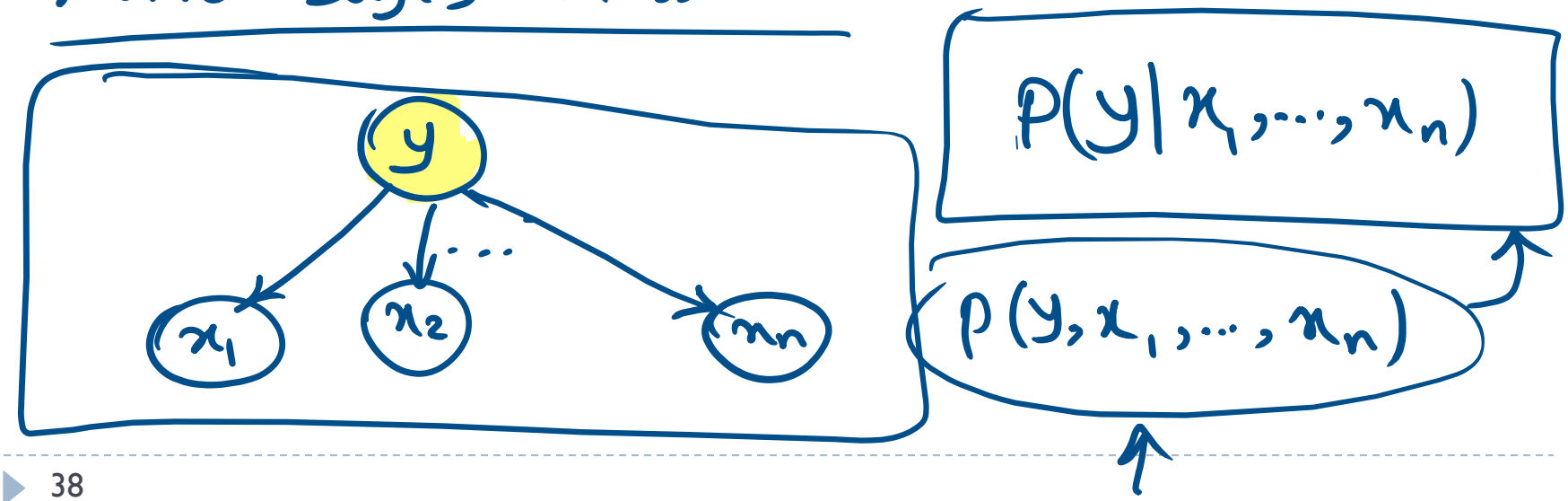
Variational Inference

$$P(x_1, \dots, x_n)$$

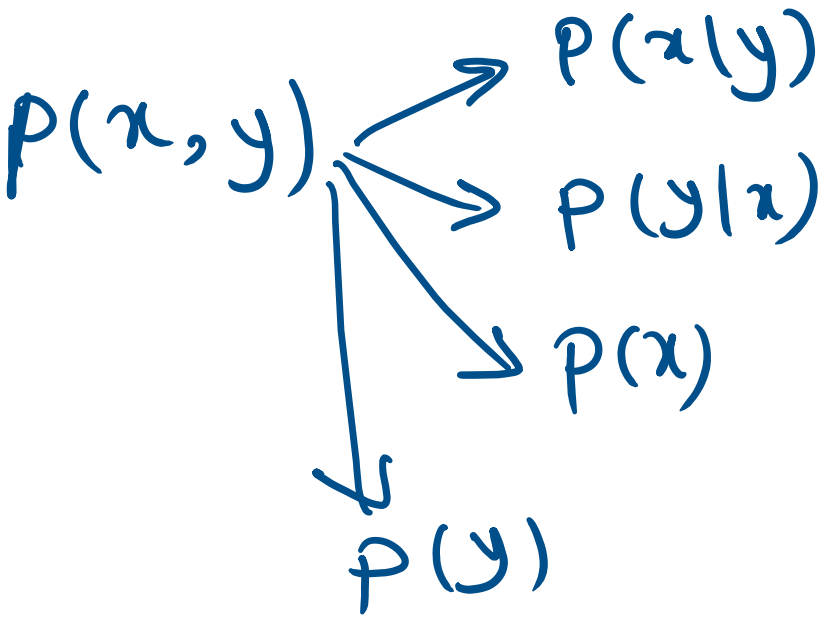
$$P(x_1 \mid x_2, \dots, x_n) = ?$$

Naive Bayes classifier



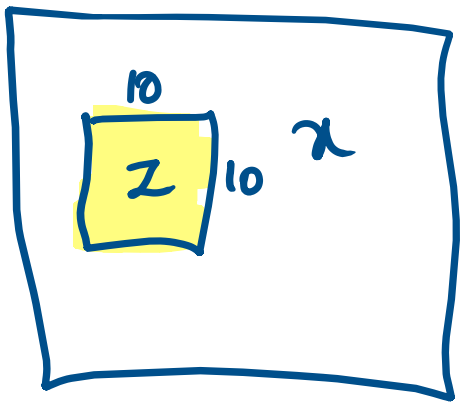
$$P(y, x_1, \cdots, x_n) = P(y) \prod_{i=1}^{n} P(x_i | y)$$

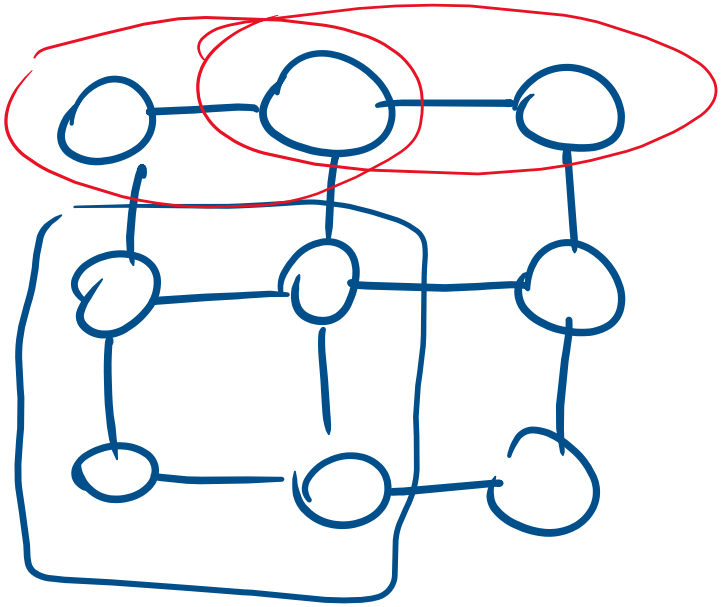
$$P(y | x_1, \cdots, x_n) = ?$$



Inpainting

$p(x, z)$

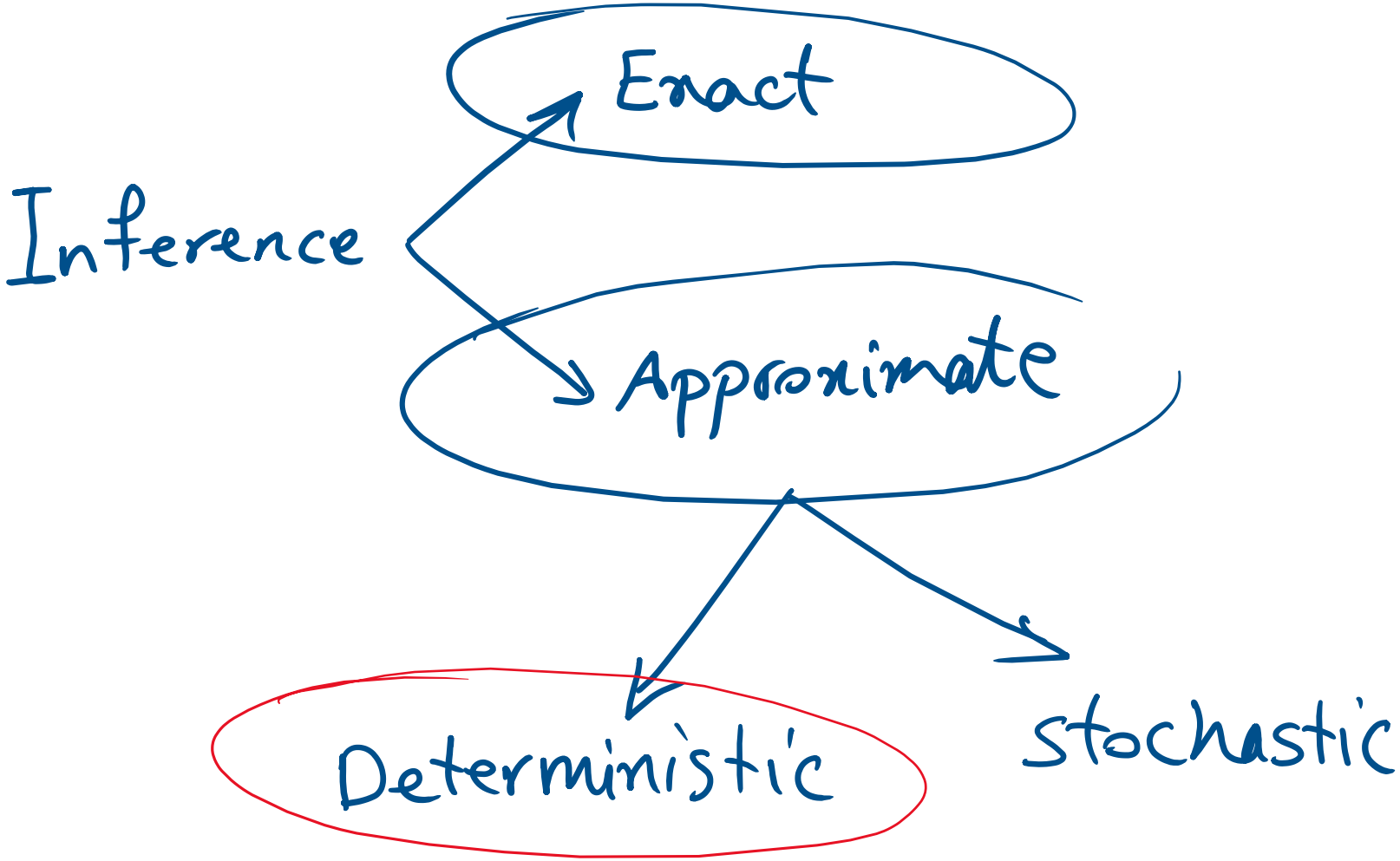




$$\max_z \; p(z \mid x)$$

$$p(z \mid x) = \frac{p(x, z)}{p(x)}$$

$$= \frac{p(x, z)}{\sum_z p(x, z)}$$


Exact
Inference
Approximate
Deterministic
Stochastic

$S = X \cup Z$

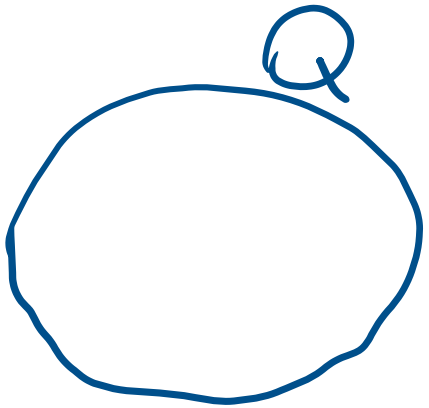
observed

unobserved/Latent/hidden

$p(z|x) = ?$

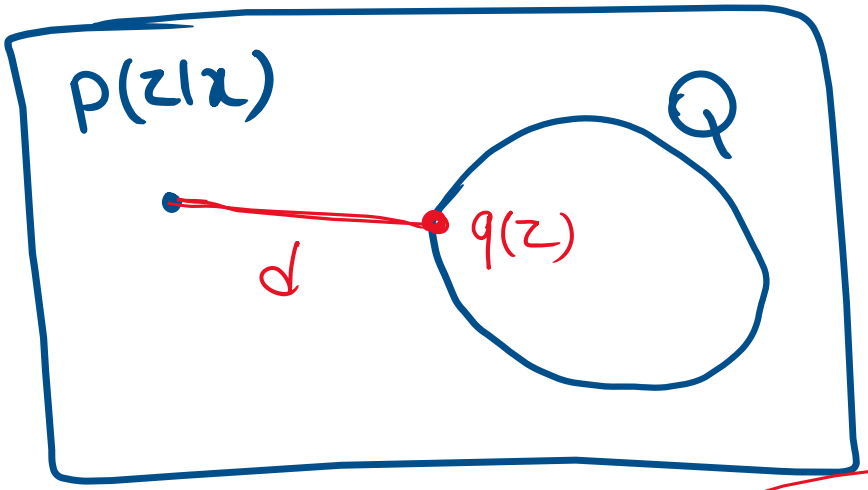
$p(z, x)$

$p(z|x) = q(z)$



$\min_{x} f(x)$

variational



variation calculus

variational

functional

$$q^*(z) = \arg \min_{q(z) \in Q} d\big(p(z|x), q(z)\big)$$