Experiment 3

AIM : Projection of data

To Perform projection of data along one axis in python.

DESCRIPTION:

The vector projection of a on b is a vector whose magnitude is the scalar projection of a on b with the same direction as b.

$$\mathbf{a}_1 = a_1 \hat{\mathbf{b}} = \frac{\mathbf{a} \cdot \mathbf{b}}{|\mathbf{b}|} \frac{\mathbf{b}}{|\mathbf{b}|}$$

CODE and OUTPUT :

```
In [16]:  # Representation of Data in Python using matplotlib
          # Libraries
          import numpy as np
          import scipy as sp
          from sklearn import datasets
          import math
          import matplotlib.pyplot as plt
          %matplotlib inline
```

```
In [17]:  # We will use IRIS dataset provided by sklearn library of python
          iris = datasets.load_iris()
          X = iris.data[:,:2]
          y = iris.target
          # Representation of Actual Data Points
          plt.scatter(X[:,0],X[:,1],c=y)
          plt.title('Actual Data representation without projection')
          plt.xlabel('Sepal Length')
          plt.ylabel('Sepal Width')
          plt.show()
```
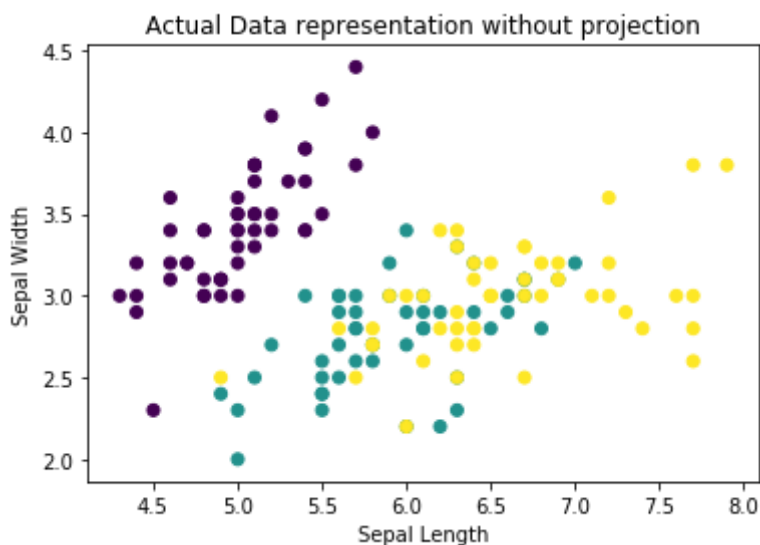
In [18]:
```python
# Unit Vector to perform projection on
vector = np.array([[1/math.sqrt(2),1/math.sqrt(2)]] )
# Dot Product if data points with vector
dotProduct = np.matmul(X,np.transpose(vector))
dotProduct.reshape(dotProduct.shape[0],1)
print(dotProduct.shape)
```

```
(150, 1)
```

In [19]:
```python
# Projection data on given vector
projection = np.matmul(dotProduct, vector)
print(projection[:10,:])
```

```
[[4.3  4.3 ]
 [3.95 3.95]
 [3.95 3.95]
 [3.85 3.85]
 [4.3  4.3 ]
 [4.65 4.65]
 [4.   4.  ]
 [4.2  4.2 ]
 [3.65 3.65]
 [4.   4.  ]]
```

In [20]:
```python
# Projectes Points along a given Vector
plt.scatter(projection[:,0],projection[:,1],c=y)
plt.title('Projected Data Points along Vector %s'%vector[0])
plt.xlabel('Sepal Length')
plt.ylabel('Sepal Width')
plt.show()
```
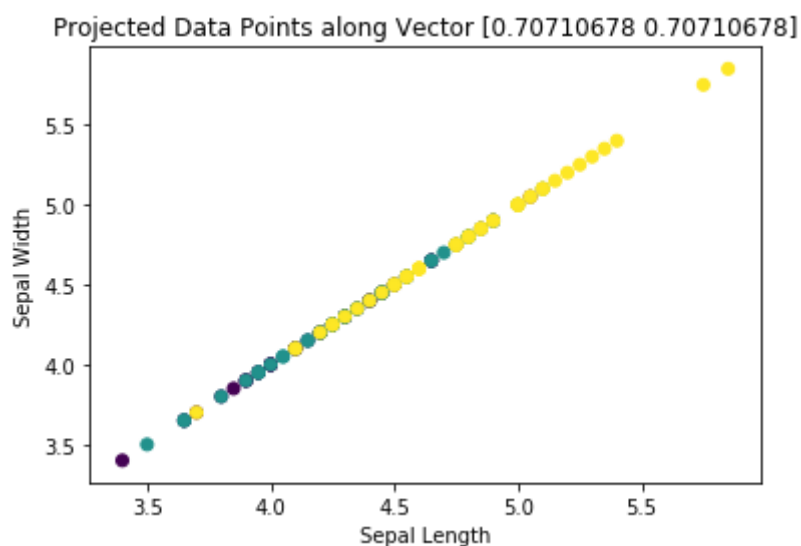

LEARNING OUTCOMES :

In this experiment, We learn about how to project data on a given vector