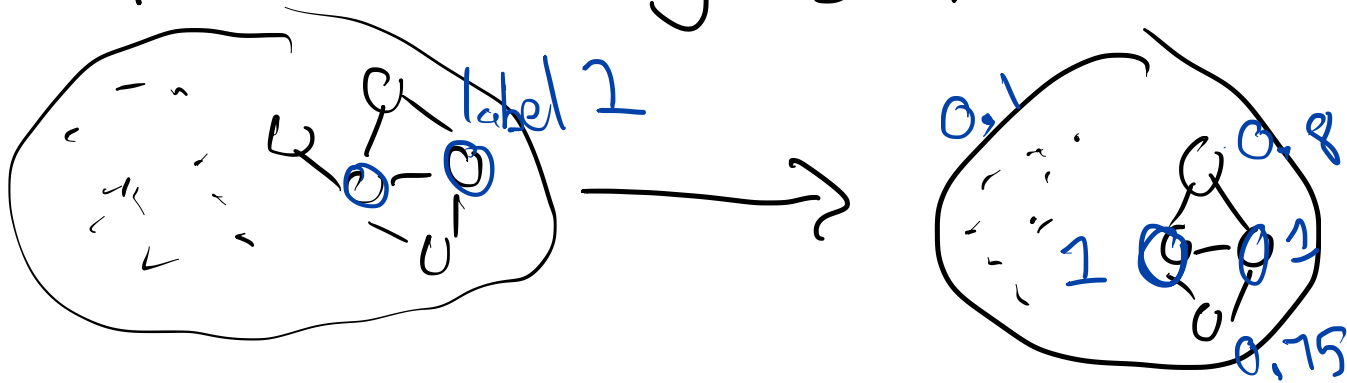
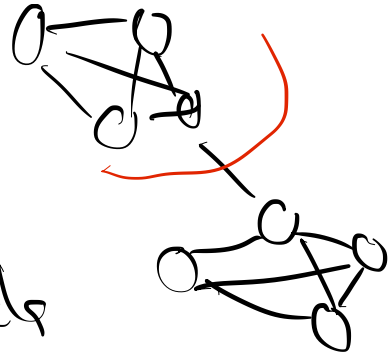


April 9, 2020

"unsupervised" learning: graph clustering

"semi-supervised" learning: graph + some labels

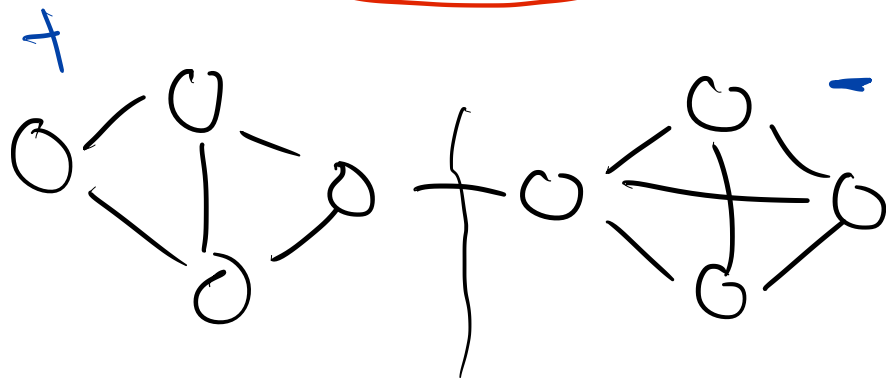
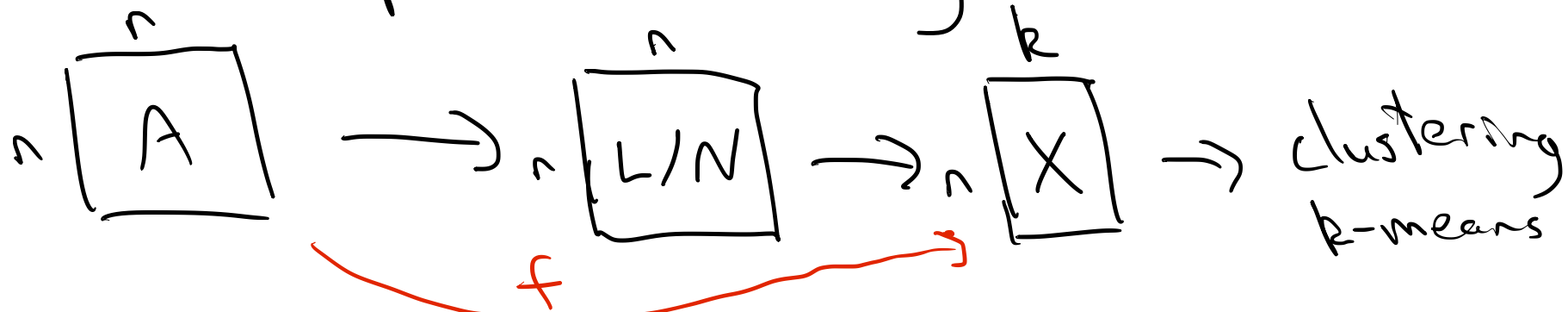


Today: "representation" learning on graphs

$$n \times \boxed{A} \xrightarrow{f} n \times \boxed{X} \in \mathbb{R}^{n \times k}$$

- generative models
- data interpretation
- "downstream" ML tasks

Example: spectral clustering



Case 1: Latent space models (Hoff et al. 02)

x_1, \dots, x_n latent positions of n nodes $x_i \in \mathbb{R}^k$

Idea: nearby nodes are likely to connect

$$P_{ij} = \Pr(i \rightarrow j) = \frac{1}{1 + \exp(\|x_i - x_j\|_2^2 - \alpha)}$$

$$\text{logit}(P_{ij}) = \log\left(\frac{P_{ij}}{1 - P_{ij}}\right) = \alpha - \|x_i - x_j\|_2^2$$