Deep Generative Modeling

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Mon-Wed 11:00-12:20, G101.

Classroom link

https://classroom.google.com/c/Nzg2NzQ2NzE4MDQx?cjc=23w4n4vs

Course Description

In this course, we will explore the most common takes on generative modeling in the current state of the art. The modeling techniques, that include probabilistic, adversarial, and energy-based paradigms, typically leverage modern deep learning architectures to approximate target data distributions. We will both review the theoretical foundations of these models and see how they can be implemented in practice.

Syllabus

1. **Review**: probabilities; neural networks.
2. **Foundations of Generative Modeling**: Goals and definitions; taxonomy.
3. **Principles of maximum likelihood learning**.
4. **Auto-regressive models**: Description; NADE; advanced AR models.
5. **Latent variable-based models**: Variational auto-encoders (VAE); VQ-VAE.
6. **Normalizing flows**. Variable changes; Real NVP; GLOW; modern NF techniques.
7. **Generative adversarial networks**. Basic formulation; Advanced topics .
8. **Energy-based models**. Definitions; Deep Boltzmann Machines; Score-based algorithms.
9. **Diffusion models**. Basic formulations; Improved sampling functions.
10. **Flow matching**.

Evaluation

- Quizzes and attendance (10%)
- Projects (25%)

- Homework (40%)
- Oral exam (25%)