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%ECE 403 Assignment 1 Problem 4

clc;
clear all;
close all;

% non-centralized data matrix
X = [ 0.6 0.4; 1 1.2; 1.6 1.3; 2 2.3]'

% PART A
% find mean using built-in function, careful of row vs col
 representation
% could have done this by summing all four columns and dividing by 4
mu = mean(X')'

% PART B
% centralize the data
% in matlab, directly subtracting columns from matrix is allowed,
% it does the subtraction elementwise, taking each column as the
 "element"
% for the operation
A = X - mu

% PART C
% Evaluate the covariance
C = (A*A') / length(X)

% extract u1 and lambda1
[U, V] = eigs(C)
u1 = U(:,1)
lambda1 = V(1,1)

% PART D
% project the data into new basis
% each column f_i of F is the principle component of each x_i
F = u1'*A
```

```
X =

    0.6000    1.0000    1.6000    2.0000
    0.4000    1.2000    1.3000    2.3000


mu =

    1.3000
    1.3000


A =
```

```
   -0.7000   -0.3000    0.3000    0.7000
   -0.9000   -0.1000         0    1.0000


C =

    0.2900    0.3400
    0.3400    0.4550


U =

    0.6181   -0.7861
    0.7861    0.6181


V =

    0.7224         0
         0    0.0226


u1 =

    0.6181
    0.7861


lambda1 =

    0.7224


F =

   -1.1402   -0.2640    0.1854    1.2188
```

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