Machine Learning

Use PCA method to reduce the number of features for Breast Cancer Dataset from sklearn library and reduce it into 2 components.

In [1]:
```
import pandas as pd
import matplotlib.pyplot as plt
```

Load the Dataset

In [2]:
```
from sklearn.datasets import load_breast_cancer

breast_cancer = load_breast_cancer()
```

In [3]:
```
breast_cancer.keys()
```

Out[3]:
```
dict_keys(['data', 'target', 'frame', 'target_names', 'DESCR', 'feature_names', 'filename'])
```

In [4]:
```
breast_cancer.data
```

Out[4]:
```
array([[1.799e+01, 1.038e+01, 1.228e+02, ..., 2.654e-01, 4.601e-01,
        1.189e-01],
       [2.057e+01, 1.777e+01, 1.329e+02, ..., 1.860e-01, 2.750e-01,
        8.902e-02],
       [1.969e+01, 2.125e+01, 1.300e+02, ..., 2.430e-01, 3.613e-01,
        8.758e-02],
       ...,
       [1.660e+01, 2.808e+01, 1.083e+02, ..., 1.418e-01, 2.218e-01,
        7.820e-02],
       [2.060e+01, 2.933e+01, 1.401e+02, ..., 2.650e-01, 4.087e-01,
        1.240e-01],
       [7.760e+00, 2.454e+01, 4.792e+01, ..., 0.000e+00, 2.871e-01,
        7.039e-02]])
```

In [5]:
```
breast_cancer.target_names
```

Out[5]:
```
array(['malignant', 'benign'], dtype='<U9')
```

In [6]:
```
breast_cancer.feature_names
```

Out[6]:
```
array(['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'], dtype='<U23')
```

In [7]:
```
breast_cancer.data.shape
```

Out[7]: (569, 30)

In [8]:
```
cancer_df = pd.DataFrame(breast_cancer.data, columns=breast_cancer['feature_names'])
cancer_df.head()
```

Out[8]:

	mean radius	mean texture	mean perimeter	mean area	mean smoothness	mean compactness	mean concavity	mean concave points	mean symmetry	m fra dimen
0	17.99	10.38	122.80	1001.0	0.11840	0.27760	0.3001	0.14710	0.2419	0.07
1	20.57	17.77	132.90	1326.0	0.08474	0.07864	0.0869	0.07017	0.1812	0.05
2	19.69	21.25	130.00	1203.0	0.10960	0.15990	0.1974	0.12790	0.2069	0.05
3	11.42	20.38	77.58	386.1	0.14250	0.28390	0.2414	0.10520	0.2597	0.09
4	20.29	14.34	135.10	1297.0	0.10030	0.13280	0.1980	0.10430	0.1809	0.05

5 rows × 30 columns

Scale the data

In [9]:
```
from sklearn.preprocessing import StandardScaler

scaler = StandardScaler()
scaler.fit(cancer_df)
```

Out[9]: StandardScaler()

In [10]:
```
scaled_cancer_df = scaler.transform(cancer_df)
scaled_cancer_df.shape
```

Out[10]: (569, 30)

In [11]:
```
scaled_cancer_df[:4,:5]
```

Out[11]:
```
array([[ 1.09706398, -2.07333501,  1.26993369,  0.9843749 ,  1.56846633],
       [ 1.82982061, -0.35363241,  1.68595471,  1.90870825, -0.82696245],
       [ 1.57988811,  0.45618695,  1.56650313,  1.55888363,  0.94221044],
       [-0.76890929,  0.25373211, -0.59268717, -0.76446379,  3.28355348]])
```

Apply PCA method

In [12]:
```
from sklearn.decomposition import PCA
```

```
pca = PCA(n_components=2)
pca.fit(scaled_cancer_df)
```

Out[12]:
```
PCA(n_components=2)
```

In [13]:
```
pca_cancer_df = pca.transform(scaled_cancer_df)
pca_cancer_df.shape
```

Out[13]:
```
(569, 2)
```

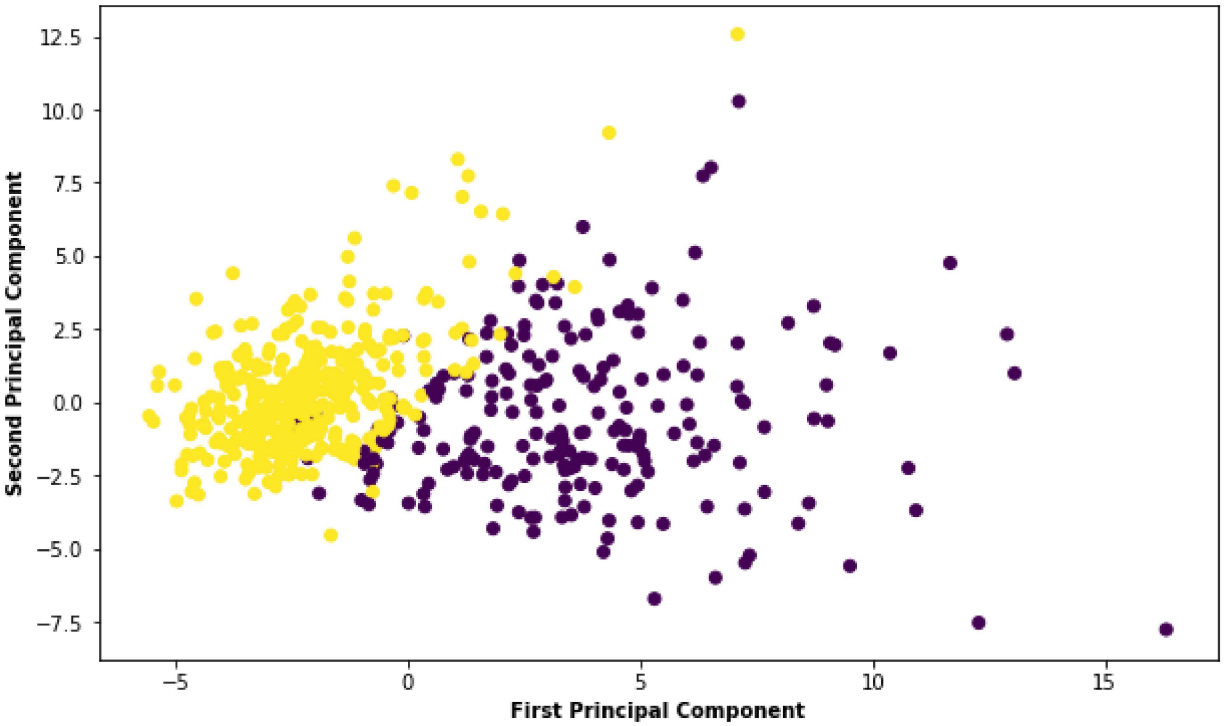
In [14]:
```
pca_cancer_df = pd.DataFrame(pca_cancer_df, columns=['PCA_1', 'PCA_2'])
pca_cancer_df.head()
```

Out[14]:

	PCA_1	PCA_2
0	9.192837	1.948583
1	2.387802	-3.768172
2	5.733896	-1.075174
3	7.122953	10.275589
4	3.935302	-1.948072

Visualize the data

In [15]:
```
%matplotlib inline
plt.figure(figsize=(10,6))
plt.scatter(pca_cancer_df['PCA_1'], pca_cancer_df['PCA_2'], c=breast_cancer.target)
plt.xlabel("First Principal Component", fontweight='bold')
plt.ylabel("Second Principal Component", fontweight='bold')
plt.show()
```


Second Principal Component
First Principal Component
12.5
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0
−7.5
−5
0
5
10
15

In [ ]: