4836:
Variational Autoencoder with Implicit Optimal Priors

Innovative R&D by NTT

- **In short**
  - For the VAE, the aggregated posterior has been introduced as the prior of latent variable, which is the optimal in terms of maximizing the training objective function.
  - Since this optimal prior is difficult to model explicitly, we implicitly models this optimal prior by density ratio trick.
  - Our approach achieved high density estimation performance.

Table 2: Comparison of test log-likelihoods on four image datasets.

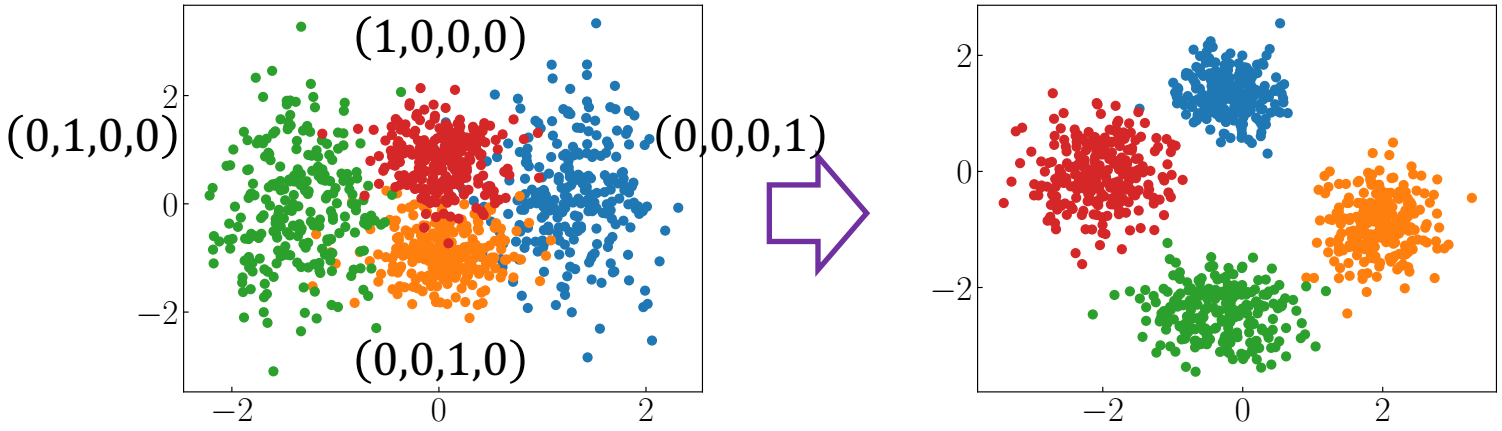
	MNIST	OMNIGLOT	FreyFaces	Histopathology
Standard VAE	-85.84 $\pm$ 0.07	-111.39 $\pm$ 0.11	1382.53 $\pm$ 3.57	1081.53 $\pm$ 0.70
VAE with VampPrior	-83.90 $\pm$ 0.08	-110.53 $\pm$ 0.09	**1392.62 $\pm$ 6.25**	1083.11 $\pm$ 2.10
Proposed method	$\approx$ **-83.21 $\pm$ 0.13**	$\approx$ **-108.48 $\pm$ 0.16**	$\approx$ **1396.27 $\pm$ 2.75**	$\approx$ **1087.42 $\pm$ 0.60**

NTT

4836:
Variational Autoencoder with Implicit Optimal Priors

Innovative R&D by NTT

- **Why can our approach achieve good performance?**
  - To explain this, we did experiment with 4-dimensional One Hot Vector dataset, and plotted the latent vector $\mathbf{z} \in \mathbb{R}^2$.



Standard VAE

Our approach

  - Our approach makes the posterior of latent vectors different from each other and data points are easy to reconstruct from them, which improves the density estimation performance.