# Generative diffusion models on variational autoencoders

#### Zheng Zhao

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### 1 Background

Generative diffusion models are a trending topic in statistical machine learning, and they have recently gained success in many applications, such as image and language models. One computational shortcoming of generative diffusion models consists in their demanding training and testing time. In this project, we will work on improving the computational efficiencies of generative diffusions without compromising their original models. Our idea will be based on combining dynamics Schrödinger bridges and variational autoencoders for fast training and testing.

#### 2 Learning outcomes

You will substantially learn new knowledge in statistical machine learning as well as practical skills:

- Generative diffusion models, a trending research topic in machine learning.
- Variational autoencoder, a classical generative model in machine learning.
- JAX, a Python library for high-performance and differentiable computation.

#### 3 Reading list

Zheng Zhao, Ziwei Luo, Jens Sjölund, and Thomas B. Schön. Conditional sampling within generative diffusion models. *arxiv:2409.09650*, 2024.

#### 4 Eligibility requirements

- Strong background in statistical machine learning is a mandate. Preferably the candidate also has a good hands-on experience of deep learning.
- The student has a research vision, and is willing to summarise and present the results to an international conference.

## 5 Contact

Zheng Zhao (email: zheng.zhao@liu.se, website: https://zz.zabemon.com/), assistant professor at STIMA.