

# Development of beam transport system optimization method using VAE and Bayesian optimization

Y. Morita, T. Nishi, T. Nagatomo, Y. Nakashima

Ultimate goal

Optimize the entire accelerator facility at once

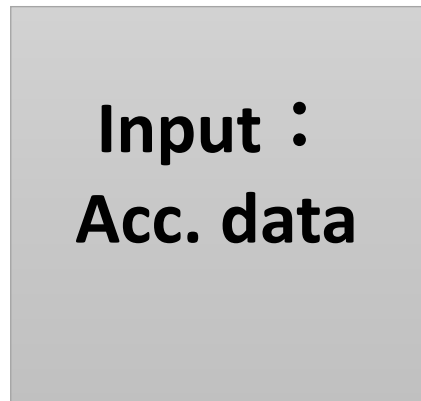
But ...



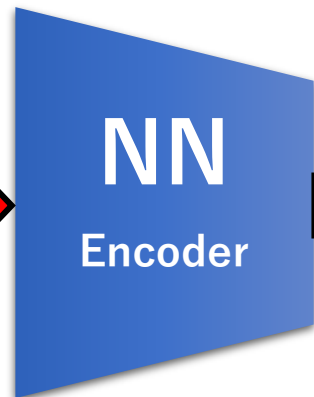
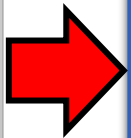
There are too many parameters

Method

**Reduce the number of parameters using VAE**



Parameters



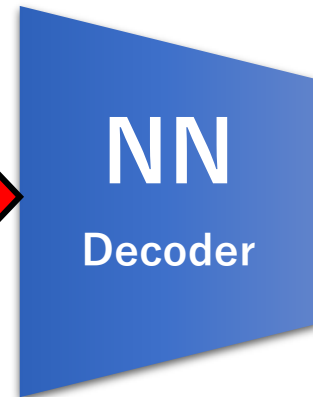
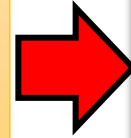
Generating  
Latent Variable



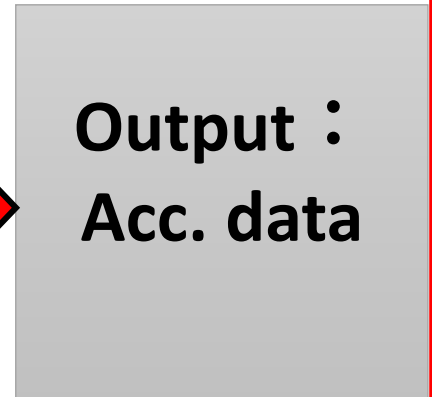
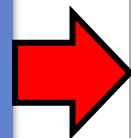
Dimensional reduction

Latent Variable  $z$

Optimize  $z$  using  
Bayesian optimization



Recovering Input



Parameters

**Optimization using  $z$  and decoder**

VAE

**We have already started experiments with Low Energy Beam Transport!**