ZHISHENG XIAO

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EDUCATION

The University of Chicago *2017-2022 (expected)*

Degree: Ph.D. Computational and Applied Mathematics

GPA: 3.96/4.0

University of California, Berkeley *2013-2017*

Degree: B.A. Applied Mathematics, B.A. Statistics

GPA: 3.84/4.0, Highest Distinction in Applied Mathematics

RESEARCH INTERESTS

Deep Learning, Probabilistic Generative Models, Representation Learning, Optimization

WORK EXPERIENCE

Nvidia Research, Learning and Perception Group June 2020-September 2020

Research Intern, supervised by Arash Vahdat

- Studied and reviewed recent advances in Variational Auto-encoders and energy-based models.
- Proposed a new energy-based generative model that is built upon a symbiotic relationship between a Variational Auto-encoder and an energy network.
- Performed large scale experiments to show that our model achieves state-of-the-art generative quality measured by FID among likelihood based models.

RESEARCH EXPERIENCE

The University of Chicago July 2018-Present

Supervised by Professor Yali Amit

- Studied various topics in deep learning and computer vision, with focuses on likelihood based generative models, including Variational Auto-encoders, normalizing flows and energy-based models.
- Designed and implemented a method to improve the generation quality of Variational Auto-encoders by learning normalizing flows to match the distribution of latent variables. It largely outperforms competing methods in a standardized evaluation.
- Proposed a method to model conditional distributions with normalizing flow, and applied it to the tasks of inverse problems and conditional image generation.
- Proposed a simple and efficient algorithm for detecting out-of-distribution samples with deep generative models.

The University of Chicago January 2019-Present

Collaborate with Professor Ruoyu Sun at UIUC

- Studied convergence theories related to optimization algorithms, including coordinate descent, ADMM and saddle point optimization algorithms.
- Proved the upper and lower bounds of iteration complexity of two coordinate descent variants. Ran experiments on real and simulated data to verify the theoretical findings.

PUBLICATION

Zhisheng Xiao, Karsten Kreis, Jan Kautz & Arash Vahdat. **VAEBM: A Symbiosis between Variational Autoencoders and Energy-based Models**. *International Conference on Learning Representations (ICLR)*, 2021. (Spotlight)

Zhisheng Xiao, Qing Yan & Yali Amit. **Likelihood Regret: An Out-of-Distribution Detection Score For Variational Auto-encoder**. *Thirty-fourth Conference on Neural Information Processing Systems (NeurIPS)*, 2020.

Zhisheng Xiao, Qing Yan & Yali Amit. **Exponential Tilting of Generative Models: Improving Sample Quality by Training and Sampling from Latent Energy**. *ICML workshop on Invertible Neural Networks, Normalizing Flows, and Explicit Likelihood Models* ,2020.

Zhisheng Xiao, Qing Yan & Yali Amit. **Generative Latent Flow**. *Preprint* (2019).

Zhisheng Xiao, Qing Yan & Yali Amit. **A Method to Model Conditional Distributions with Normalizing Flows**. *Preprint* ,2019.

Peijun Xiao, Zhisheng Xiao & Ruoyu Sun. **Understanding Limitation of Two Symmetrized Orders by Worst-case Complexity**. *Preprint, in submission to SIAM Optimization*, 2019.

TEACHING EXPERIENCE

Worked as a TA for the following courses: Matrix Computation, Convex Optimization, Non-linear Optimization, Large-scale Machine Learning.

SELECTED COURSES

Monte Carlo Simulation, Algorithms, Fundamentals of Deep Learning, Machine Learning Theory, Probabilistic Graphical Model, Deep Learning Systems, Unsupervised Learning, Uncertainty Quantification, Computational Imaging, Topics in Deep Learning

SKILLS

- **Programming Skills:** Python, R, Matlab
- **Machine Learning Frameworks:** PyTorch, TensorFlow, scikit-learn
- Familiarity with machine learning, deep learning and optimization algorithms