CHENYU ZHANG

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EDUCATION

Massachusetts Institute of Technology *Cambridge, MA*
Ph.D. Social and Engineering Systems and Statistics *2024 - present*
Presidential Fellow (Sole recipient in cohort)

Columbia University *New York, NY*
M.S. Data Science *2022 - 2024*

Fudan University *Shanghai, China*
B.S. Mathematics and Applied Mathematics *2018 - 2022*
Honors Student of Su Buqing Top Talent Program

PUBLICATIONS

[1] **Chenyu Zhang** and Navid Azizan. Personalized Collaborative Learning with Affinity-Based Variance Reduction. *Preprint. Under review,* 2026.

[2] **Chenyu Zhang** and Rujun Jiang. Riemannian adaptive regularized Newton methods with Hölder continuous Hessians. *Computational Optimization and Applications,* 2025.

[3] **Chenyu Zhang**, Xu Chen, and Xuan Di. Stochastic semi-gradient descent for learning mean field games with population-aware function approximation. *International Conference on Learning Representations (ICLR),* 2025.

[4] **Chenyu Zhang**, Rufeng Xiao, Wen Huang, and Rujun Jiang. Riemannian trust region methods for SC^1 minimization. *Journal of Scientific Computing,* 2024.

[5] Fuzhong Zhou, **Chenyu Zhang**, Xu Chen, and Xuan Di. Graphon mean field games with a representative player: analysis and learning algorithms. *International Conference on Machine Learning (ICML),* 2024.

[6] **Chenyu Zhang**, Han Wang, Aritra Mitra, and James Anderson. Finite-time analysis of on-policy heterogeneous federated reinforcement learning. *International Conference on Learning Representations (ICLR),* 2024.

[7] **Chenyu Zhang**, Xu Chen, and Xuan Di. A single online agent can efficiently learn mean field games. *European Conference on Artificial Intelligence (ECAI),* 2024.

RESEARCH EXPERIENCE

Multi-Activity Network Games *February 2025 - Present*
Ph.D. student, advised by Prof. **Saurabh Amin** *LIDS, Massachusetts Institute of Technology, MA*

- Integrated sustainability constraints into targeted interventions for multi-activity network games.
- Developed graphon modeling of cross-activity interaction to simplify analysis of large activity networks.

Personalized Collaborative Learning [1] *September 2024 - Present*
Ph.D. student, advised by Prof. **Navid Azizan** *LIDS, Massachusetts Institute of Technology, MA*

- Designed the first multi-agent learning framework that enables collaboration between arbitrarily heterogeneous agents and yields fully personalized solutions with an adaptive, affinity-based speedup.

Neural Networks *May 2023 - December 2023*
Research assistant, advised by Prof. **John Wright** *Dept. EE&APAM, Columbia University, NY*

- Analyzed the limitations of Transformers and designed tailored attention mechanisms using tensor kernels and invariant similarity weights.

- Conducted a comprehensive empirical study to estimate the intrinsic dimension of patch manifolds, deriving the optimal patch size for various vision tasks.

Mean Field Games [3,5,7] *May 2023 - August 2024*
Research assistant, advised by Prof. **Sharon Di** *Dept. CEEM, Columbia University, NY*

- Pioneered the first fully online single-agent model-free methods for learning mean field games (MFGs), achieving sample efficiency and stability enhancements without auxiliary mechanisms.
- Extended these methods to linear MFGs with continuous state-action spaces and graphon MFGs with large heterogeneous populations.

Federated Reinforcement Learning [6] *September 2022 - December 2023*
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, demonstrating linear convergence speedup despite the presence of environmental heterogeneity.

Nonsmooth Nonconvex Manifold Optimization [2,4] *October 2021 - September 2022*
Research assistant, advised by Prof. **Rujun Jiang** *Dept. Data Science, Fudan University, CN*
Co-advised by Prof. **Wen Huang** *Dept. Mathematics, Xiamen University, CN*

- Developed the first Riemannian trust-region method tailored for minimizing nonconvex functions on manifolds with a semismooth gradient field, supported by rigorous global and local convergence analysis.
- Implemented the semismooth Riemannian trust-region method in solving augmented Lagrangian method subproblems on manifolds, demonstrating its superiority through two numerical experiments.
- Extended the methodology to formulate a Riemannian adaptive regularized Newton methods framework and established its sharp worst-case iteration and operation complexities.

Reinforcement Learning with Partial Observability *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*

- Devised an innovative exploration mechanism to handle partial observability without reward feedback.
- Enhanced the mechanism by integrating linear function approximation, enabling its application to large and potentially infinite observation and state spaces.

SCHOLARSHIP & AWARD

- Presidential Fellowship, Massachusetts Institute of Technology *2024*
- Honors Student of Top Talent Program, Fudan University *2022*
- Undergraduate Merit Scholarship, Fudan University *2018-2019, 2019-2020, 2020-2021, 2021-2022*
- Undergraduate Major Scholarship, Fudan University *2019-2020, 2020-2021, 2021-2022*
- Freshman Scholarship, Fudan University *2018*

SERVICE

- **Journal Reviewer**: IMA Journal of Numerical Analysis, IEEE Transactions on Signal Processing, IEEE Transactions on Control of Network Systems.
- **Conference Reviewer**: ICLR, AISTATS, AAAI, NeurIPS, ICML, CDC, L4DC.
- **Teaching Assistant**: Optimization Methods (MIT 15.C57), Probability (MIT 6.431x), Fundamentals of Statistics (MIT 18.6501x), Machine Learning (Columbia COMS 4771), Reinforcement Learning (Columbia ORCS 4529), Convex Optimization (Columbia EEOR 4650), Analysis of Algorithms (Columbia CSOR 4231).