Methods of classification and dimensionality reduction - Report 1

March 18, 2022

1. Description of methods

SVD1. We get a $n \times d$ dimensional matrix Z that we want to approximate by a different matrix $\tilde{Z}$. We want somehow $\tilde{Z}$ to maintain only "the most important" informations from Z. That's what we can get using SVD decomposition of matrix and cutting out the smallest eigenvalues.

Presicely, we want to find matrix $\tilde{Z}_r$ of rank r ($r < rank(Z)$), so that $\|Z - \tilde{Z}_r\|$ is small. Using SVD decomposition $Z = U\Lambda^{\frac{1}{2}}V^T$ we construct $\tilde{Z}$ as

$$\tilde{Z}_r = U_r\Lambda_r^{\frac{1}{2}}V_r^T,$$

where Λ_r contains r biggest eigenvalues of Z and U_r, V_r contains only columns corresponding to those eigenvalues.

NMF. We get a real $n \times d$ dimensional matrix Z, such that $n \geq d$. The aim is to approximate Z as

$$Z \approx WH,$$

where

- W is $n \times r$ matrix of nonegative elements,
- H is $r \times d$ matrix of nonnegative elements.

Precisely, we look for

$$\arg\min_{W,H} \|Z - WH\|^2,$$

where $\|A\|^2 = \sum_{i,j} A_{ij}^2$.

SVD2.

2. Our data

Description.

Performing methods.

Choosing parameters.

3. Results