Yuhao Zhang

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1513 University Ave, Room 3158, Madison, WI 53706

Education

University of Wisconsin-Madison — Madison, WI
Doctor of Philosophy in Mechanical Engineering — *Sep 2020 – Present*
- Advisor: Prof. Xiangru Xu

University of Michigan-Ann Arbor — Ann Arbor, MI
Master of Science in Engineering in Mechanical Engineering — *Sep 2017-May 2019*
- Advisor: Prof. Necmiye Ozay and Prof. Jean-Baptiste Jeannin

Peking University — Beijing, China
Bachelor of Engineering in Energy and Power Engineering — *Sep 2013-Jun 2017*
- Advisor: Prof. Jianchun Mi
- Thesis: Experimental and Simulation Research on MILD Combustion Properties in Methanol Boilers
- Double Degree in Economics

Experience

University of Wisconsin-Madison — Madison, WI
Research Assistant at Autonomous & Resilient Controls Lab — *Sep 2020-Present*
- Designed controller for safety-critical systems with measurement and actuation uncertainties, and tested it in both simulations and quadcopter experiments.
- Proposed provable stability conditions for Neural Network Control Systems with dynamics uncertainties.
- Developed optimization-based techniques for formal safety verification and reachability analysis of controlled systems with Artificial Neural Network components.

University of Michigan-Ann Arbor — Ann Arbor, MI
Research Associate — *Sep 2018-Jun 2020*
- Designed a high-level software architecture for autonomous taxiing and landing of aircraft.
- Implemented separate modules for the proposed architecture, including a path-finding algorithm, a taxi-way waypoint generator, and a low-level tracking controller.
- Employed falsification techniques to evaluate the performance of the designed controllers.

University of Michigan-Ann Arbor — Ann Arbor, MI
Grader - EECS 560 "Linear Systems Theory" — *Jan 2019-May 2019*
- Helped the course instructor with assignment grading.

University of Michigan-Ann Arbor — Ann Arbor, MI
Course Project - Self-driving Cars: Perception and Control — *Sep 2017-Dec 2017*
- Designed a controller for a bicycle model to follow a pre-defined track as rapidly as possible.
- Developed a control algorithm based on MPC to avoid obstacles known only at run-time.

Peking University — Beijing, China
Undergraduate Research Assistant at Laboratory of Turbulence & Complex Systems — *Feb 2016-Jun 2017*
- Simulated combustion in traditional boilers and summarize the environmental influence of pollution.
- Experimental and simulation study of methanol MILD combustion in boilers.

The Chinese University of Hong Kong — Hong Kong
Summer Research Intern at Department of Mechanical and Automation Engineering — *Jul 2016-Aug 2016*
- Worked on harvesting kinetic energy from human motion and vibrations, advised by Prof. Wei-Hsin Liao.

REPRESENTATIVE PUBLICATIONS

Yuhao Zhang, Xiangru Xu, ***"Robust Stability of Neural Feedback Systems with Interval Matrix Uncertain-ties"***, Automatica, 2024. (Provisionally accepted)

Yuhao Zhang, Hang Zhang, Xiangru Xu, ***"Reachability Analysis of Neural Network Control Systems with Tunable Accuracy and Efficiency"***, IEEE Control Systems Letters, 8: 1697-1702, 2024.

Yuhao Zhang, Hang Zhang, Xiangru Xu, ***"Backward Reachability Analysis of Neural Feedback Systems Using Hybrid Zonotopes"***, IEEE Control Systems Letters, 7: 2779-2784, 2023.

Yuhao Zhang, Xiangru Xu, ***"Safety Verification of Neural Feedback Systems Based on Constrained Zono-topes"***, IEEE Conference on Decision and Control, Cancun, Mexico, page 2737-2744, 2022.

Yuhao Zhang, Sequoyah Walters, Xiangru Xu, ***"Control Barrier Function Meets Interval Analysis: Safety-Critical Control with Measurement and Actuation Uncertainties"***, American Control Conference, Atlanta, GA, USA, page 3814–3819, 2022.

Sara Shoouri, Shayan Jalili, Jiahong Xu, Isabelle Gallagher, **Yuhao Zhang**, Joshua Wilhelm, Jean-Baptiste Jeannin, Necmiye Ozay, ***"Falsification of a Vision-based Automatic Landing System"***, AIAA SciTech Forum, 2021.

Yuhao Zhang, Guillaume Poupart-Lafarge, Huaiyuan Teng, JoshuaWilhelm, Jean-Baptiste Jeannin, Necmiye Ozay, Eelco Scholte, ***"A software architecture for autonomous taxiing of a"***, AIAA SciTech Forum, 2020.

Skills

Software/Programming: MATLAB, Python, C++, C, Simulink, SolidWorks, PyTorch, Linux, CUDA, FEM

Hardware: Crazyflie quadrotor, Raspberry Pi, Arduino

Leadership and Community Service

Engineering EXPO — Madison, WI
Student Exhibitor — *Apr 2023*
- Demonstrated quadrotor experiments to middle school students, earning the Honorable Mention Award.

Practice Department in College of Engineering — Beijing, China
Vice President — *Sep 2014-Jun 2015*
- Organized summer-vacation internship programs and scheduled local company visits.

Student Life Department in College of Engineering — Beijing, China
Core Member — *Sep 2013-Jun 2014*
- Organized festival celebration activities.

Awards and Achievements

Student Research Grants Competition Award
University of Wisconsin-Madison Graduate School — *Apr 2023*

LeRoy Fellowship
Department of Mechanical Engineering, University of Wisconsin-Madison — *Sep 2023*

XIA Shouyu and HUANG Yuqin Scholarship
College of Engineering, Peking University — *May 2016*

Community Service Award
College of Engineering, Peking University — *Dec 2015*

Second prize in National High School Mathematics Competition
Chinese Mathematical Society — *Nov 2012*

Courses

Nonlinear Optimization, Dynamic Programming, High Performance Computing, Advanced Computational Dynamics, Linear System Theory, Robot Kinematics and Dynamics, Self-Driving Cars: Perception and Control