UNIVERSITY OF COPENHAGEN DTU

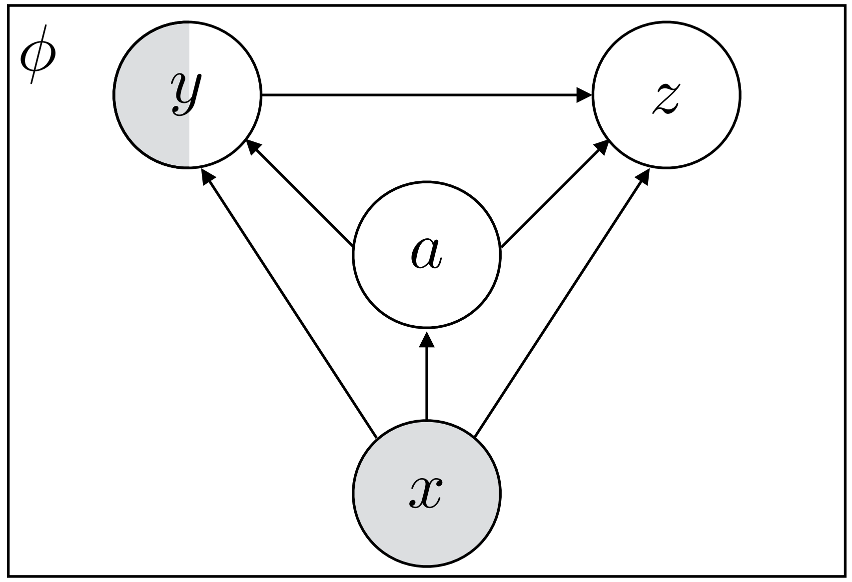
Fit more complex latent distributions…

In order to

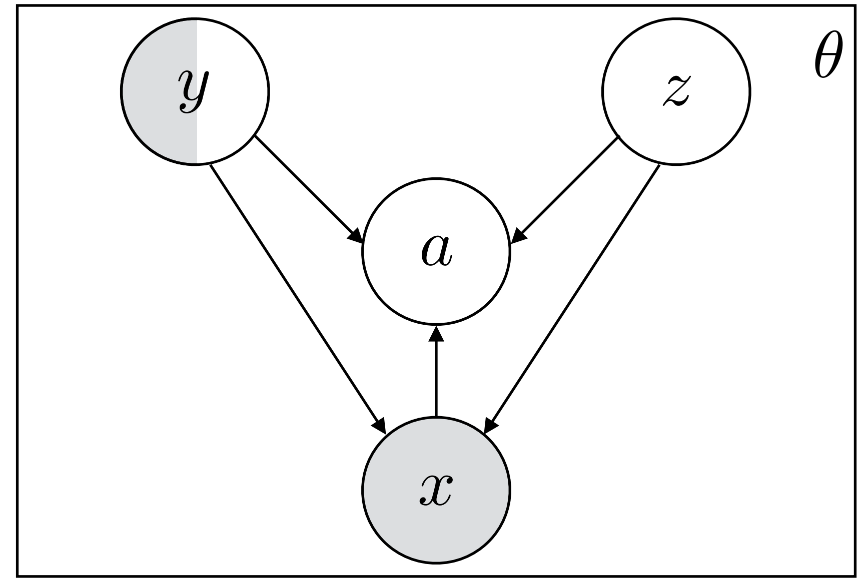
Capture the data manifold for generative modeling.

Utilize the latent space for semi-supervised learning.

Q



P



The labeled lower bound is

$$
\begin{aligned}
\log p(x,y) &= \log \int_a \int_z p_\theta(x,y,a,z) dz da \\
&\geq \mathbb{E}_{q_\phi(a,z|x,y)} \left[\log \frac{p_\theta(x,y,a,z)}{q_\phi(a,z|x,y)} \right] \\
&\equiv -\mathcal{L}(x,y)
\end{aligned}
$$

The unlabeled lower bound is

$$
\begin{aligned}
\log p(x) &= \log \int_a \sum_y \int_z p_\theta(x,y,a,z) dada \\
&\geq \mathbb{E}_{q_\phi(a,y,z|x)} \left[\log \frac{p_\theta(x,y,a,z)}{q_\phi(a,z|x,y)} - \log q_\phi(y|a,x) \right] \\
&= \mathbb{E}_{q_\phi(a|x)} \left[\sum_y q_\phi(y|a,x) \mathbb{E}_{q_\phi(z|a,x)} \left[\log \frac{p_\theta(x,y,a,z)}{q_\phi(a,z|x,y)} \right] + \mathcal{H}(q_\phi(y|a,x)) \right] \\
&\equiv -\mathcal{U}(x)
\end{aligned}
$$