
Table of Contents

EE239AS HW 7	1
Problem 2	1
Part A: PCA Visualization	1
Part B: PPCA EM Algorithm	2
Part C: PPCA Covariance	3
Part D: PPCA Visualization	4
Part E: FA EM Algorithm	4
Part F: FA Covariance	5
Part G: FA Visualization	6

EE239AS HW 7

```
clc
clear all
close all

load('hw7_data.mat')
```

Problem 2

Part A: PCA Visualization

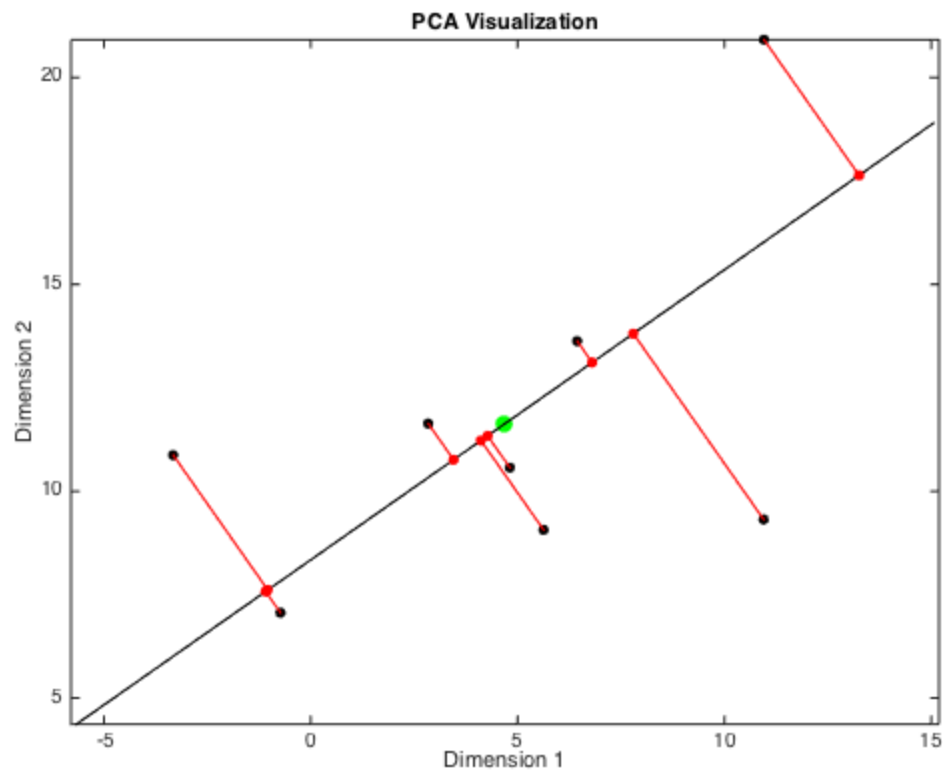
```
Y = Xsim';

Y0 = bsxfun(@minus, Y, mean(Y,2));
S = (1/size(Y0,2))*(Y0*Y0');

[u1,v1] = eigs(S,1);

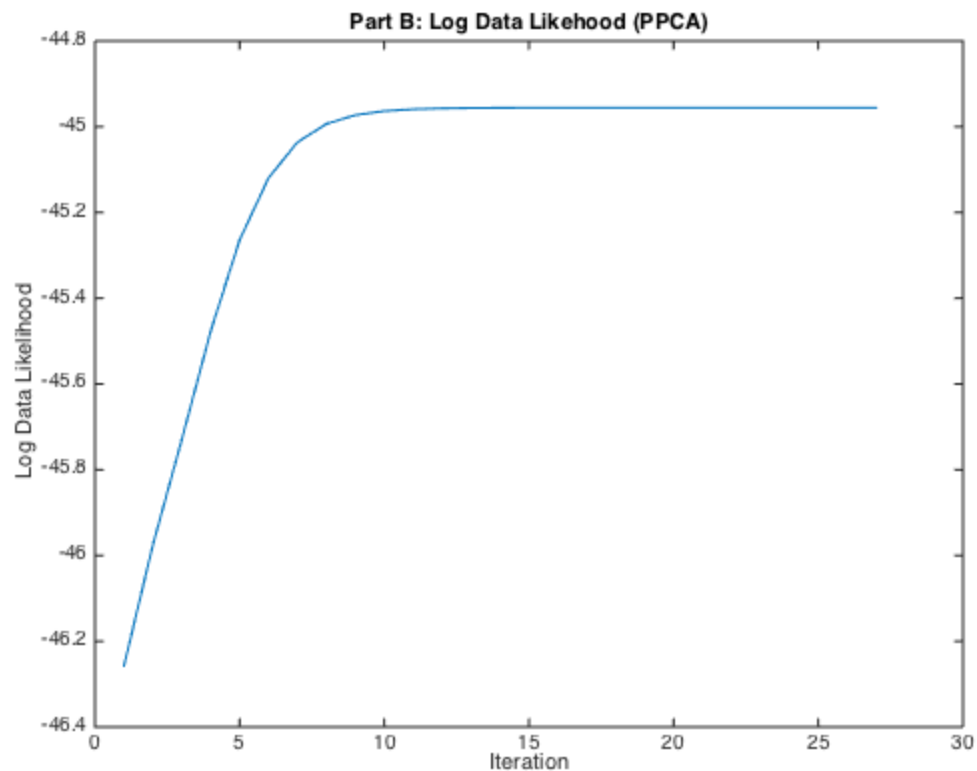
Xsim_hat = Y0'*u1;

figure(1)
dim_reduce_plot(Xsim,Xsim_hat,u1)
title('PCA Visualization')
xlabel('Dimension 1')
ylabel('Dimension 2')
```



Part B: PPCA EM Algorithm

```
D = 1;           % low dimensional space
[LL, W, s2] = ppca_nsp(Y, D);
figure(2);
plot(LL)
title('Part B: Log Data Likelihood (PPCA)')
xlabel('Iteration')
ylabel('Log Data Likelihood')
```



Part C: PPCA Covariance

```
[N, K] = size(Xsim');  
  
cov_sample = cov(Xsim, 1);  
fprintf('\nSample Covariance:\n')  
disp(cov_sample)  
  
cov_PPCA = (W*W' + s2*eye(N));  
fprintf('\nPPCA Covariance:\n')  
disp(cov_PPCA)  
  
% The sample covariance and PPCA covariance are very similar.
```

```
Sample Covariance:  
22.4314    9.4398  
9.4398    15.5922
```

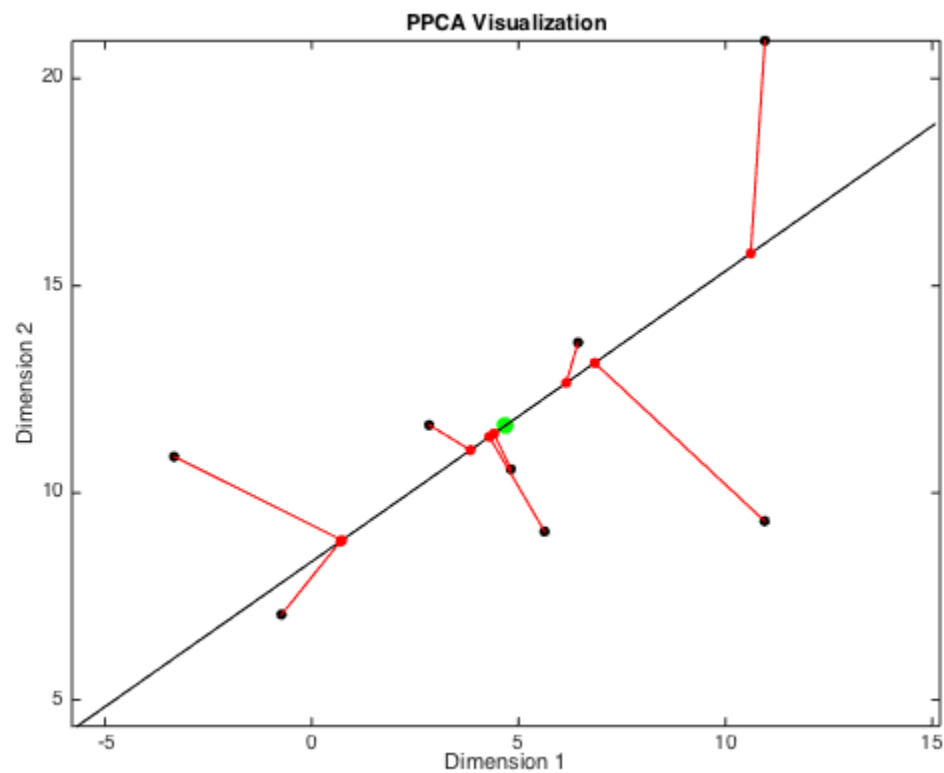
```
PPCA Covariance:  
22.4309    9.4392  
9.4392    15.5921
```

Part D: PPCA Visualization

```
mu = mean(Y, 2);
mu_mat = repmat(mu,1,K);

Es = W'*inv(W*W' + s2*eye(N))*(Y-mu_mat);

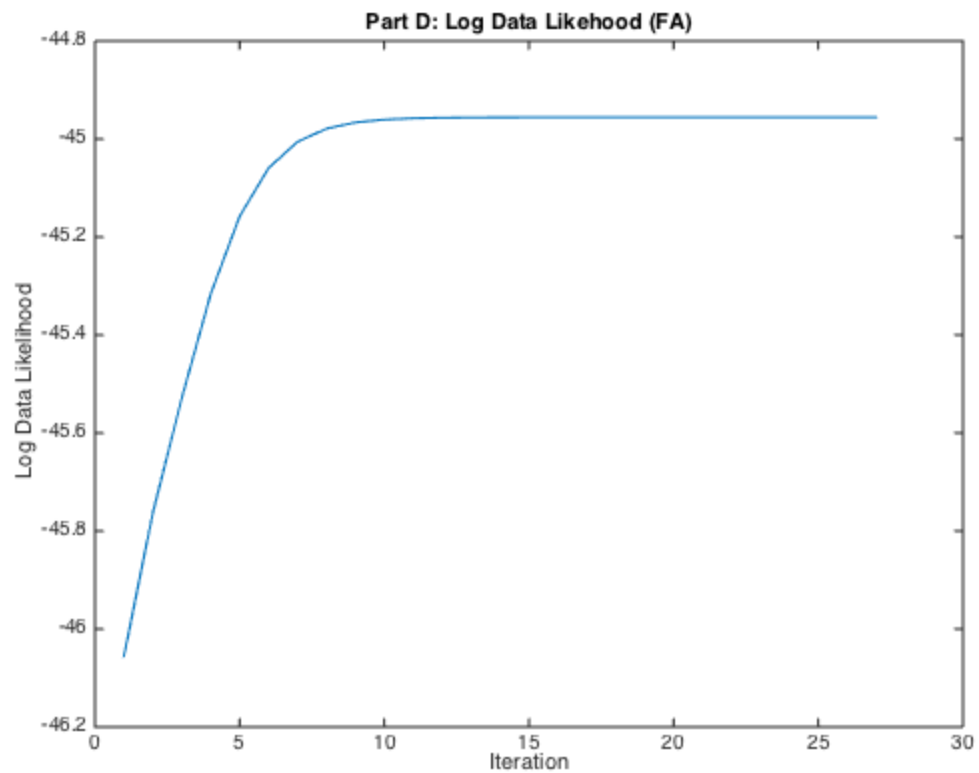
figure(3)
dim_reduce_plot(Xsim,Es',W)
title('PPCA Visualization')
xlabel('Dimension 1')
ylabel('Dimension 2')
```



Part E: FA EM Algorithm

```
D = 1;          % low dimensional space
[LL_FA, W_FA, psi] = fa_nsp(Y, D);
figure(4);
plot(LL_FA)
title('Part D: Log Data Likelihood (FA)')
xlabel('Iteration')
ylabel('Log Data Likelihood')

% The sample covariance and FA covariance are very similar.
```



Part F: FA Covariance

```
[N, K] = size(Xsim');

cov_sample = cov(Xsim, 1);
fprintf('\nSample Covariance:\n')
disp(cov_sample)

cov_FA = (W_FA*W_FA' + psi);
fprintf('\nFA Covariance:\n')
disp(cov_FA)

% The sample covariance and FA covariance are very similar.
```

Sample Covariance:

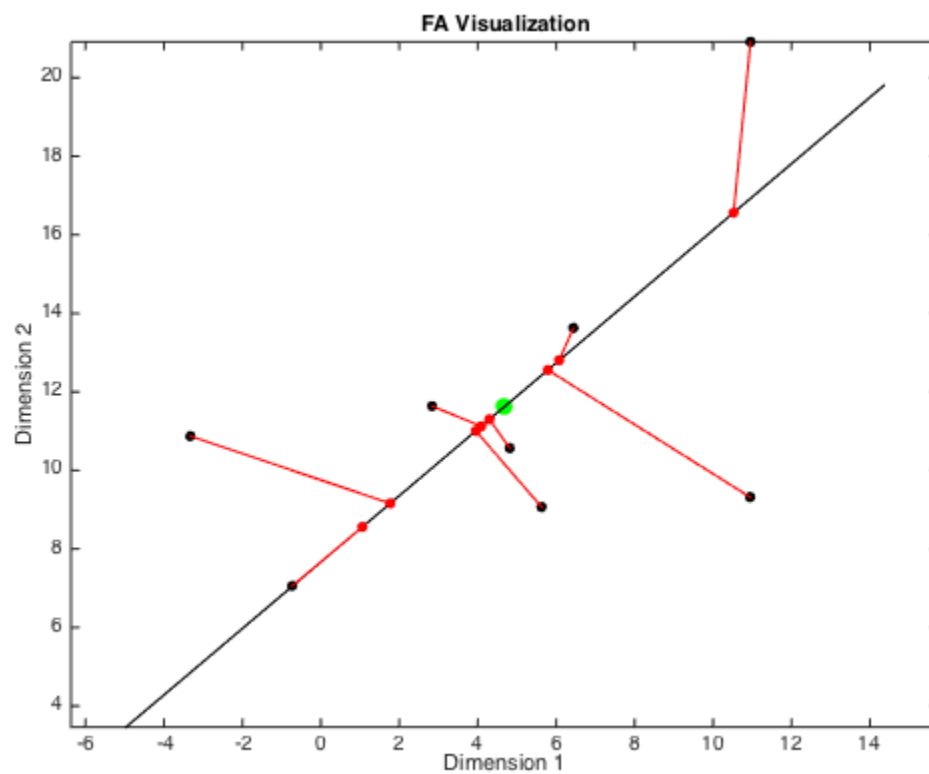
22.4314	9.4398
9.4398	15.5922

FA Covariance:

22.4311	9.4394
9.4394	15.5920

Part G: FA Visualization

```
mu = mean(Y, 2);  
mu_mat = repmat(mu,1,K);  
  
Es_FA = W_FA'*inv(W_FA*W_FA' + psi)*(Y-mu_mat);  
  
figure(5)  
dim_reduce_plot(Xsim,Es_FA',W_FA)  
title('FA Visualization')  
xlabel('Dimension 1')  
ylabel('Dimension 2')
```



Published with MATLAB® R2014b