

# Yuanji Zou

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## HIGHLIGHTS

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Skills: Control system design, system modeling and simulation, optimization, robust stability analysis, computer-aided design, vehicle experimentation skills, machining skills

Programming Languages: C/C++, MATLAB, Python

Office Applications: Latex, Photoshop, SolidWorks

## EDUCATION

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University of Minnesota (U of M), Minneapolis, MN, U.S.A.

Expected May 2025

- Ph.D. Candidate in Mechanical Engineering, Overall GPA: 3.9/4.0 Advisor: Dr. N. Elia

Tsinghua University (THU), Beijing, China

Jul 2019

- B.E. in Automotive Engineering. Overall GPA: 3.7/4.0, Ranking 7<sup>th</sup> /71 (top 10%)

Tsinghua University (THU), Beijing, China

Jul 2019

Joint Degree (Honors Degree) in Xinya College

## PUBLICATION & PATENT

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- Y. Zou and N. Elia, "Robust mean square stability," *2022 European Control Conference (ECC)*, London, United Kingdom, 2022, pp. 1623-1628.
- Y. Zou and N. Elia, "Algebraic Riccati equation approach for network distributed optimal H<sub>2</sub> synthesis," *2024 Conference on Decision and Control (CDC)*, Milan, Italy, 2024. (Accepted for publication.)
- Y. Zou and N. Elia, "A synthesis approach for distributed H<sub>2</sub> control problems with communication delays," *2024 Allerton Conference (CDC)*, Urbana, USA, 2024. (Accepted for publication.)
- L. Meng, Y. Zou, Y. Qin, Z. Hou. A new electric wheel and optimization on its suspension parameters. *Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering*. 2020;234(12):2759-2770.

## RESEARCH INTEREST

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- Control theories, Network control systems, optimal control
- Stochastic systems, uncertain systems, robust stability

## RESEARCH EXPERIENCES

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University of Minnesota, Minneapolis, MN, U.S.A.

Aug 2019 - Present

Graduate Research Assistant

Advisor: Dr. N. Elia

**Robust Mean Square Analysis**

2020-2022

- Characterized Uncertain Multi-Agent Dynamical Systems: Analyzed systems with unmodeled dynamics and stochasticity induced by communication intermittency.
- Defined Robust Mean Square Stability (RMSS): Introduced RMSS to evaluate robustness against model uncertainty and randomness.
- Developed RMSS Evaluation Techniques: Applied frequency-domain methods and

linear matrix inequalities to assess RMSS margins.

- Designed and Validated Controllers: Synthesized suboptimal controllers and validated performance through practical implementation on a pendulum robot system.

### **Networked Distributed Controller Design**

2022 - Present

- Modeled Multi-Agent Systems: Developed mathematical models for networked multi-agent systems and distributed controllers.
- Designed  $H_2$  Optimal Control Algorithm: Established an algorithm for distributed  $H_2$  optimal synthesis tailored to multi-agent networks.
- Achieved Networked Implementation: Implemented the optimal controller within the networked system, ensuring internal stability and practical feasibility.
- Validated via Practical Application: Demonstrated the algorithm's effectiveness using a cooperative platoon control system.

**University of California, Berkeley, CA, U.S.A.**

**Jul 2018 - Sept 2018**

*Research Student*

### **Simulation of Urban Driving Behavior**

Advisor: Dr. M. Tomizuka

- Developed Data Handling Tools: Programmed scripts to auto-unpack and process ROS .bag files.
- Modeled Vehicle Dynamics: Established a discrete time 11-DoF dynamic model for 4-wheel cars with suspensions in C++ and integrated into an auto-driving simulator.
- Designed Robust PID Controller: Engineered and optimized a robust PID controller to achieve precise trajectory tracking in urban driving scenarios.

**Tsinghua University, Beijing, China**

**Dec 2017 - Jun 2019**

*Research Student*

### **Electric Wheels Design**

Advisor: Dr. Z. Hou

- Developed Prototype for Electric Wheel: Designed and fabricated a new electric wheel prototype using metal 3D printing for EV/HEV applications.
- Optimized Vibration Performance: Analyzed the amplitude-frequency characteristics of the in-wheel motor's vertical vibration and optimized its performance by fine-tuning suspension parameters using nonconvex optimization.

## **ACTIVITIES & WORK EXPERIENCE**

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**Teaching Assistant of course ME 2011, U of M**

**Aug 2019 - Present**

- Led weekly lab. Held office hours. Planned discussion.

**“Challenge Cup” National Undergraduate Scientific Competition, Tsinghua University**

**Nov 2019**

- Designed and assembled an in-wheel driving, all wheel steering vehicle chassis equipped with simple auto-driving system
- The vehicle was able to do spin turn and lateral translation.
- Won the First Prize in the competition.

**“Sunshine Boat” Volunteer Program, Tsinghua University**

**Jul 2016**

- Raised donations for orphaned children in the Hunan Province.
- Participated in voluntary physical education in the Hunan Province.
- Conducted research on the mental and physical health of orphaned children