  |  |
| .. | ... | ... |  | ... |  |

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|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ... |  |  |  |  |  |
| 564 | 166.10 | 2027.0 | 0.14100 | | 0.21 |
| 130 |  |  |  |  |  |
| 565 | 155.00 | 1731.0 | 0.11660 | | 0.19 |
| 220 |  |  |  |  |  |
| 566 | 126.70 | 1124.0 | 0.11390 | | 0.30 |
| 940 |  |  |  |  |  |
| 567 | 184.60 | 1821.0 | 0.16500 | | 0.86 |
| 810 |  |  |  |  |  |
| 568 | 59.16 | 268.6 | 0.08996 | | 0.06 |
| 444 |  |  |  |  |  |
| worst concavity | | worst concave points | | worst symmetry | \ |
| 0 | 0.7119 |  | 0.2654 | 0.4601 |  |
| 1 | 0.2416 |  | 0.1860 | 0.2750 |  |
| 2 | 0.4504 |  | 0.2430 | 0.3613 |  |
| 3 | 0.6869 |  | 0.2575 | 0.6638 |  |
| 4 | 0.4000 |  | 0.1625 | 0.2364 |  |
| .. | ... |  | ... | ... |  |
| 564 | 0.4107 |  | 0.2216 | 0.2060 |  |
| 565 | 0.3215 |  | 0.1628 | 0.2572 |  |
| 566 | 0.3403 |  | 0.1418 | 0.2218 |  |
| 567 | 0.9387 |  | 0.2650 | 0.4087 |  |
| 568 | 0.0000 |  | 0.0000 | 0.2871 |  |
| worst fractal dimension | | |  |  |  |
| 0 |  | 0.11890 |  |  |  |
| 1 |  | 0.08902 |  |  |  |
| 2 |  | 0.08758 |  |  |  |
| 3 |  | 0.17300 |  |  |  |
| 4 |  | 0.07678 |  |  |  |
| .. |  | ... |  |  |  |
| 564 |  | 0.07115 |  |  |  |
| 565 |  | 0.06637 |  |  |  |
| 566 |  | 0.07820 |  |  |  |
| 567 |  | 0.12400 |  |  |  |
| 568 |  | 0.07039 |  |  |  |
| [569 rows x 30 columns] | | |  |  |  |
| In [10]: print(df.head()) | |  |  |  |  |
| mean radius mean texture mean perimeter | | | | mean area mean smoo | |
| thness | \ |  |  |  |  |
| 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 |  |  |  |  |  |



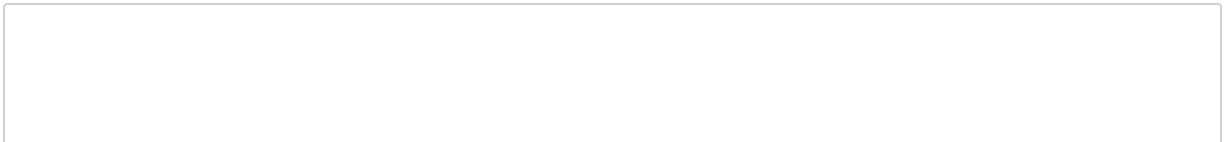
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mean compactness mean concavity mean concave points mean sym

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| metry | \ |  |  |  |  |
| 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 concavit | | |
| y \ |  |  |  |  |  |
| 0 | 2019.0 | 0.1622 |  | 0.6656 | 0.711 |
| 9 |  |  |  |  |  |
| 1 | 1956.0 | 0.1238 |  | 0.1866 | 0.241 |
| 6 |  |  |  |  |  |
| 2 | 1709.0 | 0.1444 |  | 0.4245 | 0.450 |
| 4 |  |  |  |  |  |
| 3 | 567.7 | 0.2098 |  | 0.8663 | 0.686 |
| 9 |  |  |  |  |  |
| 4 | 1575.0 | 0.1374 |  | 0.2050 | 0.400 |
| 0 |  |  |  |  |  |
| 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 | |

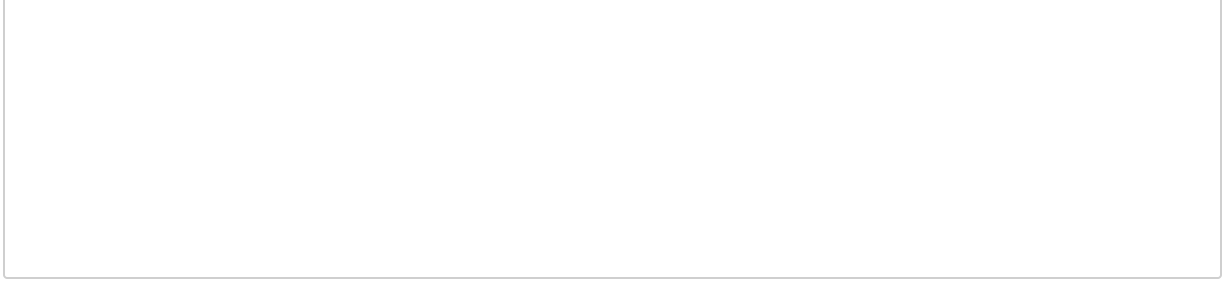
[5 rows x 30 columns]



In [15]:

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**from** sklearn.preprocessing **import** StandardScaler

scalar **=** StandardScaler()

scalar.fit(df)

scaledData **=** scalar.transform(df)

print(df.head())

print(scaledData)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| mean radius mean texture mean perimeter | | | | mean area | mean smoo |
| thness | \ |  |  |  |  |
| 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 sym |
| metry | \ |  |  |  |  |
| 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 concavit |
| y | \ |  |  |  |
| 0 | 2019.0 | 0.1622 | 0.6656 | 0.711 |
| 9 |  |  |  |  |
| 1 | 1956.0 | 0.1238 | 0.1866 | 0.241 |
| 6 |  |  |  |  |
| 2 | 1709.0 | 0.1444 | 0.4245 | 0.450 |

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 2 |  | 1709.0 |  | 0.1444 | 0.4245 | 0.450 |
| 4 |  |  |  |  |  |  |
| 3 |  | 567.7 |  | 0.2098 | 0.8663 | 0.686 |
| 9 |  |  |  |  |  |  |
| 4 |  | 1575.0 |  | 0.1374 | 0.2050 | 0.400 |
| 0 |  |  |  |  |  |  |
|  | 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] | | |  |  |  |
| [[ | 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]] | | |  |  |  |
| In [16]: print(scaledData.shape) | | | |  |  |  |
| (569, | | 30) |  |  |  |  |
| In [19]: **from** sklearn.decomposition **import** PCA | | | | |  |  |
| pca **=** PCA(n\_components**=**2) | | | |  |  |  |
| pca.fit(scaledData) | | | |  |  |  |
| Out[19]: PCA(n\_components=2) | | | |  |  |  |
| In [21]: x\_pca **=** pca.transform(scaledData) | | | | |  |  |
| print(x\_pca) | | |  |  |  |  |
| [[ | 9.19283683 | | 1.94858307] | |  |  |
| [ | 2.3878018 | | -3.76817174] | |  |  |
| [ | 5.73389628 | | -1.0751738 ] | |  |  |
| ... | |  |  |  |  |  |
| [ | 1.25617928 | | -1.90229671] | |  |  |
| [10.37479406 | | | 1.67201011] | |  |  |
| [-5.4752433 | | | -0.67063679]] | |  |  |



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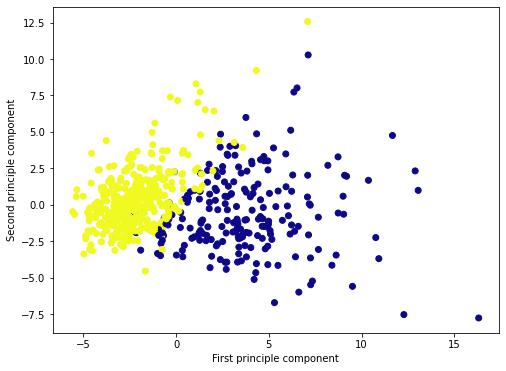
In [22]: plt.figure(figsize**=**(8,6))

plt.scatter(x\_pca[:,0],x\_pca[:,1],c **=** data['target'], cmap**=**'plasma'

plt.xlabel('First principle component')

plt.ylabel('Second principle component')

Out[22]: Text(0, 0.5, 'Second principle component')



In [ ]: 

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