PCA_starter

March 7, 2023

[ ]:
```
# Enable interactive rotation of graph
%matplotlib inline

import numpy as np
from scipy.io import loadmat
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D

# Load data for activity
X = loadmat('PCA_Activity.mat')['X']
rows, cols = np.array(X.shape)
x, y, z = X

print('Rows of X = ',rows)
print('Cols of X = ',cols)
```

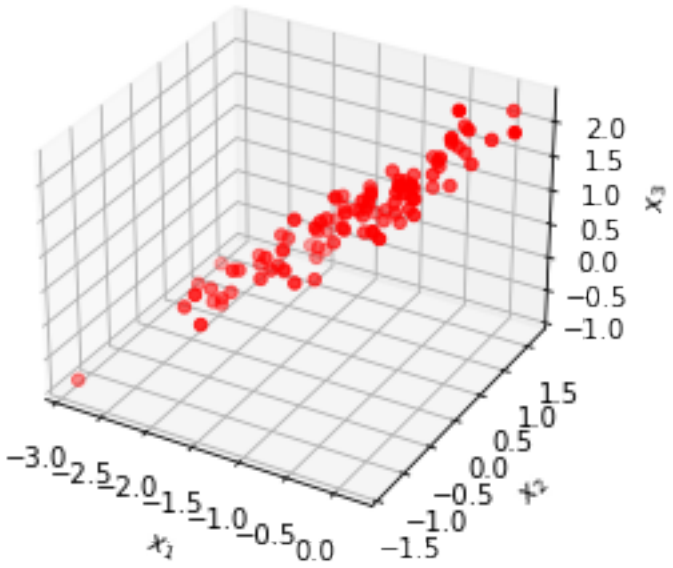
```
Rows of X =  3
Cols of X =  100
```

[ ]:
```
fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')

ax.scatter(x, y, z, c='r', marker='o')

ax.set_xlabel('$x_1$')
ax.set_ylabel('$x_2$')
ax.set_zlabel('$x_3$')

plt.show()
```



[ ]:
```
# Subtract mean
X_m = X - np.mean(X, 1).reshape((3,1))
x_m, y_m, z_m = X_m
```

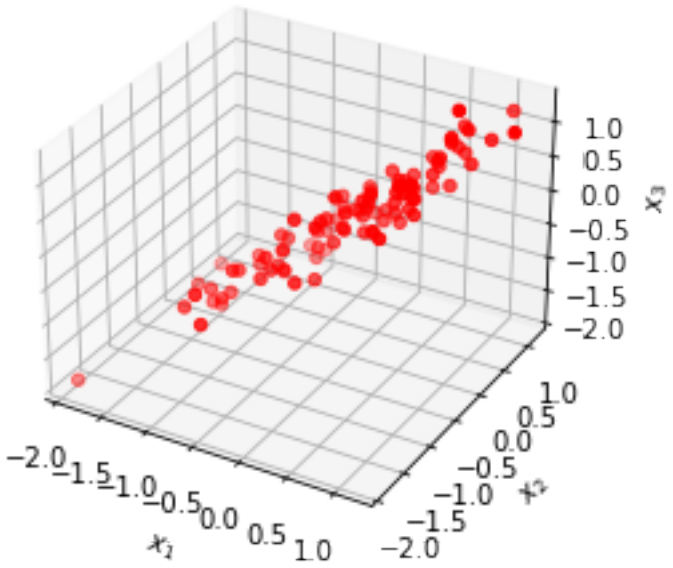
[ ]:
```
# display zero mean scatter plot

fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')

ax.scatter(x_m, y_m, z_m, c='r', marker='o')

ax.set_xlabel('$x_1$')
ax.set_ylabel('$x_2$')
ax.set_zlabel('$x_3$')

plt.show()
```



[ ]:
```
# Use SVD to find first principal component

U,s,VT = np.linalg.svd(X_m,full_matrices=False)

# complete the next line of code to assign the first principal component to a
a = U[:,0]

print(a)
```

```
[-0.58277194 -0.57701087 -0.57221964]
```

[ ]:
```
# display zero mean scatter plot and first principal component

fig = plt.figure()
ax = fig.add_subplot(111, projection='3d')

ax.scatter(x_m, y_m, z_m, c='r', marker='o', label='Data')

ax.scatter(a[0],a[1],a[2], c='c', marker='s')

ax.set_xlabel('$x_1$')
ax.set_ylabel('$x_2$')
ax.set_zlabel('$x_3$')

ax.plot([0,a[0]],[0,a[1]],[0,a[2]], c='b',label='Principal Component')
```

```
ax.legend()
plt.show()
```