

CHENYU ZHANG

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EDUCATION

Columbia University

2022 - 2023 (expected)

M.S. in Data Science

Overall GPA: 4.28/4.00

Selected Relevant Courses

Reinforcement Learning	A+	Algorithms for Data Science	A+
Probability and Statistics for Data Science	A+	Exploratory Data Analysis	A+
Machine Learning	A	Modern Control Theory	A+
High-Dimensional Probability	A	Computer Systems	A

Fudan University

2018 - 2022

B.S. in Mathematics and Applied Mathematics

Honors Student of Su Buqing Top Talent Program

Selected Relevant Courses

Numerical Linear Algebra and Optimization (H)	A	Deep Learning	A
Numerical Solution to Differential Equations	A	Methods of Optimization	A
Functions of Complex Variable	A	Probability Theory	A
An Introduction to Differential Manifolds (H)	A-	Advanced Algebra	A
Computational Thinking	A	Fundamentals of Mechanics	A

Selected Relevant Seminars

Intelligent Optimization Algorithms	Convex Optimization
Complex Analysis	Global Differential Geometry
Differential Manifolds and Differential Topology	Differential Geometry of Curves and Surfaces
Non-Euclidean Geometry and Point Set Topology	Advanced Mathematical Analysis

Shenzhen Middle School

2015 - 2018

Honor Curriculum (Physics Olympiad)

Award: Chinese Physics Olympiad - First Class Award

PUBLICATIONS

- **Chenyu Zhang**, Xu Chen, and Xuan Di. A single online agent can efficiently learn mean field games. *Twenty-Seventh International Conference on Artificial Intelligence and Statistics*, 2023. [Under review]
- **Chenyu Zhang**, Han Wang, Aritra Mitra, and James Anderson. Finite-time analysis of on-policy heterogeneous federated reinforcement learning. *The Twelfth International Conference on Learning Representations*, 2023. [Under review] [Preprint]
- **Chenyu Zhang** and Rujun Jiang. Riemannian adaptive regularized Newton methods with Hölder continuous Hessians. *Mathematics of Operations Research*, 2023. [Under review] [Preprint]
- **Chenyu Zhang**, Rufeng Xiao, Wen Huang, and Rujun Jiang. Riemannian trust region methods for SC^1 minimization. *Journal of Scientific Computing*, 2023. [Under review] [Preprint]

WORKING PAPERS

- **Chenyu Zhang**, Xu Chen, and Xuan Di. Efficient single-agent model-free methods for learning mean field games with automatic stabilization and linear function approximation. 2023. [Ready to submit]
- **Chenyu Zhang**, Qi Cai, Zhuoran Yang, and Zhaoran Wang. On reward-free reinforcement learning for POMDPs with linear function approximation. [Ready to submit]

RESEARCH EXPERIENCE

Neural Networks

May 2023 - Present

Research assistant, advised by Prof. John Wright

Dept. EE&APAM, Columbia University, NY

- Analyzed the constraints of neural tangent kernels and designing data-aware kernels for neural networks.
- Identified limitations of shallow Transformers and designing tailored attention mechanisms.

Mean Field Games

May 2023 - Present

Research assistant, advised by Prof. Sharon Di

Dept. CEEM, Columbia University, NY

- Developed the first sample-efficient single-agent model-free methods for learning mean field games.
- Designing multi-agent reinforcement learning systems able to handle large heterogeneous populations.

Federated Reinforcement Learning

September 2022 - Present

Research assistant, advised by Prof. James Anderson

Dept. EE, Columbia University, NY

Co-advised by Prof. Aritra Mitra

Dept. ECE, North Carolina State University, NC

- Developed a novel on-policy federated reinforcement learning method and established its finite-time error bounds, highlighting its linear convergence speedups with the presence of environmental heterogeneity.
- Conducted three numerical experiments validating the theoretical results and showcasing the adaptability of our proposed methods.

Manifold Nonsmooth Nonconvex Optimization

October 2021 - September 2022

Research assistant, advised by Prof. Rujun Jiang

Dept. Data Science, Fudan University, China

Co-advised by Prof. Wen Huang

Dept. Mathematics, Xiamen University, China

- Developed the first semismooth Riemannian trust-region method for nonsmooth nonconvex optimization problems on manifolds, and proved its convergence results including superlinear local convergence rate.
- Applied our semismooth Riemannian trust-region method to solve augmented Lagrangian methods' subproblem on manifolds, and demonstrated its superiority through two numerical experiments.
- Established an optimal iteration complexity $\tilde{O}(\epsilon^{-(2+\alpha)/(1+\alpha)})$ of Riemannian Newton-type methods with α -Hölder continuous Hessians.

Partially Observable Reinforcement Learning

March 2021 - January 2022

Research assistant, advised by Prof. Zhaoran Wang

Dept. of IEMS&CS, Northwestern University, IL

Co-advised by Prof. Zhuoran Yang

Dept. of Stat&Data Science, Yale University, CT

- Designed a reward-free RL algorithm for linear POMDPs and established its sample efficiency guarantee.

TEACHING EXPERIENCE

COMS 4771 Machine Learning

September 2023 - December 2023

Teaching assistant, advised by Prof. Daniel Hsu

Dept. CS, Columbia University, NY

ORCS 4529 Reinforcement Learning

September 2023 - December 2023

Teaching assistant, advised by Prof. Shipra Agrawal

Dept. IEOR, Columbia University, NY

EEOR 4650 Convex Optimization

September 2023 - December 2023

Teaching assistant, advised by Prof. James Anderson

Dept. EE, Columbia University, NY

CSOR 4231 Analysis of Algorithms

January 2023 - May 2023

Teaching assistant, advised by Prof. Eleni Drinea

Dept. CS, Columbia University, NY

SCHOLARSHIPS & AWARDS

Honors Student of Top Talent Program (2022), Undergraduate Merit Scholarship (2018-2022), Undergraduate Major Scholarship (2018-2021), Second class award in the Chinese Mathematics Competitions (2019), Second class award in the Chinese Physics Competitions (2019), Freshman Scholarship (2018).