Experiment – 9

Student Name: Vivek Kumar **UID: 21BCS8129**
Branch: BE-CSE(LEET) **Section/Group: WM-20BCS-616/A**
Semester: 5th **Date of Performance: 9/11/2022**
Subject Name: Machine Learning Lab **Subject Code: 20CSP-317**

1. Aim/Overview of the practical:

Implement Principle Component Analysis.

2. Task to be done/ Which logistics used:

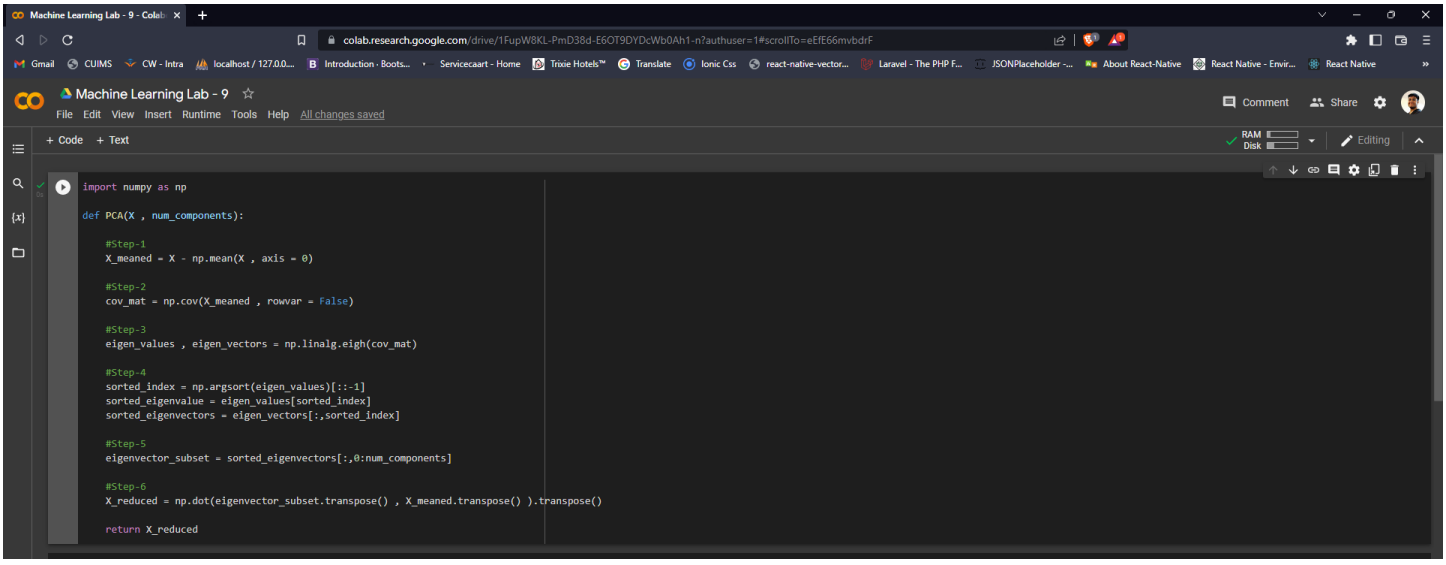
Implement Principle Component Analysis.

3. Steps for experiment/practical/Code:

```
import numpy as np

def PCA(X , num_components):
    #Step-1
    X_meaned = X - np.mean(X , axis = 0)

    #Step-2
    cov_mat = np.cov(X_meaned , rowvar = False)

    #Step-3
    eigen_values , eigen_vectors = np.linalg.eigh(cov_mat)

    #Step-4
    sorted_index = np.argsort(eigen_values)[::-1]
    sorted_eigenvalue = eigen_values[sorted_index]
    sorted_eigenvectors = eigen_vectors[:,sorted_index]

    #Step-5
    eigenvector_subset = sorted_eigenvectors[:,0:num_components]

    #Step-6
    X_reduced = np.dot(eigenvector_subset.transpose() , X_meaned.transpose() ).transpose()

    return X_reduced

import pandas as pd

#Get the IRIS dataset
url = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
```

```
data = pd.read_csv(url, names=['sepal length','sepal width','petal length','petal
width','target'])

#prepare the data
x = data.iloc[:,0:4]

#prepare the target
target = data.iloc[:,4]

#Applying it to PCA function
mat_reduced = PCA(x , 2)

#Creating a Pandas DataFrame of reduced Dataset
principal_df = pd.DataFrame(mat_reduced , columns = ['PC1','PC2'])

#Concat it with target variable to create a complete Dataset
principal_df = pd.concat([principal_df , pd.DataFrame(target)] , axis = 1)

import seaborn as sb
import matplotlib.pyplot as plt

plt.figure(figsize = (6,6))
sb.scatterplot(data = principal_df , x = 'PC1',y = 'PC2' , hue = 'target' , s = 60 , palette=
'icefire')
```

4. Result/Output/Writing Summary:



Machine Learning Lab - 9 - Colab

colab.research.google.com/drive/1FupW8KL-PmD38d-E6OT9DYDcWb0Ah1-n?authuser=1#scrollTo=eEfE66mvbdrF

Machine Learning Lab - 9

File Edit View Insert Runtime Tools Help All changes saved

Comment Share

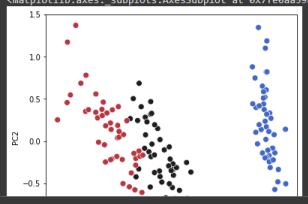
+ Code + Text

RAM Disk Editing

```
[2] import pandas as pd

    #Get the IRIS dataset
    url = "https://archive.ics.uci.edu/ml/machine-learning-databases/iris/iris.data"
    data = pd.read_csv(url, names=['sepal length','sepal width','petal length','petal width','target'])

    #prepare the data
    x = data.iloc[:,0:4]

    #prepare the target
    target = data.iloc[:,4]

    #Applying it to PCA function
    mat_reduced = PCA(x , 2)

    #Creating a Pandas DataFrame of reduced Dataset
    principal_df = pd.DataFrame(mat_reduced , columns = ['PC1','PC2'])

    #Concat it with target variable to create a complete Dataset
    principal_df = pd.concat([principal_df , pd.DataFrame(target)] , axis = 1)
```

```
import seaborn as sb
import matplotlib.pyplot as plt

plt.figure(figsize = (6,6))
sb.scatterplot(data = principal_df , x = 'PC1',y = 'PC2' , hue = 'target' , s = 60 , palette= 'icefire')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe0aa598c10>
```



2s completed at 1:39 PM

28°C Cloudy

ENG IN 13:56 09-11-2022

Machine Learning Lab - 9 - Colab

colab.research.google.com/drive/1FupW8KL-PmD38d-E6OT9DYDcWb0Ah1-n?authuser=1#scrollTo=eEfE66mvbdrF

Machine Learning Lab - 9

File Edit View Insert Runtime Tools Help All changes saved

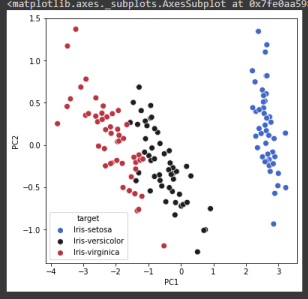
Comment Share

+ Code + Text

RAM Disk Editing

```
[3] import seaborn as sb
    import matplotlib.pyplot as plt

    plt.figure(figsize = (6,6))
    sb.scatterplot(data = principal_df , x = 'PC1',y = 'PC2' , hue = 'target' , s = 60 , palette= 'icefire')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7fe0aa598c10>
```




```
[ ]
```

2s completed at 1:39 PM

28°C Cloudy

ENG IN 13:56 09-11-2022

Learning outcomes (What I have learnt):

1. Understood the concept of PCA.
2. Learnt how to Covariance Matrix.
3. Learnt the separation of eigen value and eigen vectors from CM.
4. Plot the graph using seaborn and matplotlib.

Evaluation Grid (To be created as per the SOP and Assessment guidelines by the faculty):

Sr. No.	Parameters	Marks Obtained	Maximum Marks
1.			
2.			
3.			