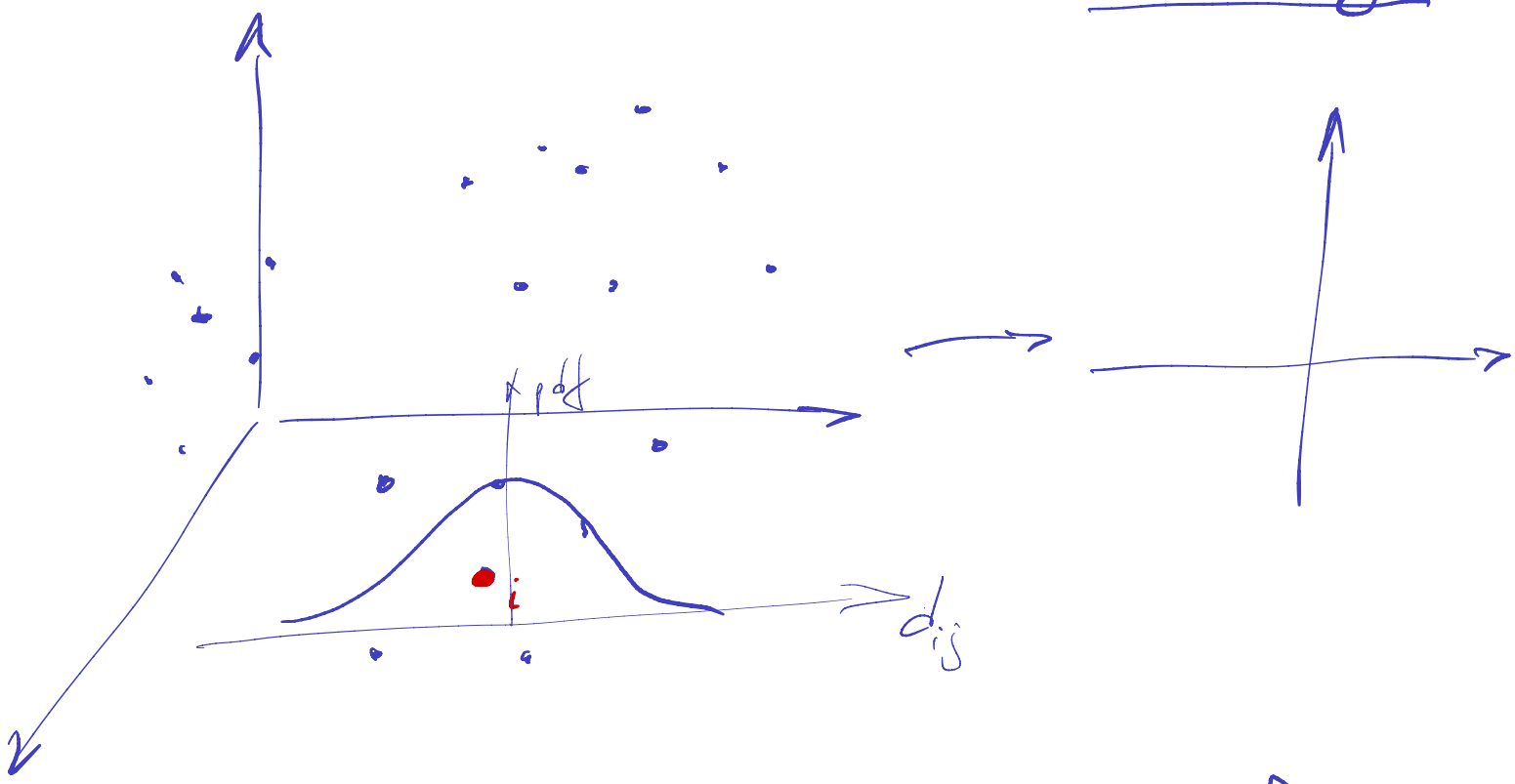
t-SNE

t-distributed Stochastic Neighbor Embeddings

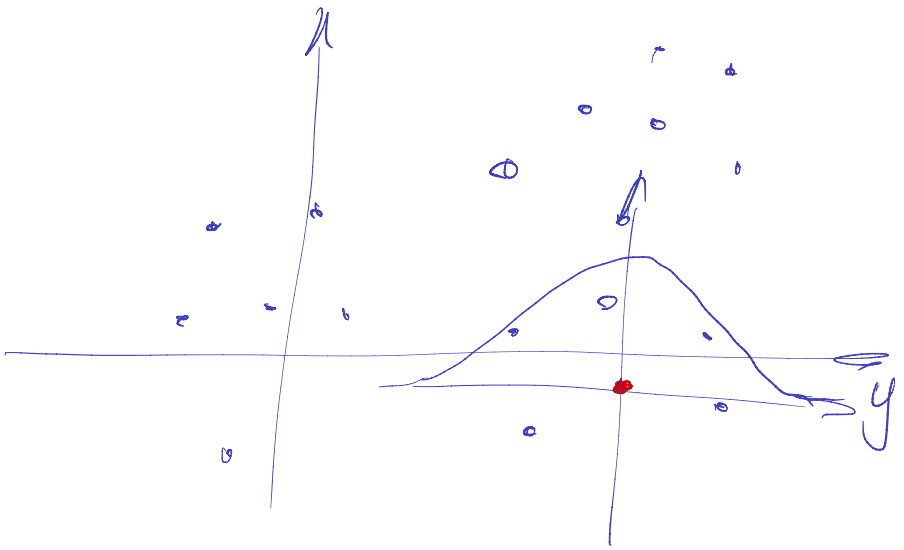


① $d_{ij} = x_i - x_j$ $\quad \{x_1, x_2 \dots x_N\} \subset \mathbb{R}^D$

$$p_{j|i} = \frac{\exp\left(-\frac{\|x_i - x_j\|^2}{2\sigma_i^2}\right)}{\sum_{k \neq i} \exp\left(-\frac{\|x_k - x_i\|^2}{2\sigma_i^2}\right)} \qquad p_{i|i} = 0$$

$\{y_1, y_2 \dots y_N\} \subset \mathbb{R}^d \qquad d = 2, 3, \dots$

$$q_{ij} = \frac{(1 + \|y_i - y_j\|^2)^{-1}}{\sum_{k \neq i} (1 + \|y_k - y_i\|^2)^{-1}} \qquad q_{ii} = 0$$



$$KL(p \| q) = \sum_{i \neq j} p_{ij} \ln \frac{p_{ij}}{q_{ij}} = \mathcal{L}(y_1, y_2 \dots y_N)$$

$$\frac{\partial \mathcal{L}}{\partial y_i} = \dots$$