Jietian Liu

Electrical and Computer Engineering

608-335-9833 jietian@umich.edu linkedin.com/in/jietian-liu-65612b214

EDUCATION

University of Michigan-Ann Arbor **Aug. 2024 – present**
Ph.D. candidate in Electrical and Computer Engineering *GPA: 4.0/4.0*

University of Michigan-Ann Arbor **Sep. 2022 – May 2024**
M.S. in Electrical and Computer Engineering *GPA: 4.0/4.0*

University of Wisconsin-Madison **Sep. 2019 – Dec. 2021**
B.S. in Applied Mathematics, Engineering, and Physics *GPA: 4.0/4.0*

RESEARCH INTERESTS

- Robust and Optimal Control
- Disturbance Preview
- Optimization

RESEARCH EXPERIENCE

Graduate Researcher | *Advisor: Prof.* ***Peter Seiler*** **Sep. 2022 – present**

- ***Robust Regret Optimal Control***
  Developed general regret control methods for uncertain discrete-time LTI systems with both nominal and uncertainty-dependent baselines. Converted the problem into a standard H_∞ synthesis via spectral factorization and solved with DK-iteration. Used Boeing 747 and Quarter Car examples to generate Pareto curves illustrating trade-offs between additive and multiplicative regret formulations, demonstrating robustness, adaptability, and performance–efficiency trade-offs.
- ***Preview-Based Regret Optimal Control***
  Developed regret-based control frameworks for discrete-time systems with disturbance preview, unifying stochastic (H_2) and worst-case (H_∞) formulations. Designed preview controllers that exploit finite-horizon future information and proved convergence of both the controller and closed-loop cost to optimal noncausal benchmarks as the preview horizon increases. Validated results through simulations on Boeing 747 flight control and quarter-car models, demonstrating that finite preview information is sufficient to achieve near–noncausal performance, with performance converging to the optimal noncausal benchmark as the preview horizon increases.

Quant Trading Intern – Derivatives | ***CITIC Securities*** **Dec. 2025 – Feb. 2026**

- Developed a low-latency trading infrastructure by implementing a FIX protocol–based trading gateway from scratch, supporting order submission, cancellation, execution reports, and market data handling. Designed and implemented multiple algorithmic execution strategies (e.g., TWAP, VWAP, POV) with parameterized control and risk constraints. Built and integrated trading strategies into the production trading system, validating robustness, execution quality, and end-to-end system reliability in a live trading environment.

Course Project | *Instructor: Prof.* ***Tulga Ersal*** **Jan. 2025 – May. 2025**

- ***Preview-Based Optimal Control for Vehicle Dynamics and Active Suspension***
  Designed and evaluated optimal and stochastic control strategies for vehicle systems, with a focus on active suspension control using disturbance preview. Implemented preview-based LQR controllers and validated their benefits on a quarter-car model, demonstrating improved ride comfort and performance as preview information increases. The project emphasized the practical impact of optimal control and preview sensing in vehicle dynamics and control applications.

Course Project | *Instructor: Prof.* ***Chris Vermillion*** **Sep. 2024 – Dec. 2024**

- ***Safety-Critical Planning via Model Predictive Control***
  Completed a graduate-level project on safety-critical planning using Model Predictive Control (MPC) with discrete-time Control Barrier Functions (CBFs). Formulated constrained finite-horizon optimization problems to generate safe control and trajectory plans under state and input constraints. Implemented optimization-based planners in MATLAB and analyzed feasibility–safety trade-offs, demonstrating how look-ahead planning via MPC improves safety and feasibility compared to myopic control strategies under actuation limits.

Course Project | *Advisor: Prof.* ***Maani Ghaffari*** **Sep. 2023 – Dec. 2023**

- ***Robust Perception for Self-Driving Vehicles under Adverse Weather***
  Conducted a team project on monocular 3D object detection for autonomous driving, focusing on improving robustness under adversarial weather (fog). Built upon a state-of-the-art monocular 3D detection model and developed data-augmentation strategies using monocular depth estimation and synthetic fog generation. Evaluated robustness on adverse-weather benchmarks and achieved top leaderboard performance, demonstrating the effectiveness of targeted data augmentation for perception robustness in self-driving scenarios.

Researcher Internship | *Advisor: Prof.* ***Jennifer Choy*** **Jan. 2022 – Aug. 2022**

- Modeled two electric dipoles in shallow defects to determine decay rates via phonon-assisted exchange and radiative/non-radiative processes. Derived distance-dependent field intensities for NV centers in any orientation using Poynting vectors, and validated through Lumerical and MATLAB simulations generating 3D far-field patterns.

Undergraduate Researcher | *Advisor: Prof.* ***Jennifer Choy*** **Sep. 2020 – Dec. 2021**

- Determined electric field patterns of perpendicular/parallel dipoles near an interface using Poynting vector analysis, validating MATLAB models with Lumerical simulations. Generalized depth-dependent radiative lifetimes for NV centers in multiple diamond cuts and optimized multilayer coatings to enhance fluorescence, confirming results via simulation.

PUBLICATIONS

1. Maryam Zahedian, Jietian Liu, Ricardo Vidrio, Shimon Kolkowitz, and Jennifer Choy. Modeling of Radiative Emission from Shallow Color Centers in Single Crystalline Diamond. *Laser & Photonics Reviews*, 17, 02 2023
2. Jietian Liu and Peter Seiler. Robust Regret Optimal Control. *International Journal of Robust and Nonlinear Control*, 34(7):4532–4553, 2024
3. Jietian Liu, Laurent Lessard, and Peter Seiler. Stochastic LQR Design with Disturbance Preview, 2024 arXiv:2412.06662, (Under review at Automatica)
4. Jietian Liu and Peter Seiler. Robust Regret Optimal Control with Uncertainty-Dependent Baseline, 2025, (Accepted by 2026 American Control Conference (ACC)).
5. Jietian Liu and Peter Seiler. Regret of H_∞ Preview Controllers, 2025, (Accepted by 2026 American Control Conference (ACC)).

PROFESSIONAL SERVICE

- Reviewer for Automatica (Elsevier Journal)
- Reviewer for American Control Conference (ACC)

CORE COURSES

- Applied Optimal Control
- Convex Opt Mthds in Con
- Nl Sys&Con
- Con Sys Anlys&Des
- Linear Systems Theory
- Discrete Event System
- Linear Feedback Control
- Robotic Kinemat Dynam
- Adv Robot Oper Sys
- Stochastic Control
- Self Driving Cars
- Appl Mathematical Analysis
- Analysis
- Numerical Analysis
- Differential Geometry
- Stochastic Process
- Mechanics
- Electromagnetic Field
- Intro to Plasma
- Atomic and Quantum Physics
- Mtrx Mthds in Mach Learn
- Prob&Info Theory in Mach Learn
- Image Processing
- Intro to Optimization
- Intro-Artificial Neural Ntwrks
- Signal Processing
- Analog&Digital Signal Process

TECHNICAL SKILLS

Computer Skills: C, C++, Java, MATLAB, Mathematica, Python, R, Julia, JavaScript, Lumerical
Language: English, Mandarin