

## RESEARCH INTEREST

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My research focuses on developing principled methodologies and theoretical foundations of machine learning and statistics.

I am particularly interested in

- (i). function approximation theory of neural networks and their statistical guarantees in learning applications;
- (ii). (deep) reinforcement learning;
- (iii). nonconvex optimization.

## EDUCATION

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| 2017 - 2022 | Georgia Institute of Technology<br><b>Ph.D. in Machine Learning</b>  |
| 2015 - 2017 | University of California, Los Angeles<br><b>M.S. in Electrical Engineering</b>   |
| 2011 - 2015 | Zhejiang University<br><b>B.S. in Electrical and Information Engineering</b><br>– Graduated with honor from Chu Kochen Honor's College (advanced class of engineering education) |

## EMPLOYMENT

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| 2022 - | Princeton University<br><b>Postdoctoral Research Associate</b><br>– Supervisor: Mengdi Wang |
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## PREPRINTS AND PUBLICATIONS

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### *Preprints*

- **Score Approximation, Estimation and Distribution Recovery of Diffusion Models on Low-Dimensional Data**  
Minshuo Chen\*, Kaixuan Huang\*, Tuo Zhao, and Mengdi Wang (Equal contribution)
- **Deep nonparametric estimation of operators between infinite dimensional spaces**  
Hao Liu, Haizhao Yang, Minshuo Chen, Tuo Zhao, and Wenjing Liao
- **High Dimensional Binary Classification under Label Shift: Phase Transition and Regularization**  
Jiahui Cheng, Minshuo Chen, Hao Liu, Tuo Zhao, and Wenjing Liao
- **Distribution Approximation and Statistical Estimation Guarantees of Generative Adversarial Networks**

Minshuo Chen, Wenjing Liao, Hongyuan Zha, and Tuo Zhao (Alphabetical order)

### Journal Publications

- **Doubly Robust Off-Policy Learning on Low-Dimensional Manifolds by Deep Neural Networks**  
Minshuo Chen\*, Hao Liu\*, Wenjing Liao, and Tuo Zhao (Equal contribution)  
*Submitted to Mathematics of Operations Research*
- **A Manifold Two-Sample Test Study: Integral Probability Metric with Neural Networks**  
Jie Wang, Minshuo Chen, Tuo Zhao, Wenjing Liao, and Yao Xie  
*Information and Inference: A Journal of IMA, under minor revision*
- **Nonparametric Regression on Low-Dimensional Manifolds using Deep ReLU Networks : Function Approximation and Statistical Recovery**  
Minshuo Chen, Haoming Jiang, Wenjing Liao, and Tuo Zhao (Alphabetical order)  
*Information and Inference: A Journal of IMA, 2022*

### Conference Publications

- **Sample Complexity of Nonparametric Off-Policy Evaluation on Low-Dimensional Manifolds using Deep Networks**  
Xiang Ji, Minshuo Chen, Mengdi Wang, and Tuo Zhao  
*International Conference on Learning Representations (ICLR), 2023*
- **On Deep Generative Models for Approximation and Estimation of Distributions on Manifolds**  
Biraj Dahal, Alexander Havrilla, Minshuo Chen, Tuo Zhao, and Wenjing Liao  
*Annual Conference on Neural Information Processing Systems (NeurIPS), 2022*
- **Benefits of Overparameterized Convolutional Residual Networks: Function Approximation under Smoothness Constraint**  
Hao Liu, Minshuo Chen, Siawpeng Er, Wenjing Liao, Tong Zhang, and Tuo Zhao  
*International Conference on Machine Learning (ICML), 2022*
- **Large Learning Rate Tames Homogeneity: Convergence and Balancing Effect**  
Yuqing Wang, Minshuo Chen, Tuo Zhao, and Molei Tao  
*International Conference on Learning Representations (ICLR), 2022*
- **Pessimism Meets Invariance: Provably Efficient Offline Mean-Field Multi-Agent RL**  
Minshuo Chen, Yan Li, Zhuoran Yang, Zhaoran Wang, and Tuo Zhao  
*Annual Conference on Neural Information Processing Systems (NeurIPS), 2021*
- **Besov Function Approximation and Binary Classification on Low-Dimensional Manifolds Using Convolutional Residual Networks**  
Hao Liu, Minshuo Chen, Tuo Zhao, and Wenjing Liao  
*International Conference on Machine Learning (ICML), 2021*
- **How Important is the Train-Validation Split in Meta-Learning?**  
Yu Bai, Minshuo Chen, Pan Zhou, Tuo Zhao, Jason D. Lee, Sham Kakade, Huan Wang, and Caiming Xiong  
*International Conference on Machine Learning (ICML), 2021*
- **Super Tickets in Pre-Trained Language Models: From Model Compression to Improving Generalization**  
Chen Liang, Simiao Zuo, Minshuo Chen, Haoming Jiang, Xiaodong Liu, Pengcheng He, Tuo Zhao, and

Weizhu Chen

*International Joint Conference on Natural Language Processing (ACL-IJCNLP)*, 2021

- **Deep Learning Assisted End-to-End Synthesis of mm-Wave Passive Networks with 3D EM Structures: A Study on A Transformer-Based Matching Network**  
Siawpeng Er, Edward Liu, **Minshuo Chen**, Yan Li, Yuqi Liu, Tuo Zhao, and Hua Wang  
*International Microwave Symposium (IMS)*, **Oral presentation**, 2021
- **Towards Understanding Hierarchical Learning: Benefits of Neural Representations**  
**Minshuo Chen**, Yu Bai, Jason D. Lee, Tuo Zhao, Huan Wang, Caiming Xiong, and Richard Socher  
*Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2020
- **Differentiable Top-k Operator with Optimal Transport**  
Yujia Xie, Hanjun Dai, **Minshuo Chen**, Bo Dai, Tuo Zhao, Hongyuan Zha, Wei Wei, and Tomas Pfister  
*Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2020
- **On Generalization Bounds of a Family of Recurrent Neural Networks**  
**Minshuo Chen**, Xingguo Li, and Tuo Zhao  
*International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2020
- **Residual Network Based Direct Synthesis of EM Structures: A Study on One-to-One Transformers**  
David Munzer, Siawpeng Er, **Minshuo Chen**, Yan Li, Naga S. Mannem, Tuo Zhao, and Hua Wang  
*IEEE Radio Frequency Integrated Circuits Symposium (RFIC)*, 2020
- **On Computation and Generalization of Generative Adversarial Imitation Learning**  
**Minshuo Chen**, Yizhou Wang, Tianyi Liu, Zhuoran Yang, Xingguo Li, Zhaoran Wang, and Tuo Zhao  
*International Conference on Learning Representations (ICLR)*, 2020
- **Efficient Approximation of Deep ReLU Networks for Functions on Low Dimensional Manifolds**  
**Minshuo Chen**, Haoming Jiang, Wenjing Liao, and Tuo Zhao (Alphabetical order)  
*Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2019
- **Towards Understanding the Importance of Shortcut Connections in Residual Networks**  
Tianyi Liu\*, **Minshuo Chen\***, Mo Zhou, Simon S. Du, Enlu Zhou, and Tuo Zhao (Equal contribution)  
*Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2019
- **On Scalable and Efficient Computation of Large Scale Optimal Transport**  
Yujia Xie, **Minshuo Chen**, Haoming Jiang, Tuo Zhao, and Hongyuan Zha  
*International Conference on Machine Learning (ICML)*, 2019
- **On Computation and Generalization of Generative Adversarial Networks under Spectrum Control**  
Haoming Jiang, Zhehui Chen, **Minshuo Chen**, Feng Liu, Dingding Wang, and Tuo Zhao  
*International Conference on Learning Representations (ICLR)*, 2019
- **Dimensionality Reduction for Stationary Time Series via Stochastic Nonconvex Optimization**  
**Minshuo Chen**, Lin F. Yang, Mengdi Wang, and Tuo Zhao  
*Annual Conference on Neural Information Processing Systems (NeurIPS)*, 2018

## AWARDS

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|            |                              |
|------------|------------------------------|
| 2021       | IDEaS-TRIAD Scholarship      |
| 2019, 2022 | ICML Travel Award            |
| 2019       | ARC-TRIAD Student Fellowship |

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| 2018, 2019  | NeurIPS Travel Award        |
| 2017 - 2018 | William S. Green Fellowship |

## EXPERIENCES

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### Teaching Assistantships:

- Computational Data Analysis / Machine Learning (CSE6740/ISYE6740), Fall 2017, Fall 2019
- Business Analytics (ISYE 4803), Spring 2018
- Regression Analysis (ISYE 6414), Fall 2018
- Basic Statistical Methods (ISYE 2028), Summer 2018, Summer 2019

Guest lecture “Representation and Statistical Properties of Deep Neural Networks on Structured Data” in Advanced Machine Learning (ISYE 8813), Fall 2021.

### Internships:

- Research Intern, Salesforce, Summer 2020
- Research Intern, Microsoft, Fall 2020 2021

## SERVICES

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### Reviewing:

- AAAI 2020 2021, ICML 2020 2021 2022, NeurIPS 2020 2021, ICLR 2021 2022 2023
- IEEE Transactions on Signal Processing, IEEE Transactions on Information Theory, IEEE Transactions on Pattern Analysis and Machine Intelligence, Operations Research,