CHENYU ZHANG

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EDUCATION

Columbia University *2022 - 2023 (expected)*

M.S. in Data Science
Overall GPA: 4.28/4

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

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

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. 2023. [Submitted to AISTATS 2024]
- **Chenyu Zhang**, Han Wang, Aritra Mitra, and James Anderson. Finite-time analysis of on-policy heterogeneous federated reinforcement learning. 2023. [Submitted to ICLR 2024]
- **Chenyu Zhang** and Rujun Jiang. Riemannian adaptive regularized Newton methods with Hölder continuous Hessians. 2023. [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*

- Identified limitations of neural tangent kernels and designing optimizable data-aware kernels for neural networks.

Mean Field Games *May 2023 - Present*
Research assistant, advised by Prof. Sharon Di *Dept. CEEM, Columbia University, NY*

- Developed 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 federated SARSA algorithm and established its finite-time error bounds, as well as demonstrated its linear convergence speedups with the presence of environmental heterogeneity.
- Conducted three numerical experiments to verify the theoretical results of the federated SARSA algorithm.

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 three numerical experiments.
- Established an optimal iteration complexity $\tilde{O}(\epsilon^{-(2+\alpha)/(1+\alpha)})$ of Riemannian Newton-type methods with α-Hölder continuous Hessian.

Reinforcement Learning for POMDPs *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*