Deep Generative Models: Principles and Applications

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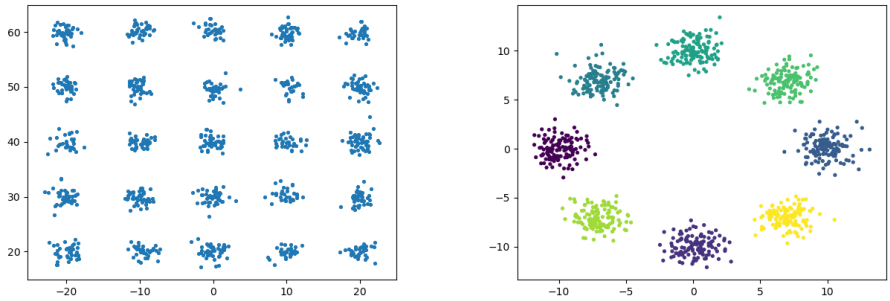
1 Submission

1. Due by June 28
2. Submitted to zebin@ruc.edu.cn
3. Format
   - Project: a three-page report (pdf)
   - Homework: a three-page report (pdf) and executable source codes (zip)

2 Data



(a) Grid (b) Circle

Figure 1: Examples of layout.

1. Mixture of 2-dimensional Gaussian
2. There are at least 36 components
3. Each component is isotropic with a variance of 1
4. The coefficients are equal
5. You can specify the layout of the means by yourself, see examples in Fig 1
6. Generate three datasets of size $15,000$ for training, validation and testing

3 Model

1. Select at least two types of deep generative models to fit the data
2. If any latent variable is involved, its dimension should be no more than 2 and its distribution should be Gaussian or uniform

4 Evaluation

1. Metrics (on training, validation and testing)
    - Samples
    - Density
    - Log-likelihood if possible
2. Comparison (organized as tables or figures)
    - Different types of models
    - Ground truth
    - Hyperparameters including architectures, learning rate, number of components in the data and many others...
3. Analysis
    - Which model is preferable and why?
    - Key aspects of the success of a DGM in practice
    - Many others...

The data generating process, models, hyperparameters (including its space and selecting criteria), metrics, results and analyses should be clearly presented.