**Code:**

import numpy as np

import matplotlib.pyplot as plt

try:

F = open("data.txt", "r")

except:

print("Something went wrong while opening the file!")

data = []

for line in F:

values = []

temp = list(line.split(' '))

faulty = False

for v in temp:

try:

values.append(float(v))

except ValueError:

print('Unknown character!')

faulty = True

if not faulty:

data.append(values)

F.close()

data = np.array(data)

means = np.mean(data, axis=0)

diff = data - means

print("data:")

print(data)

cov\_mat = np.cov(data.T)

e\_vals, e\_vecs = np.linalg.eig(cov\_mat)

e\_pair = [(e\_vals[i], np.array(e\_vecs[i])) for i in range(len(e\_vals))]

e\_pair.sort(reverse=True)

print("Sorted Pairs: ")

print(\*e\_pair)

e\_vec\_sort = []

for i in range(len(e\_pair)):

e\_vec\_sort.append(np.array(e\_pair[i][1]))

e\_vec\_sort = np.column\_stack(e\_vec\_sort)

pc1 = e\_vec\_sort[0].T.dot(diff.T)

pc2 = e\_vec\_sort[1].T.dot(diff.T)

print("PCA: ")

print(np.array([[pc1[i], pc2[i]] for i in range(len(pc1))]))

plt.figure(1)

plt.scatter(data[:, 0], data[:, 1])

plt.title("Original Data")

plt.xlabel("X")

plt.ylabel("Y")

plt.figure(2)

plt.scatter(pc1, pc2)

plt.title("Principle Components")

plt.xlabel("PC1")

plt.ylabel("PC2")

plt.show()

**Outputs:**

data:

[[2.5 2.4]

[0.5 0.7]

[2.2 2.9]

[1.9 2.2]

[3.1 3. ]

[2.3 2.7]

[2. 1.6]

[1. 1.1]

[1.5 1.6]

[1.2 0.9]]

Sorted Pairs:

(1.2661081617014531, array([ 0.67284685, -0.7397818 ])) (0.05222517163188012, array([-0.7397818 , -0.67284685]))

PCA:

[[ 0.09504277 -0.83274658]

[ 0.00697814 1.79065667]

[-0.47670218 -0.94723547]

[-0.16070898 -0.25430813]

[ 0.0548818 -1.68032377]

[-0.26146114 -0.88664428]

[ 0.35044479 0.0754218 ]

[ 0.04748884 1.15162703]

[ 0.01402137 0.4453127 ]

[ 0.33001458 1.13824004]]

