

Xinyu Liu

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Education

University of Virginia, PhD in Department of Computer Science Sep 2024 – May 2029

- **Coursework:** Natural Language Processing, Learning for Interactive Robots, Machine learning, Software logic, etc.

Peking University, BS in School of Mathematical Science Sep 2020 – Jul 2024

- **Coursework:** Mathematical Analysis; Probability Theory (H); Applied Stochastic Processes (Honor); Mathematical Statistics, etc.

Research experience

Sequential Intelligence Lab(SIL), University of Virginia – VA, US Aug 2024 – Now

- Conducting theoretical research on convergence analysis of reinforcement learning algorithms under supervision of Prof. Shangtong Zhang
- Developing mathematical frameworks for proving L^2 and almost sure convergence of reinforcement learning methods
- Analyzing convergence rates of stochastic approximation algorithms with Markovian noise

Mathematics in Lean, Peking University – Beijing, China Aug 2023 – Jun 2024

- Led by Prof. Zaiwen Wen, formalized complex mathematical proofs using formal verification system lean4
- Implemented rigorous mathematical theorems in computer-assisted proof systems, focusing on complex analysis

Autonomous Robots Lab (ARL), Peking University – Beijing, China Feb 2023 – May 2023

- Provided mathematical consultation for robotics research projects under supervision of Prof. Chang Liu
- Applied optimization theory to improve robotic system performance in autonomous driving

Dynamic System, Peking University – Beijing, China Jun 2022 – Feb 2023

- Conducted research in dynamical systems theory under guidance of Prof. Zhiqiang Li
- Analyzed mathematical properties of expanding maps and conformal fractals
- Presented theoretical findings on conformal dynamics in research seminars

Intern experience

Quantitative Research Intern, Founder Securities – Beijing, China Jul 2023 – Sep 2023

- Developed theoretical models for financial markets under supervision of Dr. Song Hao
- Applied statistical learning theory to analyze market behavior
- Implemented and validated mathematical models for option pricing

Publications

- MathlibLemma: Folklore Lemma Generation and Benchmark for Formal Mathematics Jan 2026
Xinyu Liu, Zixuan Xie, Amir Moeini, Claire Chen, Shuze Daniel Liu, Yu Meng, Aidong Zhang, Shangdong Zhang
- Extensions of Robbins-Siegmund Theorem with Applications in Reinforcement Learning Sep 2025
Xinyu Liu, Zixuan Xie, Shangdong Zhang
- Finite Sample Analysis of Linear Temporal Difference Learning with Arbitrary Features May 2025
Zixuan Xie*, *Xinyu Liu**, Rohan Chandra, Shangdong Zhang
Conference on Neural Information Processing Systems (NeurIPS), 2025.
Acceptance rate: 24.52%
- Linear Q -Learning Does Not Diverge in L^2 : Convergence Rates to a Bounded Set Jan 2025
*Xinyu Liu**, Zixuan Xie*, Shangdong Zhang
International Conference on Machine Learning (ICML), 2025.
Acceptance rate: 26.9%
- Almost Sure Convergence Rates and Concentration of Stochastic Approximation and Reinforcement Learning with Markovian Noise Nov 2024
Xiaochi Qian*, Zixuan Xie*, *Xinyu Liu**, Shangdong Zhang

Teaching Assistantships

Reinforcement Learning (Fall 2025, University of Virginia): hosted office hours and graded assignments.

Peer Review

- Emergency Technical Reviewer for Reinforcement Learning Conference (RLC) 2025
- Emergency Reviewer for International Conference on Learning Representations (ICLR) 2026
- Reviewer for International Conference on Artificial Intelligence and Statistics (AISTAT) 2026

Skills and Awards

Technologies: Python(3 years), C&C++(1 year), Latex(3 years), lean4(2 years), Mathematica/MATLAB(2 years)

Languages: Mandarin, English

Awards:

No.14 Chinese College Mathematics Competition, 1st class (National Level)
Second Prize, 35th Chinese Mathematical Olympiad Final Round (2019)
Gold Medal, Olympiad of Metropolities (2019)