Bhavini Jeloka

PhD Candidate

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Education

Georgia Institute of Technology — Atlanta, GA
Ph.D. in Machine Learning · GPA: 3.92/4.0 — 2023 – Present
Advisor: Dr. Panagiotis Tsiotras

Indian Institute of Technology Bombay — Mumbai, India
M.S. in Systems and Control Engineering · GPA: 9.55/10 — 2018 – 2023
Advisors: Dr. Ravi Banavar, Dr. Florentina Nicolau & Dr. Adnane Saoud

B.S. in Mechanical Engineering · GPA: 9.55/10 — 2018 – 2023
Advisors: Dr. Ravi Banavar & Dr. D.H.S. Maithripala

Research Experience

Graduate Research Assistant — 2023 – Present
Georgia Institute of Technology — Atlanta, GA

- Risk-Averse Multi-Population Mean-Field Games: Developed a risk-averse multi-population MFG framework in which populations optimize worst-case rewards over dynamically feasible ambiguity sets of mean-field flows. Used occupation measures and set-valued analysis to establish existence of a novel risk-averse multi-population mean-field equilibrium.
- Risk-Averse Mean Field Games & Bounded Rationality: Introduced initial-distribution risk aversion and bounded rationality into MFGs. Established equilibrium existence and proved convergence of fixed-point iteration and fictitious play to a mean-field risk-averse quantal response equilibrium.
- Mean-Field Multi-Agent Reinforcement Learning: eveloped MF-MAPPO, a mean-field extension of PPO for learning large-scale competitive team behaviors with mean-field interactions. Extended the framework to partial observability using gradient regularization and deployed policies using estimated mean fields.
- Swarm Tactics & Dynamic Task Allocation: Formulated decentralized dynamic task allocation strategies for autonomous, heterogeneous, multi-agent swarms.

Graduate Research Assistant — 2022 – 2023
Indian Institute of Technology, Bombay — Mumbai, India

- Developed a novel adaptive cruise control framework for systems subject to unknown dynamics by combining differential flatness with Gaussian Process regression.
- Formulated a robust GP-backed control law for set-point regulation and trajectory tracking, demonstrating numerical error convergence to zero.

Visiting Research Intern — 2022
CentraleSupélec — Paris, France

- Surveyed differential flatness and adaptive/learning-based control methods to inform controller design.
- Used Gaussian Processes to model unknown system dynamics and derived high-probability robust control guarantees by mapping uniformly ultimately bounded parameters to Gaussian Process variables.

Research Intern — 2021
California Institute of Technology | Advisor: Dr. Rana Adhikari — Pasadena, CA [Remote]

- Simulated LIGO single-loop suspended mirror dynamics to analyze step, impulse, and frequency responses; designed a velocity damping loop that suppressed peak resonance and ensured system stability.
- Performed system identification on a 2-DOF Simple Harmonic Oscillator under white noise by maximizing Fisher Information to extract the optimal input excitation spectrum and minimize covariance.
- Extended curve-fitting and least-squares algorithms into a general system identification framework for Single-Input Single-Output Linear Time-Invariant systems, validating on LIGO mirror suspensions.

Undergraduate Research Assistant 2019 – 2022
Indian Institute of Technology, Bombay Mumbai, India

- Formulated 3D rigid-body dynamic models incorporating pendulum and spring suspensions using Euler's equations and geometric mechanics.
- Synthesized an asymptotically stable nonlinear controller on $\mathbb{R}^3 \times SO(3)$, proving almost global asymptotic stability via Lyapunov stability criteria and LaSalle's invariance principle.

Honors and Awards

- **Overall Outstanding Student, Mechanical Engineering** 2023
  Indian Institute of Technology, Bombay
- **Mechanical Department Research Award** 2022
  Indian Institute of Technology, Bombay
- **Best Speaker: ML/AI Category** 2022
  ResCon | IIT Bombay
- **Best Speaker: Dynamics and Control Category** 2021
  Virtual Research Symposium by Students | IIT Bombay in collaboration with NTU Singapore
- **LIGO Summer Undergraduate Research Fellowship** 2021
  California Institute of Technology
- **Research Internship for Young Academics Scholarship** (Declined) 2021
  The Ohio State University
- **Undergraduate Research Award 01** 2021
  Indian Institute of Technology, Bombay
- **Institute Academic Prize** 2019 & 2020
  Indian Institute of Technology, Bombay

List of Publications and Preprints

- **Jeloka, B.**, Ganguly, S., & Tsiotras, P. (2026). Beyond Nominal Equilibria: Risk-Averse Multi-Population Mean-Field Games. arXiv preprint arXiv:2610.09244
  Preliminary version accepted at Dynamics at the Frontiers of Optimization, Sampling, and Games Workshop, NeurIPS, 2026.
- **Jeloka, B.**, Guan, Y., & Tsiotras, P. (2025). Learning Large-Scale Competitive Team Behaviors with Mean-Field Interactions. arXiv preprint arXiv:2504.21164 [**Accepted at NeurIPS 2026**]
  Preliminary version presented at the Workshop on Adaptive and Learning Agents, AAMAS, 2025.
- **Jeloka, B.**, Guan, Y., & Tsiotras, P. (2026). Robust Mean-Field Games with Risk Aversion and Bounded Rationality. arXiv preprint arXiv:2602.13353 [**Accepted at CDC 2026**]
- **Jeloka, B.**, Nicolau, F., Saoud, A., & Banavar, R. N. (2024, July). Data-driven control of adaptive cruise control systems using differential flatness and Gaussian Processes. In 2024 American Control Conference (ACC) (pp. 5094-5099). IEEE.
- **Jeloka, B.**, Nicolau, F., Saoud, A., & Banavar, R. N. (2024, August). Trajectory Tracking for an Adaptive Cruise Control System Using Differential Flatness and Gaussian Processes. In 2024 28th International Conference on Methods and Models in Automation and Robotics (MMAR) (pp. 304-309). IEEE.
- **Jeloka, B.**, Banavar, R. N., & Maithripala, D. H. S. (2021, June). Almost Globally Asymptotically Stable Switched PD Control for a Spherical Pendulum. In 2021 29th Mediterranean Conference on Control and Automation (MED) (pp. 1258-1263). IEEE.
- Ranade, A. R., Sikka, A., (incl. **Jeloka, B.**)(2021). Survey and Analysis of Payloads for Missions on PSLV's Orbital Platform. In AIAA Scitech 2021 Forum (p. 0691).

Academic Services

Reviewer in Journals and Conference Proceedings

- Dynamics at the Frontiers of Optimization, Sampling, and Games Workshop, NeurIPS (2026)

- IEEE Robotics and Automation Letters (2025, 2026)
- IEEE American Control Conference (2025, 2026)
- Automatica (2025)
- IEEE Control Systems Letters (2025)
- International Conference on Robotics and Automation (2025)
- IEEE Transactions on Aerospace and Electronic Systems (2025)

Technical Skills

Programming Languages: Python, MATLAB, HTML, C++
Tools & Libraries: PyTorch, MOSEK, GitHub, ROS, Linux
Applications: Game Theory for Large Population Systems, Multi-Agent Decision Making and (Deep) Reinforcement Learning, Path Planning and Control
Relevant Graduate Courses:

- **Machine Learning & Optimization:** Deep Learning, Generative and Geometric Deep Learning, Statistical Machine Learning, Deep Reinforcement Learning, Convex Optimization, Advanced Intelligent and Learning Agents, Games and Information
- **Mathematics & Probability:** Real Analysis (Measure Theory), High Dimensional Probability, Mathematical Foundations of Machine Learning, Optimal Transport, Differential Geometry
- **Control Theory:** Optimal Control, Advanced Nonlinear Control, Mathematical Principles of Autonomy, Intelligent Feedback and Control, Introduction to Stochastic Control

Teaching and Mentoring Experience

Graduate Teaching Assistant Present
Georgia Institute of Technology Atlanta, GA

- Optimal Guidance and Control

Graduate Teaching Assistant 2022 – 2023
Indian Institute of Technology, Bombay Mumbai, India

- Foundations of Intelligent and Learning Agents
- Mathematical Structures for Control
- Sequential Learning and Prediction

Institute Student Mentor & Department Academic Mentor Program Coordinator 2021 – 2023
Indian Institute of Technology, Bombay Mumbai, India

- Direct-managed a team of 37 student mentors providing academic guidance and counsel to 280+ underclassmen, earning Special Recognition for exceptional mentorship and leadership.

Extra-Curricular Activities

- **Athletics Coordinator**, Asha for Education 2025 – 2026
  Organized athletic and fundraising events for the non-profit organization supporting education initiatives.
- **Subsystem Engineer**, IIT Bombay Student Satellite Program 2019 – 2021
  Contributed to the Guidance, Navigation, and Control (GNC) and Mechanical subsystems.
- Completed the Publix Atlanta Half-Marathon. 2025, 2026