# Sreejeet Maity

Raleigh, North Carolina, U.S.A · · · · · ·

## Education

**North Carolina State University** — Raleigh, NC, U.S.A
Ph.D. Electrical Engineering — Aug 2023 - Present

**Indian Institute of Science, Bangalore** — Bangalore, India
M.Tech Robotics and Autonomous Systems — Aug 2021 - June 2023

**Jadavpur University** — Kolkata, India
B.E Electrical Engineering — Aug 2017 - July 2021

## Research Interests

I develop provably robust finite-sample guarantees for reinforcement learning (RL) under uncertainty and adversarial corruption. My current interests include corruption-tolerant distributed and federated RL, and tight minimax lower bounds characterizing fundamental limits of robust learning.

## Experience

**North Carolina State University** — Raleigh, NC, U.S.A
*Graduate Research/Teaching Assistant* — Aug 2023 - Present
*Ph.D. Advisor*: Dr. Aritra Mitra.

- **Finding Robust Optimal Policy from Corrupted and Correlated Observations.**
  - Showed that vanilla $Q$-learning is provably fragile under reward corruption, and designed a robust synchronous variant that employs robust Bellman targets. Established non-asymptotic, finite-time convergence, with tightness certified by a matching minimax lower bound.
  - Extended these guarantees to the *asynchronous* setting under temporal dependence, relaxing strong distributional assumptions on rewards.
  - Results disseminated across ICML 2026, NeurIPS 2025, and IEEE CDC 2024.

- **Robust Policy Evaluation under Adversarial Influences and Markovian Data.**
  - Established the first finite-time theory for robust `TD` learning under time-correlated (Markovian) noise and function approximation: (i) proved divergence of vanilla `TD` under adaptive corruption; (ii) designed `Robust-TD` with clean-case rates up to a small additive bias; and (iii) derived a near-tight lower bound certifying inevitability of the corruption term.
  - This research is published in AISTATS 2025.

- **Hybrid Algorithms and Extension to the Multi-Agent Federated Learning Setting.**
  - Developed adversarially robust, communication-efficient RL for federated multi-agent settings; introduced a novel hybrid model-free and model-based class of algorithms with finite-time guarantees under reward corruption.
  - Extended to fully decentralized MARL with Byzantine tolerance and logarithmic communication, preserving collaborative speedups; and proved conditions under which the corruption bias diminishes with sample size.
  - Two papers published at IEEE ACC 2026.

**Neuromuscular Rehabilitation Engineering Laboratory**
**University of North Carolina at Chapel Hill** — Chapel Hill, NC, U.S.A
*Research Collaboration* — April 2026 - Present

- **Personalized Reinforcement Learning for Powered Knee Prosthesis Tuning**
  - Developing personalized reinforcement learning methods for subject-specific tuning of commercial powered knee prostheses.
  - Formulated personalized MDP/CMDP models with user-specific dynamics, time-varying reward design, and safety–comfort constraints.
  - Exploring offline-to-online adaptation schemes that warm-start from population priors and enable safe, data-efficient personalization.

## Selected First-Authored Publications

- *Sreejeet Maity*†, Aritra Mitra. **Corruption-Tolerant Optimal Asynchronous $Q$-Learning**, **International Conference on Machine Learning (ICML 2026)**.
[Summary] [Paper] [Poster] [Slides] [Code]

- *Sreejeet Maity*†, Aritra Mitra. **Adversarially-Robust `TD` Learning with Markovian Data**, **International Conference on Artificial Intelligence and Statistics (AISTATS 2025)**.
[Summary] [Paper] [Poster] [Slides] [Code]

■ *Sreejeet Maity*†, Aritra Mitra. **Robust $Q$-Learning under Corrupted Rewards**,
**IEEE Conference on Decision and Control (CDC 2024)**.
[Summary] [Paper] [Poster] [Slides] [Code]

■ *Sreejeet Maity*†, Aritra Mitra. **Robust Federated $Q$-Learning with Almost No Communication**,
**2026 American Control Conference (ACC 2026)**.
[Summary] [Paper] [Poster] [Slides] [Code]

■ *Sreejeet Maity*†, Feng Zhu, Robert Heath, Aritra Mitra. **Variance-Reduced $Q$-Learning over Static and Time-Varying Networks**,
**2026 American Control Conference (ACC 2026)**.
[Summary] [Paper] [Poster] [Slides] [Code]

## Accepted Workshop Presentations

1. **Multi-Agent Robust FRL with Sparse Communication** NCSU Robotics Symposium 2026.
2. **Corruption-Tolerant Agnostic $Q$-Learning** NeuRIPS 25-Reliable ML Workshop.
3. **Robust Federated RL with Byzantine Agents** Applied AI Symposium 2025, NESCW 2026.
4. **Theoretical Limits of Robust TD Learning** New York RL Workshop (NYRL 2025), Amazon.
5. **Towards Finite-Time Theory for Adversarially-Robust RL: Mathematical Guarantees and Fundamental Limits** Northeast Systems and Control Symposium (NESCW 2025).
6. **Adversarially-Robust Deep $Q$-Network for Algorithmic Trading** MLSS 2025, NCSU.
7. **Robust Algorithms for Adversarial Reinforcement Learning** Applied AI Symposium 2024.

## Invited Talks/Seminars

■ **Towards Finite-Time Rates for Adversarially-Robust RL** CORAL Seminar, NCSU.

## Works Under Review/Preparation

■ **Resilient RL Algorithms using Batch Robustification Under Corruptive Events**
We develop a novel robust $Q$-learning method designed for adversarially corrupted rewards and transitions. It groups the online trajectory into batches and, for each state-action pair within a batch, forms a corruption-tolerant Bellman update by robustly estimating the mean reward and robustly aggregating next-state value evaluations. We yield stable learning and finite-time $\ell_\infty$ guarantees with an explicit, unavoidable degradation that scales with the corruption level.

■ **Byzantine-Resilient Federated Q-Learning with Logarithmic Communication**
We consider a federated reinforcement learning setup involving $M$ agents interacting with a common Markov Decision Process. We study the potential for sample-complexity speedups in this collaborative setting, when a fraction of agents are adversarial. To this end, we propose `Robust Fed-Q`, a federated Q-learning algorithm that integrates model-based and model-free techniques. We establish that `Robust Fed-Q` achieves near-optimal finite-time sample complexity with robustness and collaboration benefits. Notably, both guarantees hold with high probability and require only $\tilde{O}(1)$ rounds of communication—an appealing property given the communication bottlenecks in FL.

■ **Decentralized Q-Learning over Random Networks with Near-Optimal Rates**
We consider a decentralized reinforcement learning setup with $M$ agents collaboratively interacting with a common Markov Decision Process. We investigate the potential for sample-complexity speedups in this distributed setting, where agents exchange information over a random network. To this end, we propose `Decentralized Fed-Q`, a decentralized Q-learning algorithm that integrates model-based and model-free techniques. We establish that `Decentralized Fed-Q` achieves near-optimal finite-time sample complexity while leveraging collaboration among agents.

■ **Learning Robust Trading Policies under Adversarial Market Signal Corruption**
Deep Q-Learning (`DQN`) has become a widely used and effective method for algorithmic trading, enabling agents to learn sequential decision-making strategies directly from market data. Its ability to model complex temporal patterns and adapt to evolving financial environments makes it a strong candidate for real-world deployment. However, financial datas encountered in practice are often noisy or corrupted—either due to technical issues, reporting errors, or even adversarial manipulation. Such data imperfections can significantly impair the learning process and arbitrarily degrade the performance of standard `DQN`-based strategies. To address this challenge, we propose a robust variant of `DQN` designed to operate effectively in environments with adversarially corrupted signals.

## Projects

- Federated MARL-GYM : We introduce a custom multi-agent reinforcement learning environment built with Gymnasium and Pygame, designed for evaluating federated RL (FRL) algorithms. The environment models a grid world where multiple agents navigate to accomplish spatially distributed tasks, like reaching delivery points.

## Skills

Programming Languages: Python, MatLab, Simulink, C++.
Softwares and Libraries: Tensorflow, PyTorch, Scikit-learn, Numpy, Pandas, Gymnasium, MuJoCo.
Mathematical Skills: Linear Algebra, Probability, Robust Statistics, Stochastic Optimization.
Research Skills: Reinforcement Learning, Statistical Learning Theory, Optimization, Control Theory.

## Relevant Courses

Learning Theory: Theoretical Foundations of Large-Scale Machine Learning, Machine Learning for Signal Processing, Theory and Applications of Bayesian Learning, Physics Modelling with Neural Networks, Deep Learning and Neural Networks.
Mathematics: Analysis, Probability and Stochastic Process, Stochastic Models and Applications, Convex Optimization for Data Science, Detection and Estimation Theory.
Control Theory: Dynamics of Linear Systems, Networked and Distributed Control, Formal Analysis for Control Theory.

## Academic/Professional Services

- Served as the Head Teaching Assistant for ECE 516: Systems and Control Engineering and ECE 308: Elements of Control Systems at the Department of Electrical and Computer Engineering, North Carolina State University, during the Spring and Fall of 2025.
- Served as a reviewer for 30+ papers in multiple flagship control/ ML venues, including the American Control Conference (ACC), the IEEE Conference on Decision and Control (CDC), Learning for Dynamics and Control (L4DC), Annual Conference on Neural Information Processing Systems(NeuRIPS), Journal of Machine Learning Research (JMLR), Transactions in Machine Learning Reserach (TMLR), IEEE Transactions in Automatic Control (TACON), Transactions in Signal and Information Processing over Networks (TSIPN), and Transactions in Signal Processing (TSP).

## Awards

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| ACC 2026 Travel Award | May 2026 |
| L4DC 2025 Student Support Grant | May 2025 |
| NESCW 2025 Student Support Grant | May 2025 |
| IEEE CDC 2024 Student Support Award | August 2024 |
| NC State ECE Student Research Support Award | August 2024 |
| College of Engineering Graduate Merit Award | August 2023-24, 2024-25 |