

Notes: (1) These questions require thought, but do not require long answers. Please be as concise as possible. (2) For problems that require programming, please include in your submission a copy of your code (with comments) and any figures that you are asked to plot and submit your code and figures electronically to BLS before the due date.

1. Using the following matrix of positive data

$$X_p = \begin{pmatrix} 4 & 2 & 2 & 3 & 4 & 6 & 3 & 8 \\ 1 & 4 & 3 & 6 & 4 & 2 & 2 & 3 \\ 0 & 1 & 1 & 0 & -1 & 0 & 1 & 0 \end{pmatrix}$$

and negative data

$$X_n = \begin{pmatrix} 9 & 6 & 9 & 8 & 10 \\ 10 & 8 & 5 & 7 & 8 \\ 1 & 0 & 0 & 1 & -1 \end{pmatrix}$$

find the projection direction given by LDA, and an optimal classifier of the two data.

2. Using the following data matrix (column as individual data), write a program finding the top principal component and the projection of these data to that PC.

$$X = \begin{pmatrix} -2 & 1 & 4 & 6 & 5 & 3 & 6 & 2 \\ 9 & 3 & 2 & -1 & -4 & -2 & -4 & 5 \\ 0 & 7 & -5 & 3 & 2 & -3 & 4 & 6 \end{pmatrix}$$