

# Unnormalized distribution

$$p^*(z) = p(z|X) = \frac{p(X|z)p(z)}{p(X)} = \frac{\hat{p}(z)}{Z}$$

Optimization:

$$\begin{aligned}\mathcal{KL}[q(z) \parallel \frac{\hat{p}(z)}{Z}] &= \int q(z) \log \frac{q(z)}{\hat{p}(z)/Z} dz \\ &= \int q(z) \log \frac{q(z)}{\hat{p}(z)} dz + \int q(z) \log Z dz \\ &= \mathcal{KL}[q(z) \parallel \hat{p}(z)] + \log Z\end{aligned}$$

