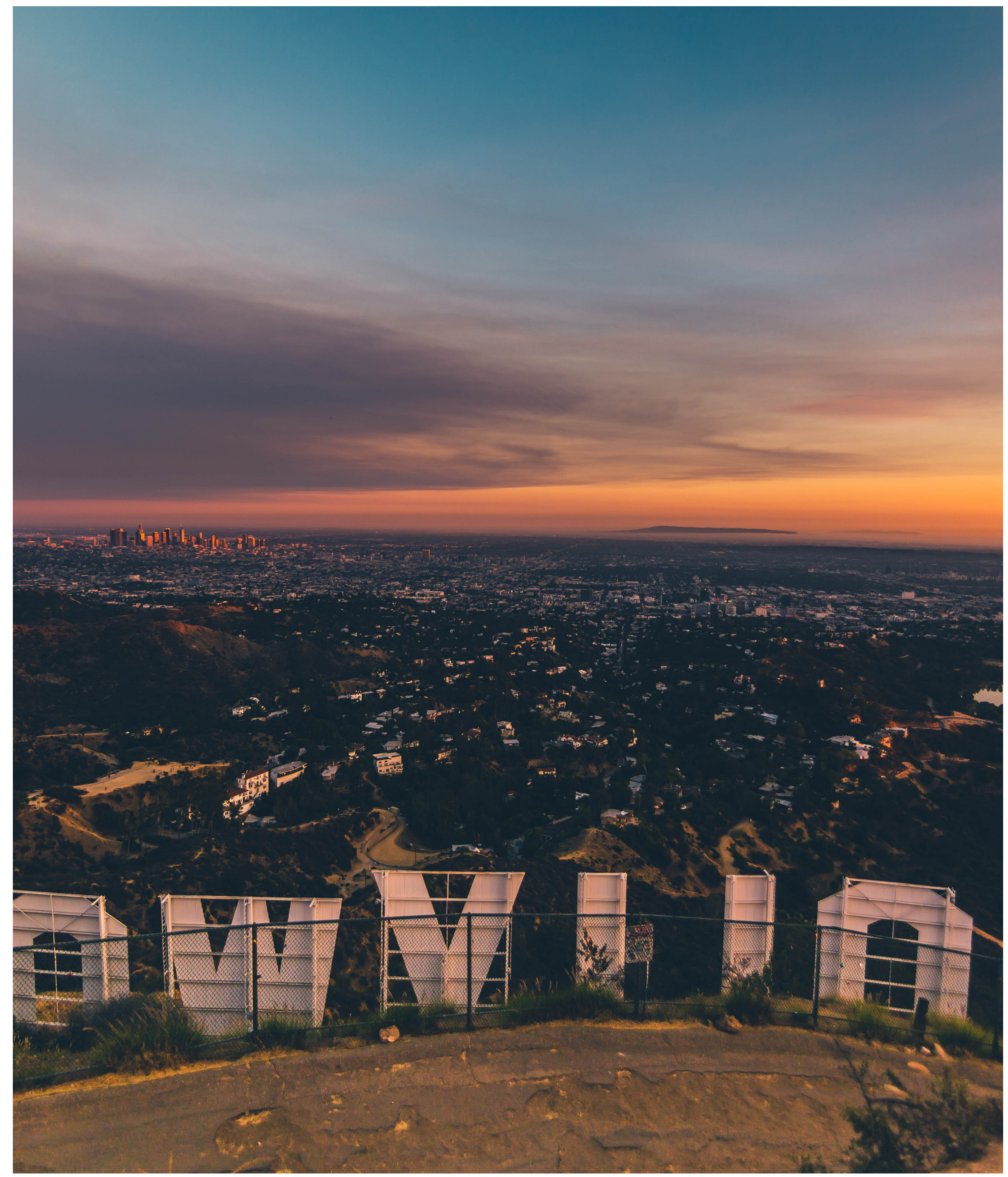
Machine Learning

Week 03 - THE FLUFF BEGNS
11/04/19

Chapter 1

- Mr. Prof. Klaus Robert Mueller is very tired
- For him it is 5AM and not 2PM
- He flew directly from Hollywood LA
- If you are too stupid for Math, do other course

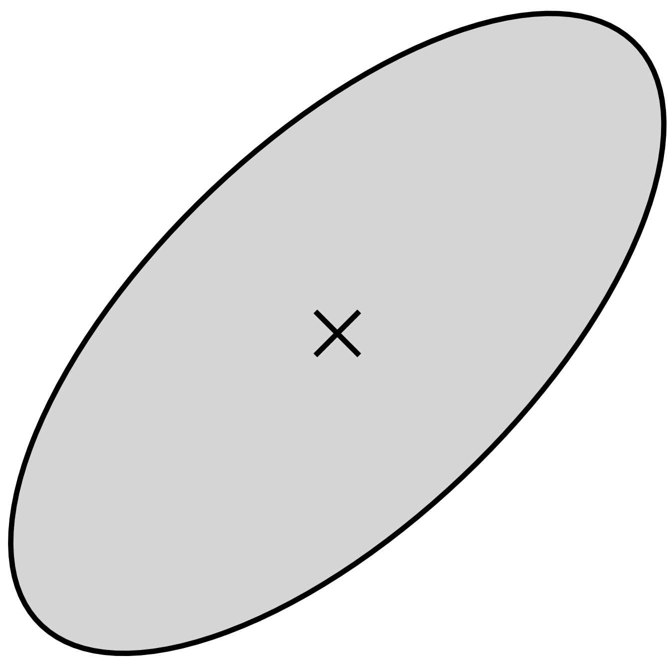


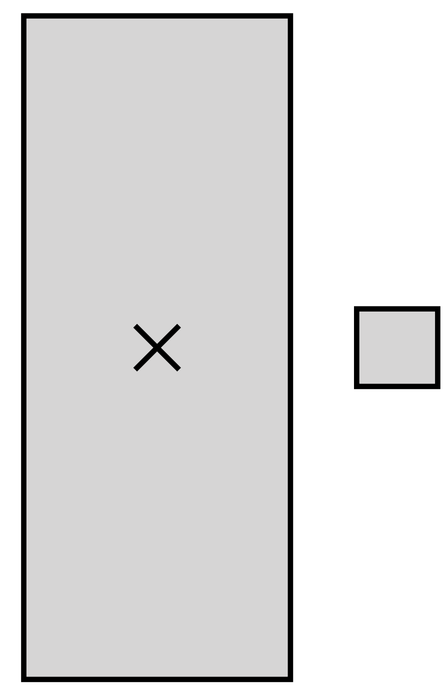
Chapter 2

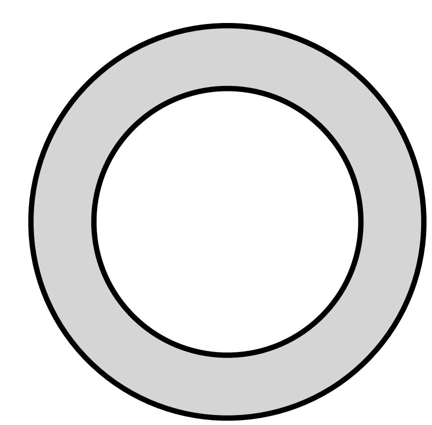
- Anil Jain: VIP for Clustering

Chapter 3

- $N(\mu, \Sigma)$

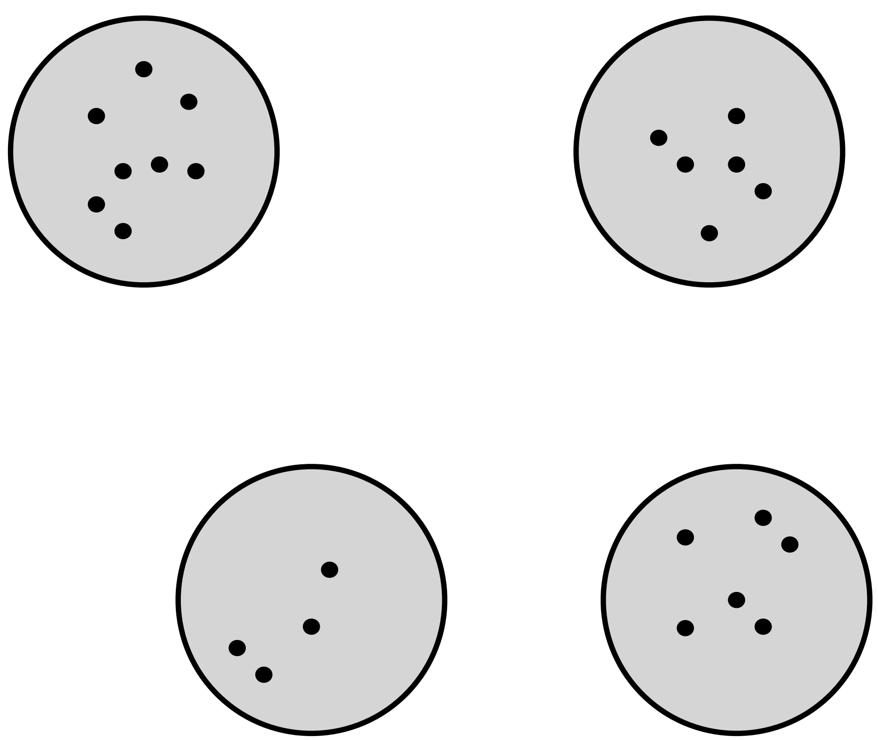


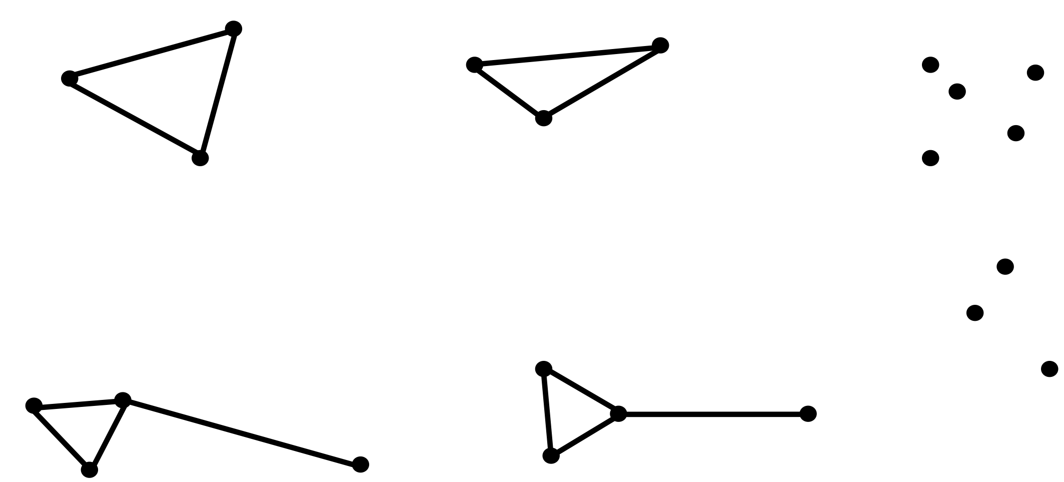




Chapter 3

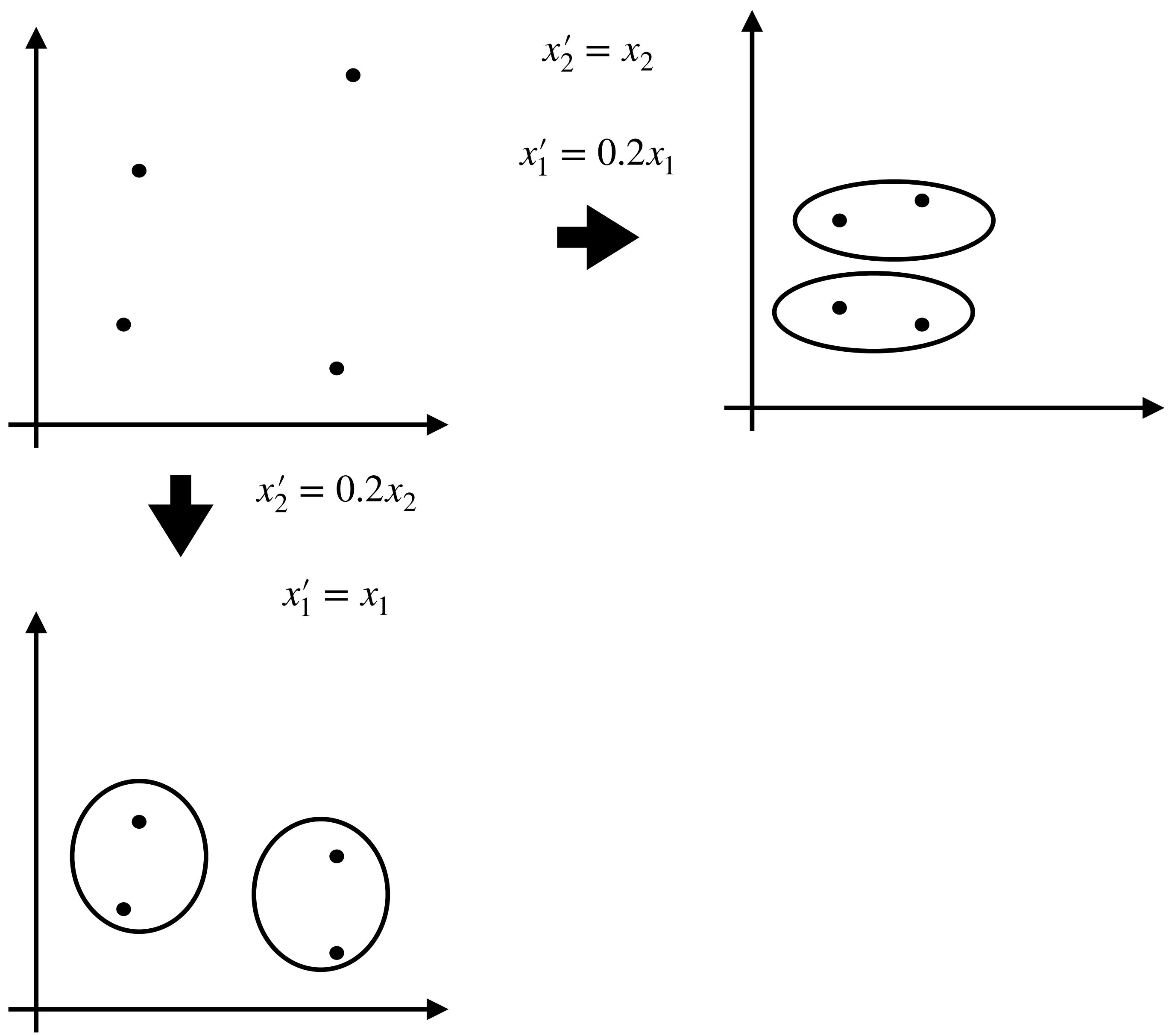
- x come from c normalizations
- Use your eyes: **EYEBALLING** 👀

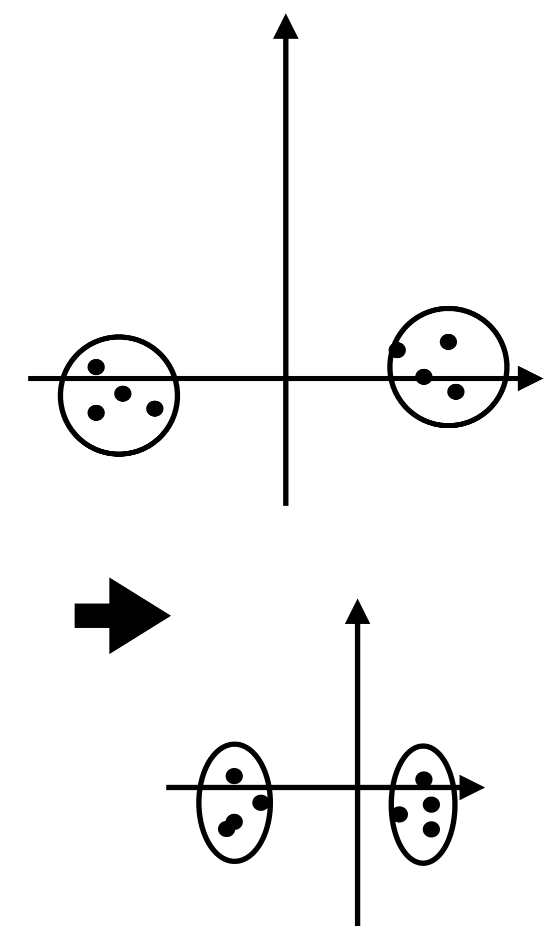




d_0 high   Medium   Small

Chapter 4: Squishen

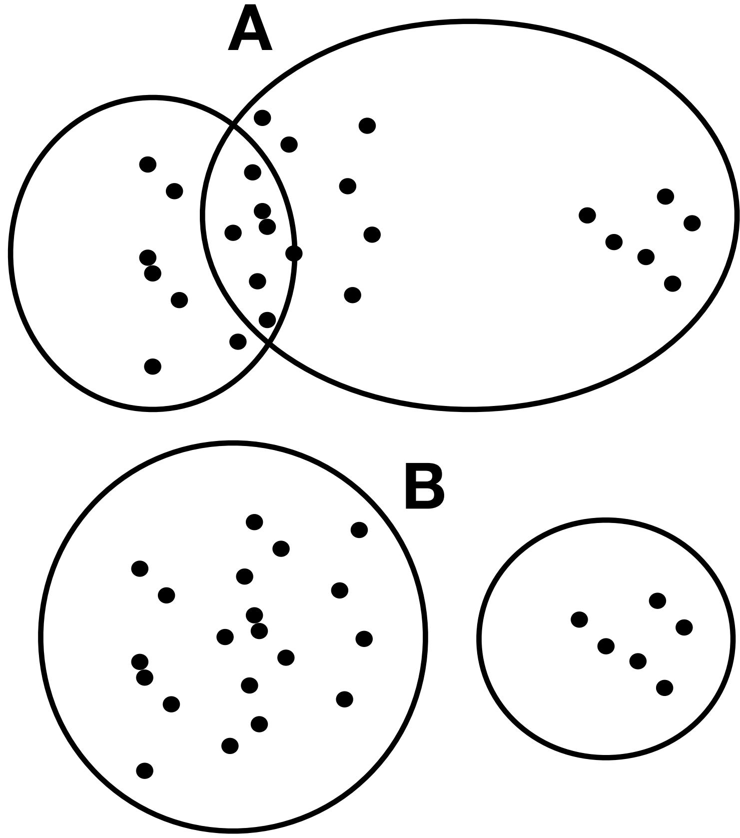




$$S(x, x') = \frac{x^T x'}{|x||x'|}$$

Chapter 5

- H n samples c H_i $H_1, \ldots, H_c$
- $$m = \frac{1}{n} \sum_{x \in H_i} x$$
- $$J = \sum_{i}^{c} \sum_{x \in H_i} |x - m_i|^2$$ min Varianz

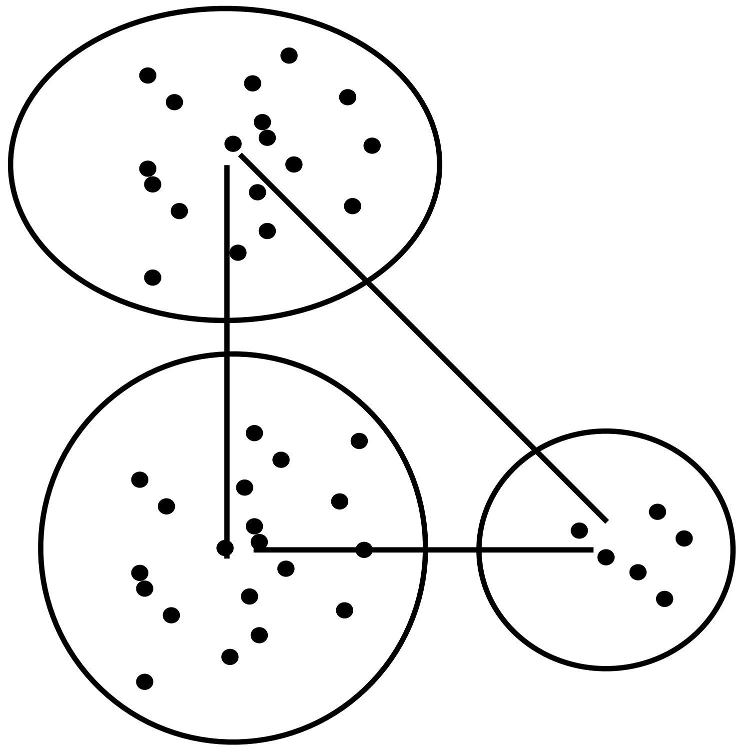


Which clustering is better wrt. Min variance? I~~ts B~~!

Its A

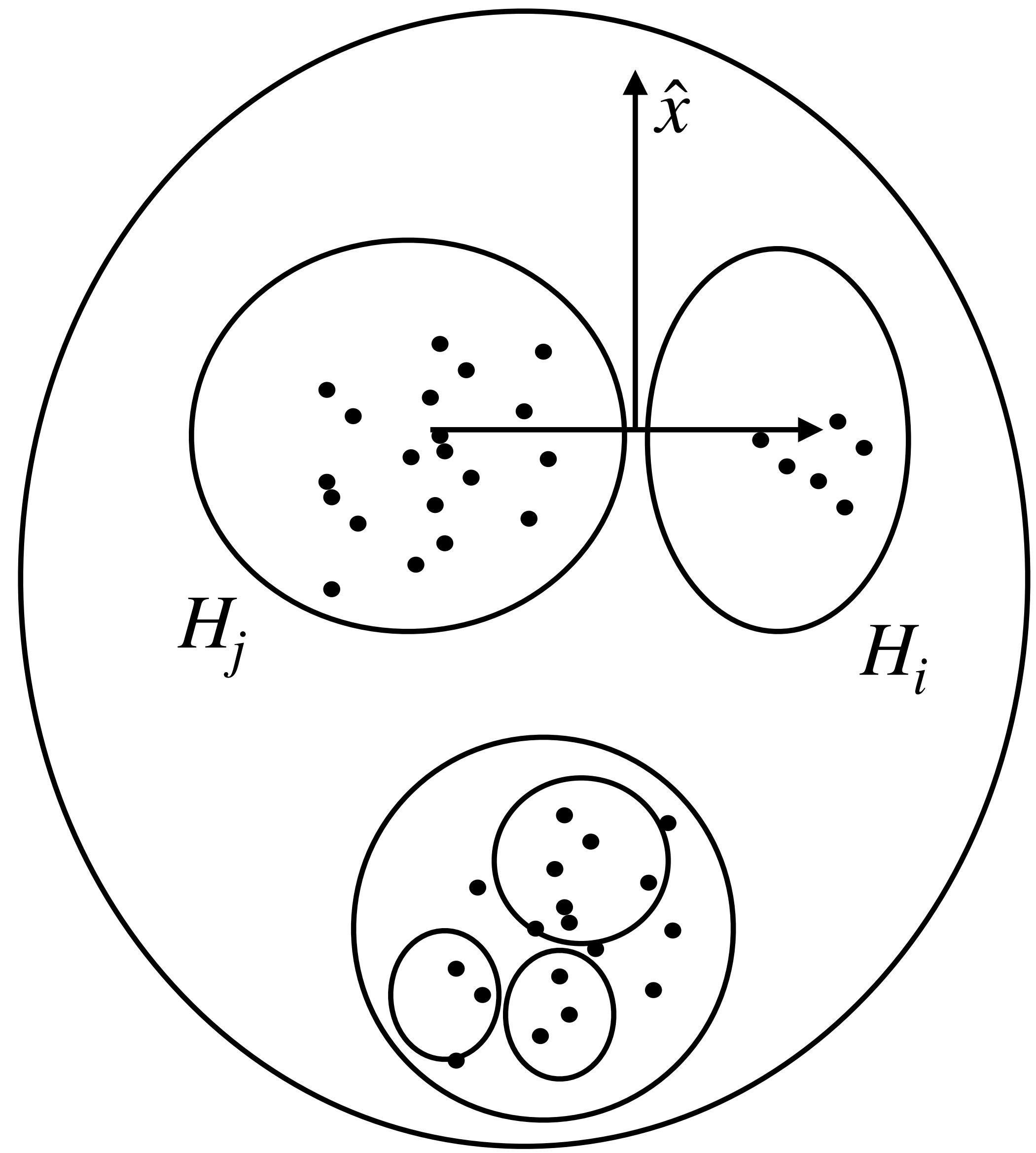
Chapter 5

- $S_i = \sum_{x \in H_i} (x - m_i)(x - m_i)^T$
- $S_V = \sum S_i$
- $S_B = \sum_i n_i (m_i - m)(m_i - m)^T$
- $S_T = \sum_{x \in H} (x - m)(x - m)^T$
- $S_T = S_V + S_B$
- $\mathrm{tr} S_W = \sum \mathrm{tr} S_i = \sum_i \sum_{x \in H_i} |x - m_i|^2$



Chapter 5

- $c = 5$
- $n = 100$
- 10^5 or 10^{20} or 10^{67}??
- 10^{67} is correct because $\dfrac{c^n}{c!}$
- => Iterative optimization



Chapter 5

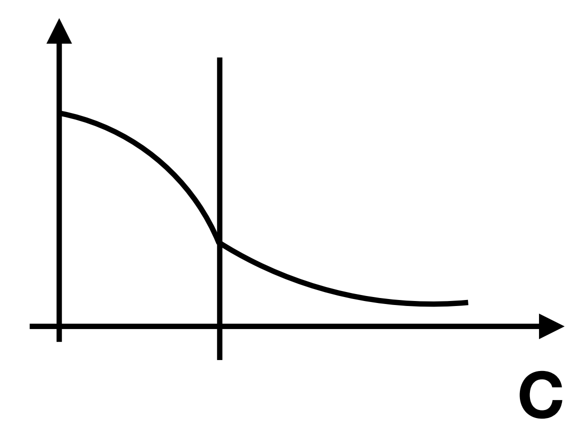
- $\hat{x}$ is in H_i will be moved to H_j

- $m_j^* = m_j + \dfrac{\hat{x} - m_j}{m_{j+1}}$

- $I_j = \sum_{x \in H_j} |x - m_j^*|^2 + |\hat{x} - m_j^*|^2 = \sum |x - m_j - \dfrac{\hat{x} - m_j}{n_{j+1}}| + \dfrac{n_j}{n_{j+1}} |\hat{x} - m_j|^2 = = I_j + \dfrac{n_j}{n_{j+1}} |\hat{x} - m_j|^2$

- $I_i = I_i + \dfrac{n_i}{n_{i+1}} |\hat{x} - m_i|^2$

- Move $\hat{x} : H_i \mapsto H_j$: $\dfrac{n_i}{n_{i+1}} |\hat{x} - m_i|^2 > \dfrac{n_j}{n_{j+1}} |\hat{x} - m_j|^2$



Limes superior und Limes inferior

- Betrachte eine Folge $(a_n)_{n\in\mathbb{N}}$ und$A_n = \{a_n : m \geq n\} \supset A_{n+1}$. Dann ist $\sup A_n \geq \sup A_{n+1} \geq \dots$ und $\inf A_n \leq \inf A_{n+1} \leq \dots$

Goal of the day: Confuse u!

- Are there any questions?