



Siddhant Mishra-Sharma (MIT/AI FI) Summer School



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*A Bayesian latent-variable model optimized with variational inference*



A diagram showing a large rounded rectangle representing a set  $N$ . Inside this rectangle are two circles. The left circle is dark gray and contains the letter  $z$ . The right circle is blue and contains the letter  $x$ . The letter  $N$  is located in the top right corner of the rectangle.

$z$

$x$

$N$

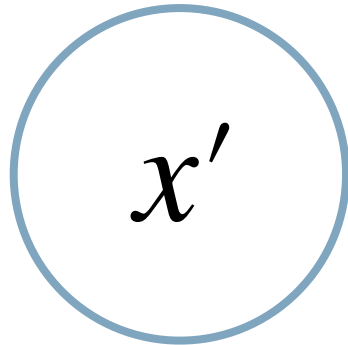
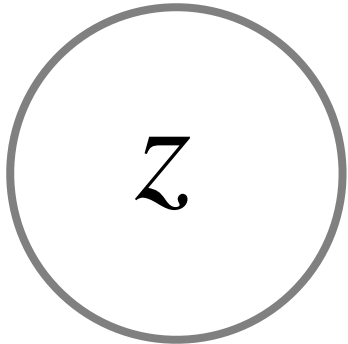
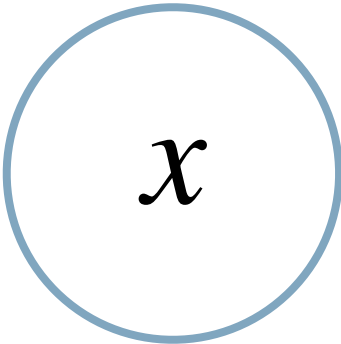
Maximizing ELBO

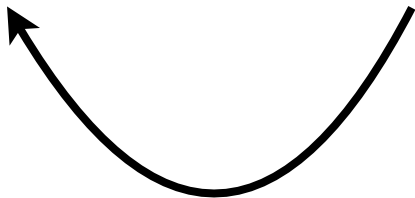
$\equiv$  Minimizing *reverse* KL

$\equiv$  Aligning the forward and reverse processes

$$\textit{Minimize} \quad \left\langle \log \frac{q(x, z)}{p(x, z)} \right\rangle$$







$$q_{\phi}(z \mid x) \cdot p(x)$$

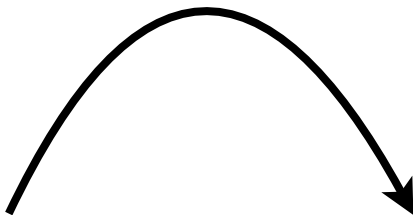
**Forward process**

*It's so over*

*We're so back*

## Reverse process

$$p_{\vartheta}(x | z) \cdot p(z)$$

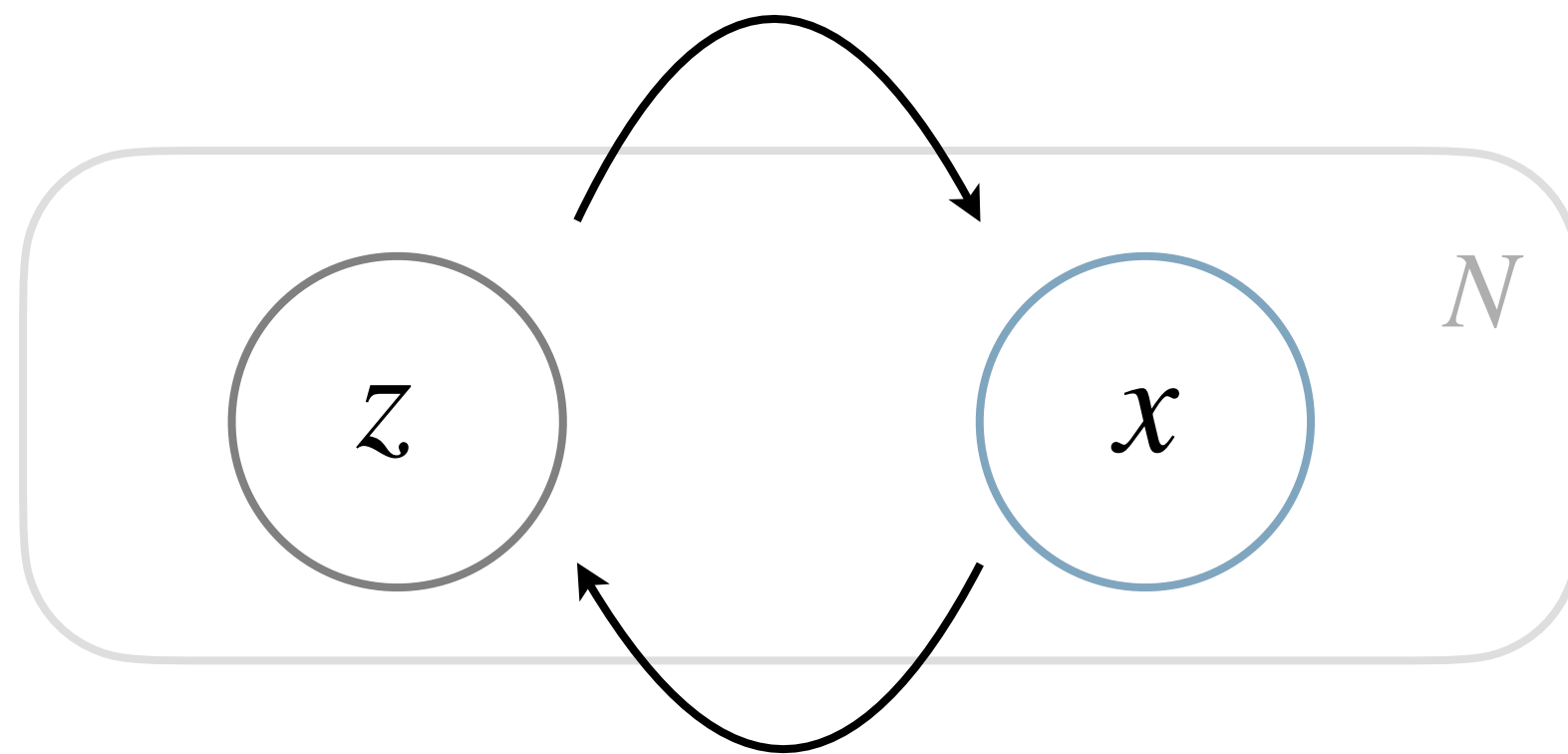


# A Bayesian latent-variable model optimized with variational inference

*We're so back*

**Reverse process**

$$p_{\theta}(x | z) \cdot p(z)$$



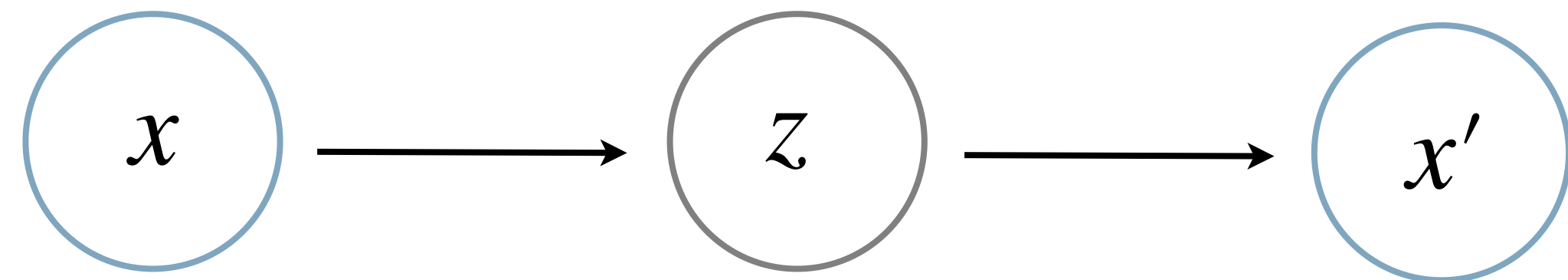
$$q_{\phi}(z | x) \cdot p(x)$$

**Forward process**

*It's so over*

Maximizing ELBO  
 $\equiv$  Minimizing *reverse* KL  
 $\equiv$  Aligning the forward and reverse processes

$$\text{Minimize} \quad \left\langle \log \frac{q(x, z)}{p(x, z)} \right\rangle$$





Christopher Yau

@cwcyau

People do realise that a variational autoencoder comes from the application of variational inference to a Bayesian latent variable model right? It isn't an arbitrary loss function with a KL term stuck on to it with a tweakable parameter to balance the two?



Julian Togelius @togelius · Sep 22, 2021

No. I think of it as an arbitrary loss function and it works well for me. I'm in favor of arbitrary loss functions.



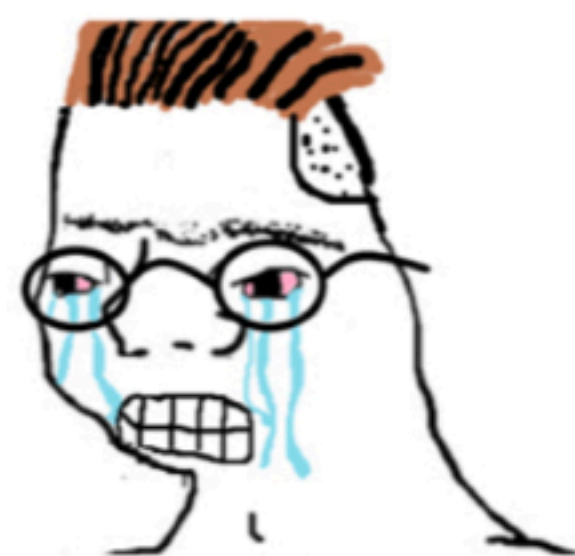
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16



34%

34%



14%

14%



0.1%

2%

2%

0.1%

IQ score

55

70

85

100

115

130

145



Julian Togelius @togelius · Sep 22, 2021

No. I think of it as an arbitrary loss function and it works well for me. I'm in favor of arbitrary loss functions.



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Yann LeCun @ylecun · Sep 22, 2021

I concur.



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