

Math 537, Summer 2023, Exam 2 (aka HW 3).

Problem 1:

This one's short and simple team. I have a bunch of Math 120 data that needs to be analyzed. Specifically I'm interested in multivariate confidence bounds and/or inference for the mean vector of student scores. Data is in the math120examscores.csv. Try and document decisions you made along the way as you progress toward your final results. And go!

Problem 2:

The DrivFace database contains image sequences of subjects while driving in real scenarios. It is composed of 606 samples of 640,480 pixels each, acquired over different days from 4 drivers (2 women and 2 men) with several facial features like glasses and beard.

A set of labels assigning each image into 3 possible gaze direction classes are given (variable 4 in the dataset: lr- looking right, f – looking front, and lf-looking left). Variable 5 gives the angle associated with the head direction (lr: -45 to 30, f: -15 to 15, lf: 30-45).

Consider these response variables, the first three variables are just identifying information.

Variables 6-9 contain information on face position (x,y,w,h) are features for location, width and height.

Variables 10-11 are x and y coordinates for the right eye position

Variables 12-13 are x and y coordinates for the left eye position

Variables 14-15 are x and y coordinates for the nose position

Variables 15-17 are x and y positions for the right corner of the mouth

Variables 18-19 are x and y positions for the left corner of the mouth

a. Perform a full PCA analysis of the data using variables 6-19 to predict either variable 4 or 5. How many principal components did you settle on and why? Please interpret some of the loading coefficients for a few of your most prominent components.

b. Perform a Factor analysis of the data using variables 6-19. How many underlying features do you think account for the observed variables, which features are loaded from the same factors? Why can't you use Factor Analysis to predict variables 4 or 5 like Principal Component Analysis?