**Variational Auto-Encoders**

**Introduction**

In this homework, I use 2 VAEs to model a generative process on MNIST dataset.

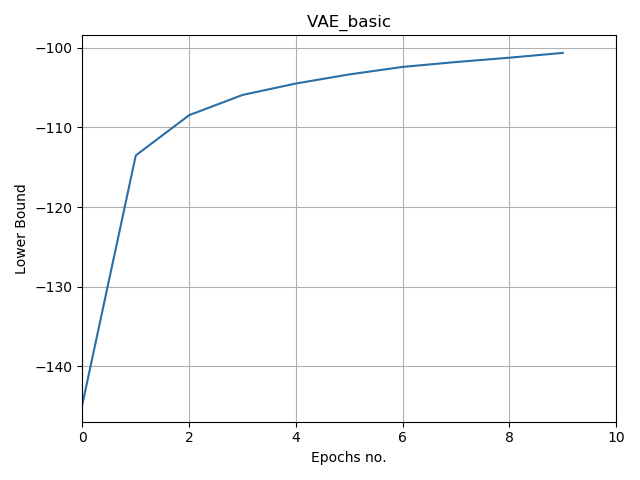
**VAE\_basic**

The basic model uses Bernoulli likelihood function.

Each training epoch takes an average of ~60s.



*Figure1: Output of VAE\_basic after epoch10*

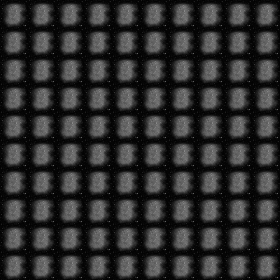


*Figure2: Lower bound of VAE\_basic after epoch10*

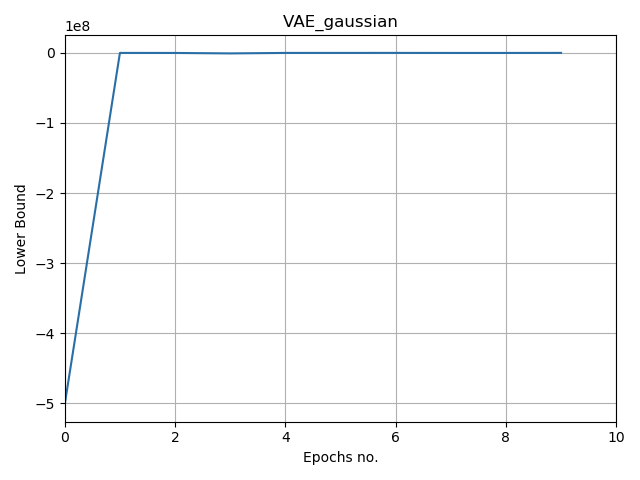
**VAE\_gaussian**

This model uses Gaussian likelihood function.

Each training epoch takes an average of ~75s.



*Figure3: Output of VAE\_gaussian after epoch10*



*Figure4: Lower bound of VAE\_ gaussian after epoch10*

**Comments and Discussion**

For *VAE\_gaussian*, the lower bound is in the order of -105 after 10 epochs. This is much larger than that of *VAE\_basic*, which was in the order of -102. This means that *VAE\_gaussian* is learning the correct distribution.

A possible reason is that *VAE\_gaussian* takes longer to learn and we have not run enough epochs. Another possible reason is implementation error.