

Bidirectional-Inference VAE (BIVA) and Nouveau VAE (NVAE) intro

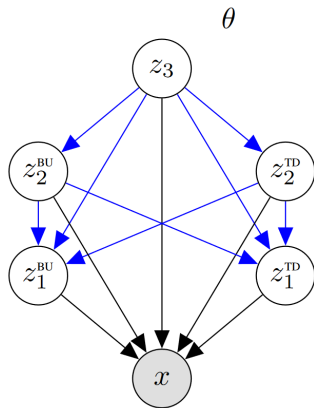
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September 23, 2021

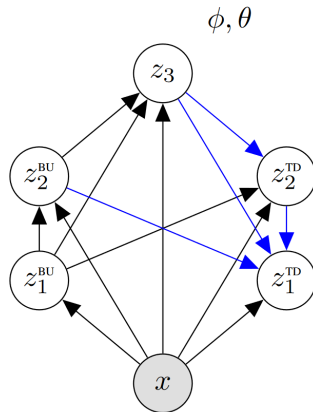
BIVA: Motivation

- Three main classes of explicit density models
- Autoregressive models (AR)
 - Better test likelihood and generation quality
 - Scale poorly
- Flow-based models (NF)
 - Scale better
 - Worse density estimation
- VAEs
 - Fast and tractable sampling
 - Easy-to-access encoding networks
 - Worse *test likelihood* and generation quality

Method



(a) Generative model



(b) Inference model

Method

Extending LVAE:

- Generative model

- Extra dependencies $p_\theta(x|z_1) \rightarrow p_\theta(x|z)$ and $p_\theta(z_i|z_{i+1}) \rightarrow p_\theta(z_i|z_{>i})$
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$$p_\theta(x, z) = p_\theta(x|z)p_\theta(z_L) \prod_{i=1}^{L-1} p_\theta(z_i^{\text{BU}}|z_{>i})p_\theta(z_i^{\text{TD}}|z_{>i})$$

- Inference model

- Bottom-up (BU) path of stochastic latent variables
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$$q_\phi(z|x) = q_\phi(z_L|x, z_{<L}^{\text{BU}}) \prod_{i=1}^{L-1} q_\phi(z_i^{\text{BU}}|x, z_{<i}^{\text{BU}})q_{\phi, \theta}(z_i^{\text{TD}}|x, z_{<i}^{\text{BU}}, z_{>i}^{\text{BU}}, z_{>i}^{\text{TD}})$$

Experiments

- Better than AR and NF on MNIST
- Semi-supervised classification
- Anomaly detection on complex distributions

NVAE: Motivation

- VAEs
 - Fast and tractable sampling
 - Easy-to-access encoding networks
 - Worse test likelihood and *generation quality*
- First VAE for 256×256 pixels