

# Clustering

Soft clustering by MLE of a Gaussian mixture:

- Given data  $x$  and a fixed number of component Gaussian we can use maximum likelihood estimation to get a particular Gaussian mixture distribution.
- This achieves soft clustering.

$$\log \text{likelihood} = \ln(p(X|\pi, \mu, \Sigma)) = \sum_{n=1}^N \ln\left(\sum_{k=1}^K \pi_k \mathcal{N}(x_n|\mu_k, \Sigma_k)\right)$$

- This has problems as this space will have lots of local maxima.