

Feb 13, 2020

Dimensionality reduction so far

PCA: $\|A - X\|_F^2$ s.t. X rank k

Robust PCA: $\|A - (X+S)\|_F^2$ X rank k , S sparse

Matrix completion: $\|P_\Omega(A - X)\|_F^2$ X rank k



$$a_j^T \approx \sum_{s=1}^k L_{js} v_s^T$$

coefficients

basis vectors

basis vectors of maximal variance

Example: PCA

$$A \approx U_k \Sigma_k V_k^T$$

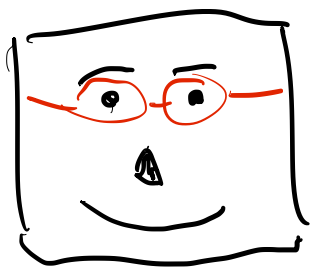
PCs

Structure: $A \geq 0$ (nonnegative)

Dim redux: $A \approx LR$ $L, R \geq 0$

Nonnegative matrix factorization (NMF)

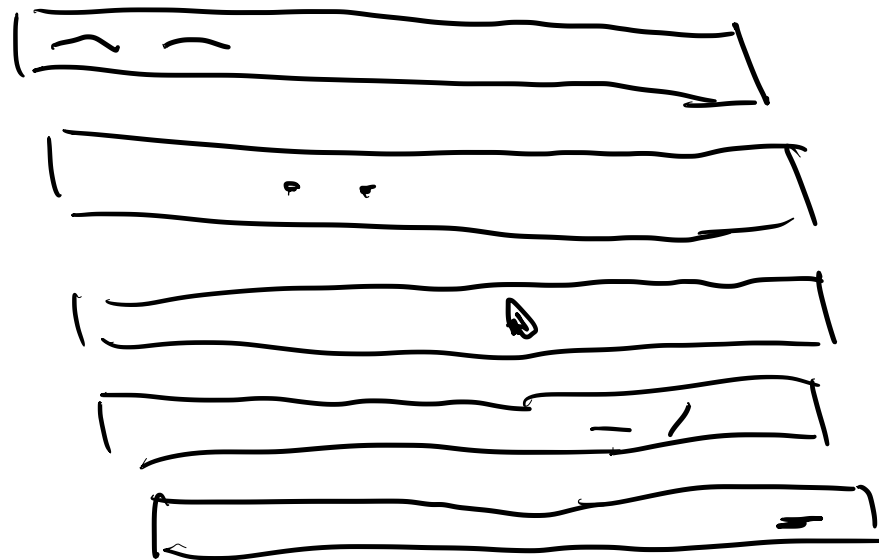
Example: face images



data point \rightarrow



R matrix:



basis vectors:
interpretable
nonnegative

