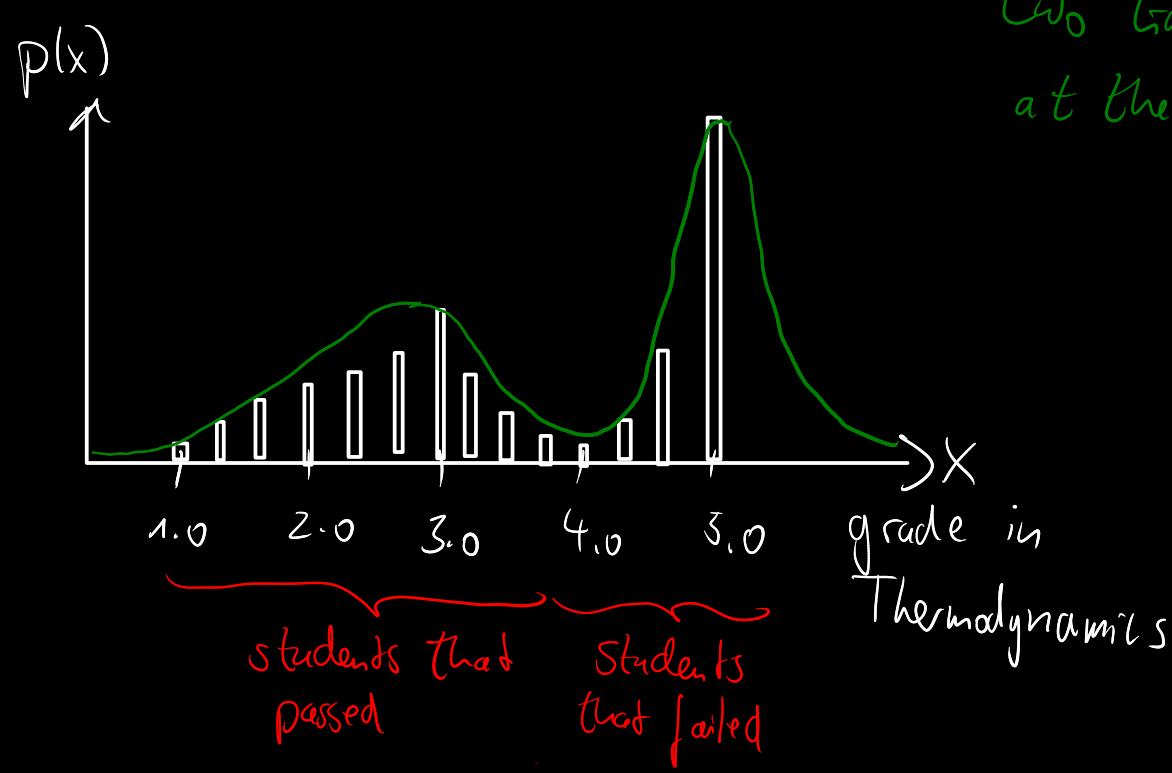


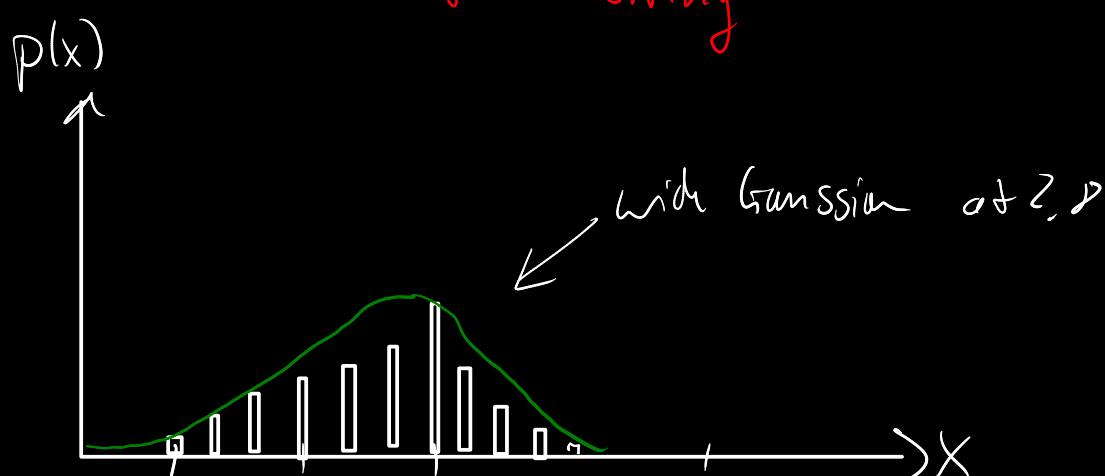
Gaussian Mixture Model - Intro



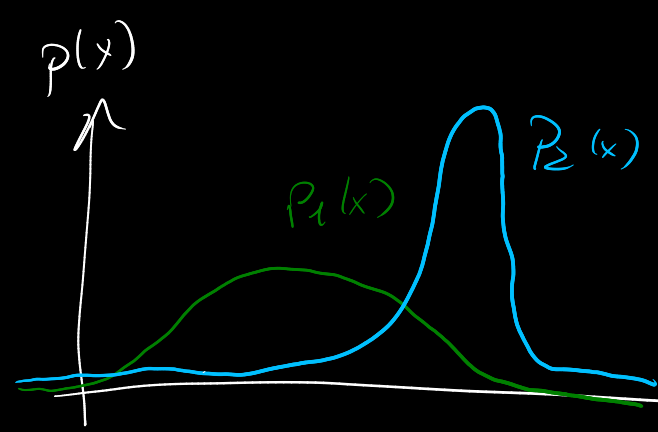
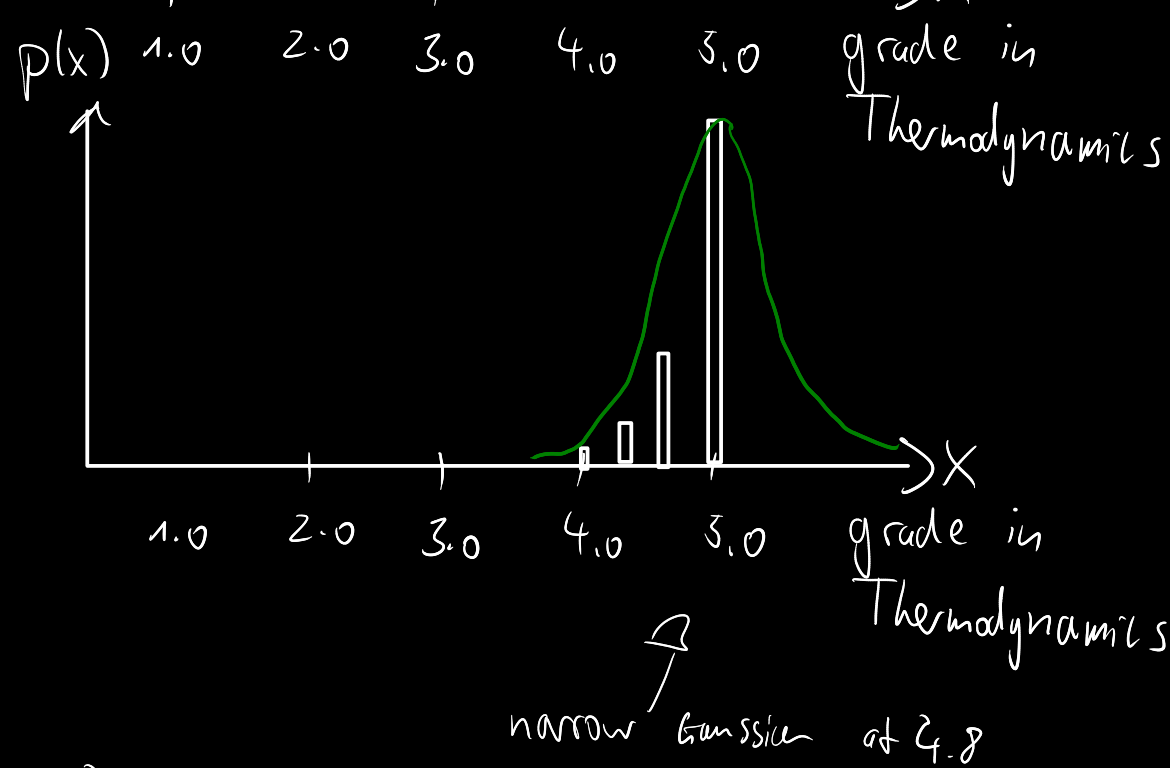
Two Gaussians
at the same time?

Multi-Modal Distribution (here: 2 peaks at the same time)

↳ allows for clustering



+ superposition



$$p(x) = p_1(x) + p_2(x)$$

⇒ violates normalization

↳ introduce mixing coefficients

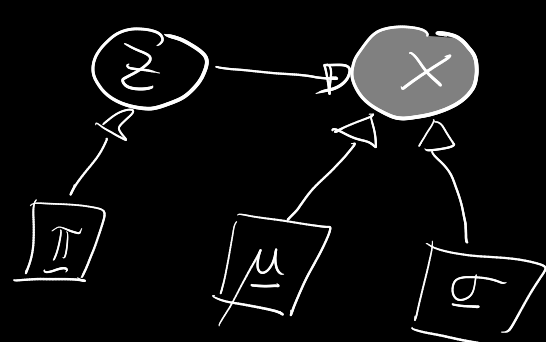
$$\pi_1 = 0.4 \quad \pi_2 = 0.6$$

$$p(x) = \pi_1 p_1(x) + \pi_2 p_2(x)$$

(Isn't it just the integral of a mixture Dist?)

GMM are a special case of Mixture Distribution

DGMM



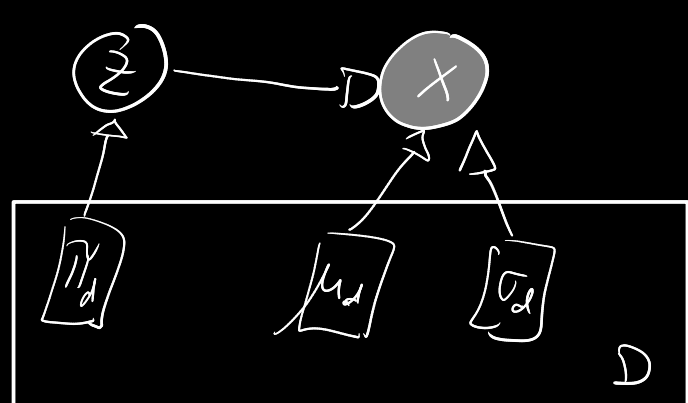
z ... class / cluster of the
grades

x ... grade itself

$$z \sim \text{Categorical}(\underline{\pi})$$

$$x \sim \mathcal{N}(\mu[z], \Sigma[z])$$

equivalent



D ... number of classes

the joint

$$p(z, x) = p(z) \cdot p(x|z)$$

$$= \text{Cat}(\underline{\pi}) \cdot \mathcal{N}(\mu[z], \Sigma[z])$$

$$= \left(\prod_{d=0}^{D-1} \pi_d^{I(z=d)} \right) \cdot \left(\frac{1}{\sqrt{2\pi} \cdot \sqrt{\Sigma_d}} \cdot \exp\left(-\frac{1}{2\sqrt{\Sigma_d}^2} \cdot (x - \mu_d)^2\right) \right)$$