Structured Variational Autoencoders for the Beta-Bernoulli Process

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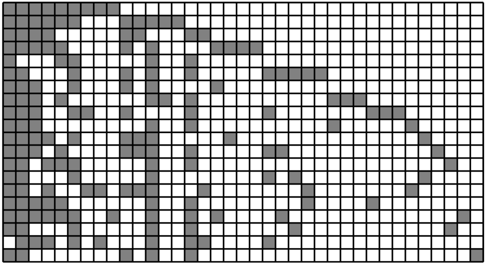
NIPS 2017 Advances in Approximate Bayesian Inference

Indian Buffet Processes



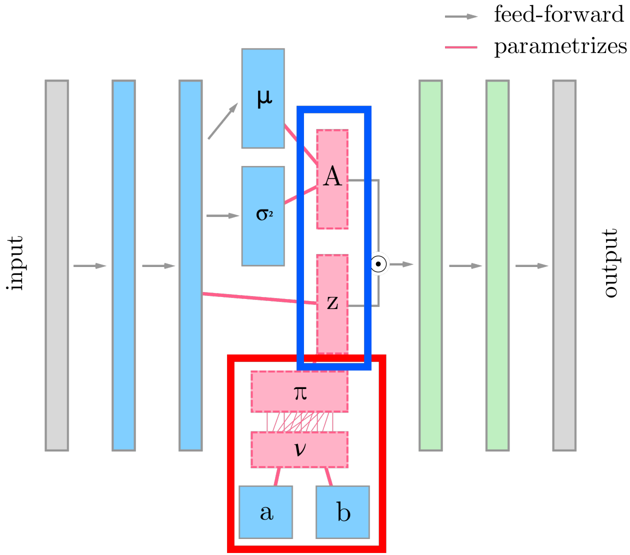
$$\nu_k \sim \text{Beta}(\alpha, 1); \pi_k = \prod_{j=1}^{k} \nu_j$$

$$z_{n,k} \sim \text{Bern}(\pi_k)$$

$$\mathbf{A}_n \sim \mathcal{N}(\mathbf{0}, \mathbf{I}_{K^+})$$

$$\mathbf{x}_n \sim p_\theta(\mathbf{x}_n | \mathbf{Z}_n \odot \mathbf{A}_n)$$

Structured Variational Inference



Results

	MNIST IWAE		Omniglot IWAE	
Model	Train	Test	Train	Test
MF-IBP BBVI	102.6	104.5	129.4	134.5
MF-IBP Gumbel	94.2	96.4	125.0	129.5
S-IBP BBVI	93.8	96.2	115.2	124.5
S-IBP Gumbel	81.7	**86.5**	101.4	**113.0**

MNIST Features

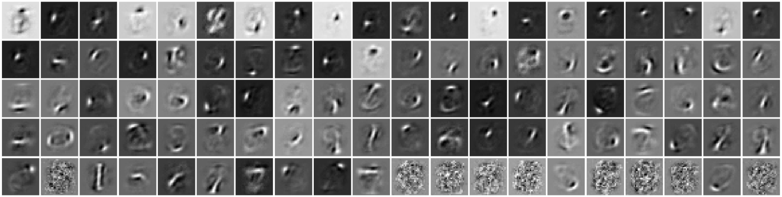


Figure: Features learned from a linear IBP model applied to MNIST

Summary

- We use neural networks to amortize IBP inference for arbitrary likelihoods
- Structured posteriors outperform mean-field VI
- Code: github.com/rachtsingh/ibp_vae
- Come to our poster!