

# ZHISHENG XIAO

5747 S Ellis Ave Office 307, Chicago, IL, 60637

312-203-0790

zxiao@uchicago.edu

## 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.

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**. *Preprint, in submission to ICLR 2021* (2020).

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