SEMESTER/MASTER PROJECT PROPOSAL: Deep Generative Models for Conditional Sampling

Description:

Generative modeling has seen some very significant progress in recent years in deep learning through various approaches such as generative adversarial networks (GANs), variational auto-encoders (VAEs), normalizing flows (NFs) or score-based generative methods. However, these works generally focus on modeling the joint distribution of data $p(\mathbf{x})$. However, in practice, we are often more interested in modeling the conditional distribution $p(\mathbf{x}_{\text{unobserved}}|\mathbf{x}_{\text{observed}})$, the distribution unknown features given some observed ones. The conditional distribution caputres the likelihood of some feature given some prior observation.

In this project, we are interesting on building on some recent lines of works aimed at learning such conditional distributions [1], [2], [3], [4]. Many questions are still to be explored, such as developing more natural ways to integrate prior information into a generative model, or building a deeper understanding of the trade-offs between different generative approaches, etc. Feel free to contact me (see below) if you are interested in any of these topics!

Prerequisites:

Deep learning experience (ideally on python with pytorch), machine learning and optimization knowledge.

Contact

Thomas Sanchez (thomas.sanchez@epfl.ch)

REFERENCES

[1] O. Ivanov, M. Figurnov, and D. Vetrov, "Variational autoencoder with arbitrary conditioning," in *International Conference on Learning Representations*, 2019. [Online]. Available: https://openreview.net/forum?id=SyxtJh0qYm

[2] M. Belghazi, M. Oquab, and D. Lopez-Paz, "Learning about an exponential amount of conditional distributions," in *Advances in Neural Information Processing Systems 32*, 2019. [Online]. Available: http://papers.nips.cc/paper/9523-learning-about-an-exponential-amount-of-conditional-distributions.pdf

[3] T. Sanchez, I. Krawczuk, Z. Sun, and V. Cevher, "Uncertainty-driven adaptive sampling via gans," 2020. [Online]. Available: https://openreview.net/pdf/5c7b46785fcbc1ec4c468d12c5f6d8d7ac3a7a68.pdf

[4] R. R. Strauss and J. B. Oliva, "Arbitrary conditional distributions with energy," *arXiv preprint arXiv:2102.04426*, 2021.