Problem Set 9, Nov 14, 2019 (Theory Questions SVD)

Goals. The goal of this exercise is to

- familiarize yourself with the theory related to SVD.

- have time to discuss Project 2 with the assistants and teammates.

1 Theory Questions

Problem 1 (How to compute U and S efficiently):

In class, we saw that solving the eigenvector/value problem for the matrix $XX^\top$ gives us a way to compute U and S. But in some instances $D \gg N$. In those cases, is there a way to accomplish this computation more efficiently?

Problem 2 (Positive semi-definite):

Show that if X is a $N \times N$ symmetric matrix then the SVD has the form $USU^\top$, where U is a $N \times N$ unitary matrix and S is a $N \times N$ diagonal matrix with non-necessarily positive entries. Show that if X is positive semi-definite, then all entries of S are non-negative.