

```
%Importing all data
```

```
rawdata = xlsread('HW.xlsx')
```

```
rawdata = 18x6
```

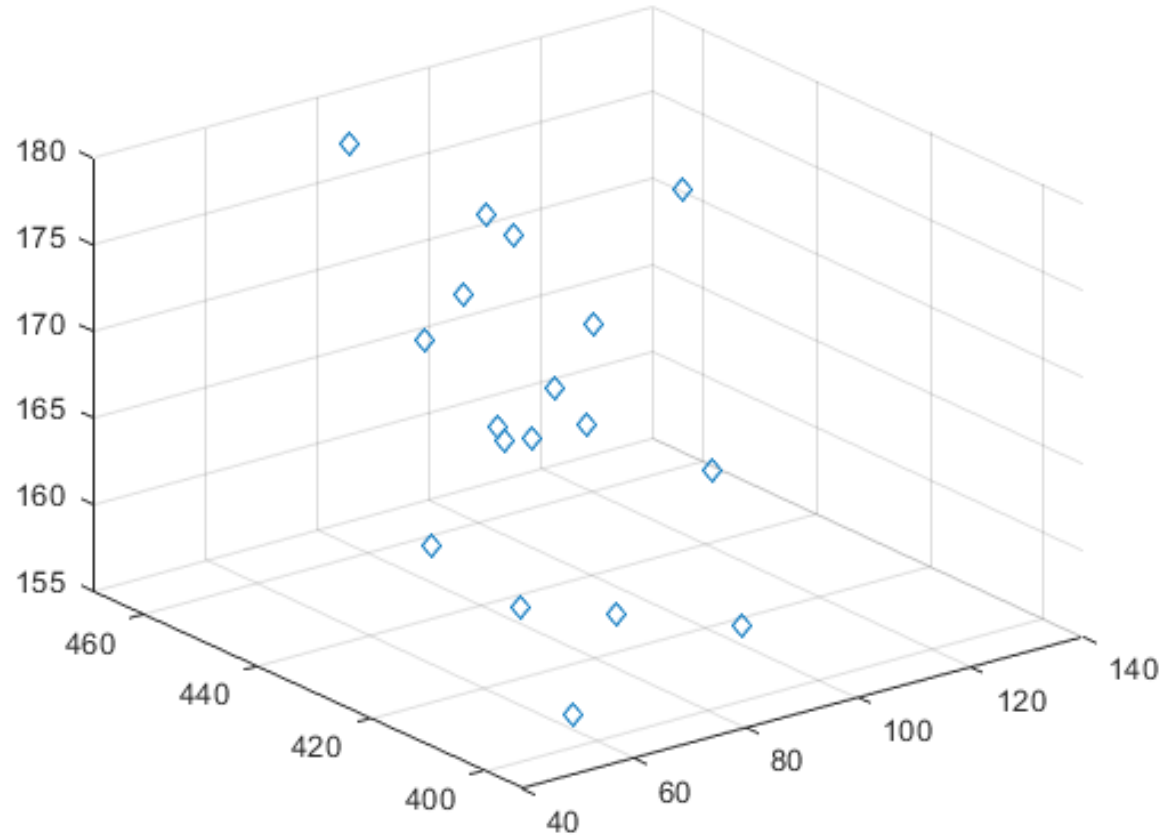
1350	79	393	161	870	165
1588	85	468	177	1110	160
1294	68	424	168	1050	152
1222	59	412	161	930	151
1585	98	439	164	1105	165
1297	82	429	169	1080	160
1796	79	449	169	1160	154
1565	55	424	163	1010	140
2664	128	452	173	1320	180
1166	55	399	157	815	140

```
%Scatter Plot of raw data
```

```
scatter3(rawdata(:,2),rawdata(:,3),rawdata(:,4),'diamond');
```

```
title("3D plot of original raw data");
```

3D plot of original raw data



%Adjusted data

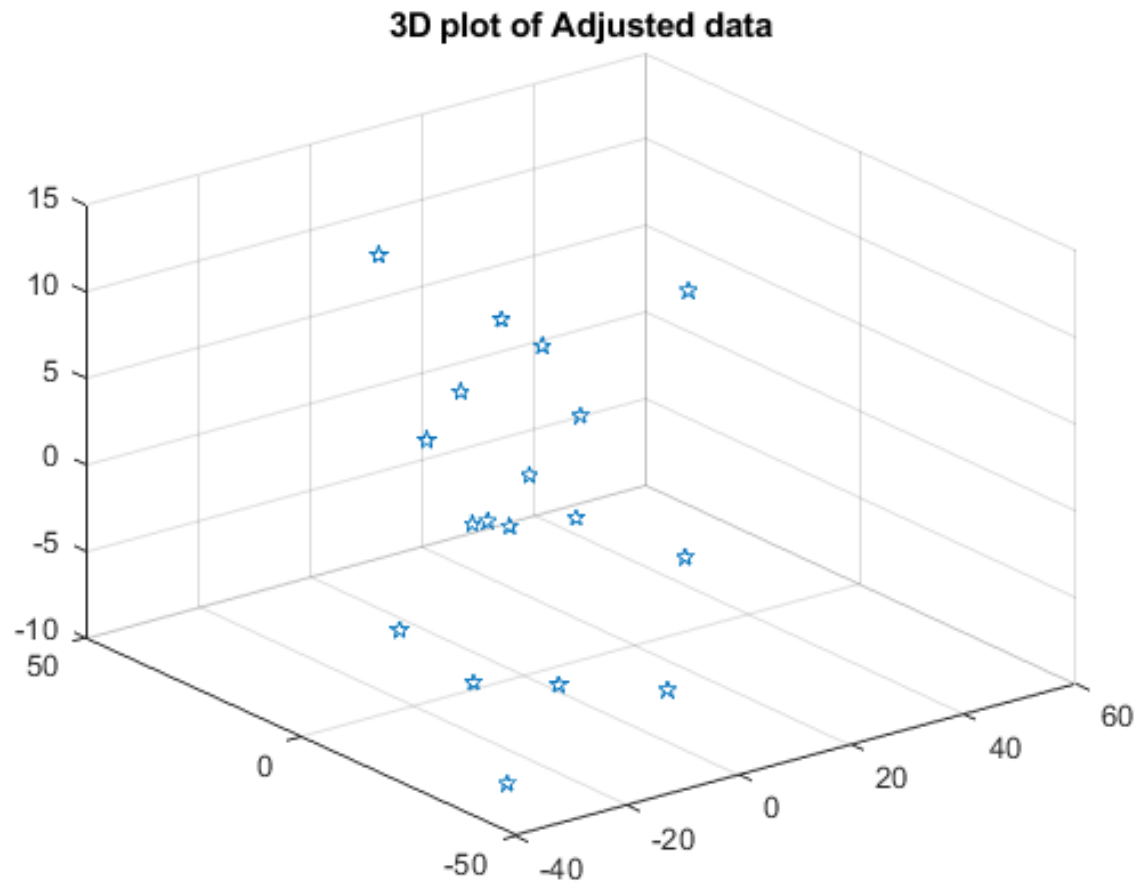
```
size_raw = size(rawdata);  
row = size_raw(1,1);  
col = size_raw(1,2);  
adjustData = zeros(row, 3);  
mean_x2 = mean(rawdata(:,2));  
mean_x3 = mean(rawdata(:,3));  
mean_x4 = mean(rawdata(:,4));  
adjustData(:,1) = rawdata(:,2) - mean_x2;  
adjustData(:,2) = rawdata(:,3) - mean_x3;
```

```
adjustData(:,3) = rawdata(:,4) - mean_x4;  
adjustData
```

```
adjustData = 18×3  
    -5.6111   -40.5000   -5.6667  
     0.3889    34.5000    10.3333  
   -16.6111    -9.5000     1.3333  
   -25.6111   -21.5000   -5.6667  
    13.3889     5.5000   -2.6667  
    -2.6111    -4.5000     2.3333  
    -5.6111    15.5000     2.3333  
   -29.6111    -9.5000    -3.6667  
    43.3889    18.5000     6.3333  
   -29.6111   -34.5000    -9.6667
```

```
%Scatter Plot of Adjusted data
```

```
scatter3(adjustData(:,1),adjustData(:,2),adjustData(:,3), 'pentagram');  
title("3D plot of Adjusted data");
```



```
%Calculating covariance matrix
```

```
cov_x = cov(adjustData)
```

```
cov_x = 3x3
```

```
415.1928  288.9118  56.3922  
288.9118  488.7353  99.7647  
56.3922   99.7647  28.2353
```

```
%Calculating eigen vector and eigen value
```

```
[eig_vector, eig_value] = eig(cov_x)
```

```
eig_vector = 3×3
    0.0146    -0.7608    -0.6488
   -0.2114     0.6319   -0.7457
    0.9773     0.1480   -0.1516
eig_value = 3×3
    7.5007         0         0
         0  164.2593         0
         0         0  760.4034
```

```
diag_eig = diag(eig_value)
```

```
diag_eig = 3×1
    7.5007
   164.2593
   760.4034
```

```
%Calculating Principle Component
e1 = diag_eig(1) %first eigen value
```

```
e1 = 7.5007
```

```
e2 = diag_eig(2) %second eigen value
```

```
e2 = 164.2593
```

```
e3 = diag_eig(3) %third eigen value
```

```
e3 = 760.4034
```

```
pvar1 = (e1/(e1+e2+e3))*100 %percentage variance of e1
```

```
pvar1 = 0.8047
```

```
pvar2 = (e2/(e1+e2+e3))*100 %percentage variance of e2
```

```
pvar2 = 17.6213
```

```
pvar3 = (e3/(e1+e2+e3))*100 %percentage variance of e3
```

```
pvar3 = 81.5740
```

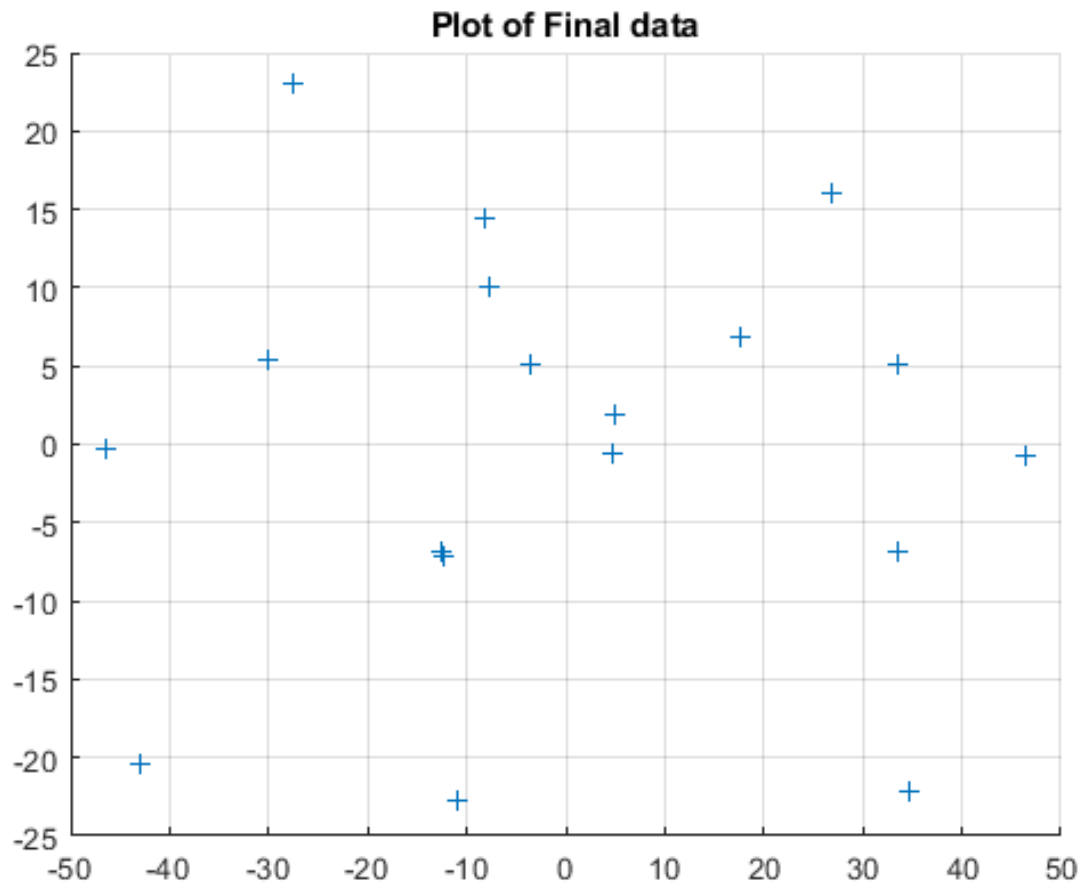
```
%Note:We know eigen vector with the highest eigen value is considered as  
%the principal component of data set. Here, eigen vector with the largest  
%eigen value was the third column. Also taking into account the second  
%column of eigen vector as its eigen value is significant  
feature_vector = [eig_vector(:,3), eig_vector(:,2)]
```

```
feature_vector = 3x2  
    -0.6488    -0.7608  
    -0.7457     0.6319  
    -0.1516     0.1480
```

```
%Now we obtain the final data  
final_data = adjustData * feature_vector
```

```
final_data = 18x2  
    34.6997   -22.1614  
   -27.5446    23.0340  
    17.6597     6.8320  
    33.5084     5.0602  
   -12.3842    -7.1055  
     4.6961    -0.5115  
    -8.2711    14.4086  
    26.8524    15.9821  
   -42.9072   -20.3824  
    46.4039    -0.7033
```

```
%Scatter Plot of Final data  
scatter(final_data(:,1),final_data(:,2),'+');  
title("Plot of Final data");  
grid on;
```



%Decoding data

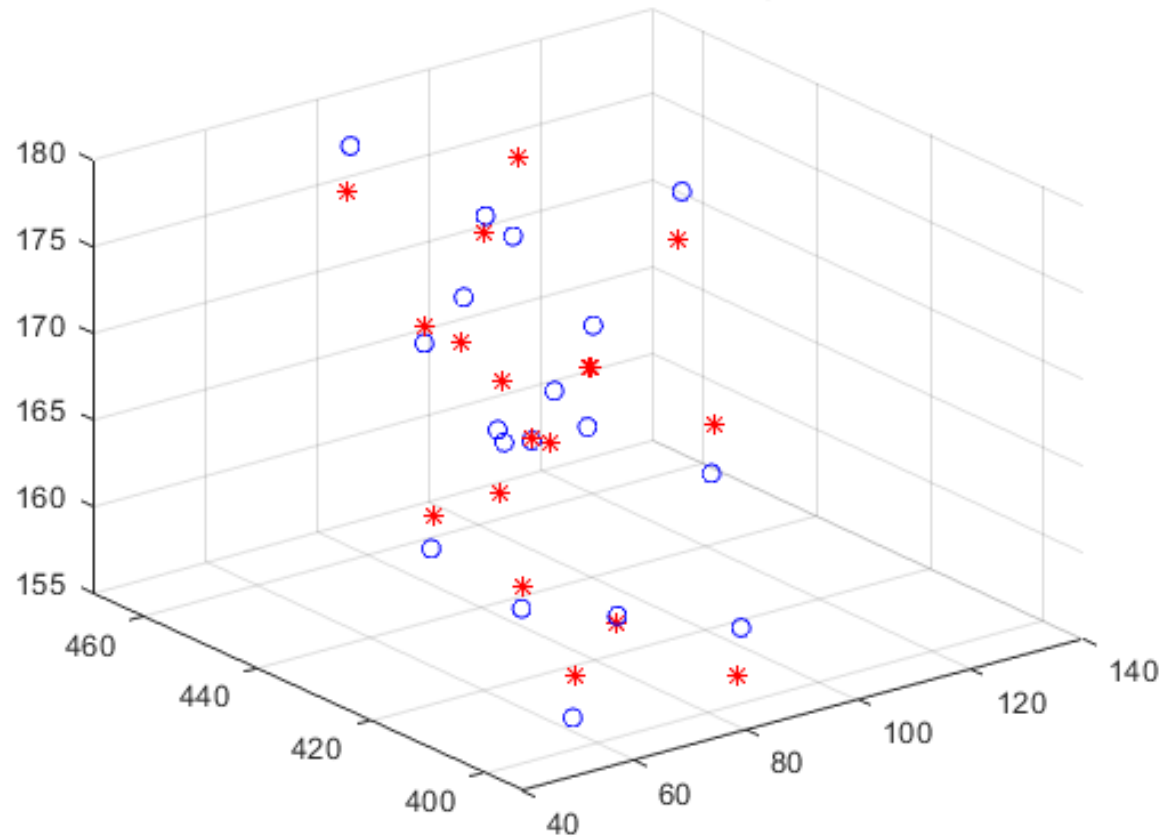
```
decodedInput = (final_data * feature_vector');  
decodedInput(:,1) = decodedInput(:,1) + mean_x2;  
decodedInput(:,2) = decodedInput(:,2) + mean_x3;  
decodedInput(:,3) = decodedInput(:,3) + mean_x4;  
decodedInput
```

decodedInput = 18×3

78.9570	393.6216	158.1261
84.9589	468.5944	174.2519
67.9552	424.6486	165.0013
59.0200	411.7109	162.3366
98.0522	438.2447	167.4919
81.9533	429.6750	165.8791
79.0158	448.7721	170.0535
55.0293	423.5756	164.9624
127.9574	452.6158	170.1531
55.0378	398.4531	159.5287

```
%Plot showcasing Principle Component Analysis
figure;
scatter3(rawdata(:,2),rawdata(:,3),rawdata(:,4), 'blue', 'o');
hold on;
scatter3(decodedInput(:,1),decodedInput(:,2),decodedInput(:,3), 'red', '*');
grid on;
title("3D - Principle Component Analysis");
```


Principle Component Analysis



```
%2DPlot showcasing Principle Component Analysis
figure;
scatter(rawdata(:,2),rawdata(:,3),'blue','o');
hold on;
scatter(decodedInput(:,1),decodedInput(:,2),'red','*');
grid on;
title("2D - Principle Component Analysis");
```

Principle Component Analysis

