

Problem Set 11, Dec 01, 2016

(Theory Questions, TensorFlow Introduction)

Goals. The goal of this exercise is to

- familiarize yourself with the theory related to SVD.
- introduce you to the TensorFlow platform.

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 $\mathbf{X}\mathbf{X}^\top$ 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 \mathbf{X} is a $N \times N$ symmetric matrix then the SVD has the form $\mathbf{U}\mathbf{S}\mathbf{U}^\top$, 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 \mathbf{X} is positive semi-definite, then all entries of S are non-negative.

2 TensorFlow Getting Started

Tutorials. In the folder `labs/ex11` of the course github repository

github.com/epfml/ML_course

you find a PDF tutorial from CS224d in Stanford. It will help you getting started with programming in this framework, and use it in python, similarly as NumPy.

We also recommend some of the online material here:

www.tensorflow.org/tutorials