Zhuoyuan "Jacob" WANG

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Research Interests

My interests focus on developing safe and efficient control and AI solutions with long-term guarantees and real-time efficiency in high-dimensional and interactive systems, ranging from theory to applications.

Education

Carnegie Mellon University, Pittsburgh, PA, United States — Feb 2021 – May 2026

Ph.D., Electrical and Computer Engineering.

Advisor: Yorie Nakahira

Tsinghua University, Beijing, China — Sep 2016 – Jun 2020

B.E., Automation.

Advisor: Gao Huang, Yilin Mo

Professional Experience

Mitsubishi Electric Research Laboratories, Cambridge, MA, United States — May 2025 – Aug 2025

Research Intern, Computational Sensing Group.

Advisor: Saviz Mowlavi

Washington University in Saint Louis, St. Louis, MO, United States — May 2019 – Aug 2019

Research Intern, Applied Mathematics Lab.

Advisor: Jr-Shin Li

Honors and Awards

Michel and Kathy Doreau Graduate Fellowship at Carnegie Mellon University	2022
CIT Dean's Fellowship at Carnegie Mellon University	2021
Mathematical Contest in Modeling (MCM) Honorable Mention	2019
Contemporary Undergraduate Mathematical Contest in Modeling (CUMCM) First Prize	2018
Tsinghua University Scholarship - Excellent Academic Performance	2018

Selected Publications

Wang, Z., Chern, A., & Nakahira, Y. "Generalizable physics-informed learning for stochastic safety-critical systems." In IEEE Transaction on Automatic Control (TAC), 2025. Short version in Learning for Dynamics and Control Conference (L4DC), 2023.

Wang, Z.*, Jing, H.*, Kurniawan, C., Chern, A., & Nakahira, Y. "Myopically verifiable probabilistic certificates for safe control and learning." Under Review for IEEE Transaction on Automatic Control (TAC). Short version in IEEE American Control Conference (ACC), 2022.

Wang, Z., Keller, R., Deng, X., Hoshino, K., Tanaka, T., & Nakahira, Y. "Physics-informed representation and learning: Control and risk quantification." In AAAI Conference on Artificial Intelligence, 2024.

Wang, Z., Romagnoli, R., Azizzadenesheli, K., & Nakahira, Y. "Neural spline operators for risk quantification in stochastic systems." In IEEE Conference on Decision and Control (CDC), 2025.

Full Publications

Journal Publications

Wang, Z., Chern, A., & Nakahira, Y. "Generalizable physics-informed learning for stochastic safety-critical systems." In IEEE Transaction on Automatic Control (TAC), 2025.

Hoshino, K., **Wang, Z.**, & Nakahira, Y. "Scalable long-term safety certificate for large-scale systems." In IEEE Control Systems Letters, 2023.

Wang, Z., Tanaka, T., Chen, Y., & Nakahira, Y. "Multi-level multi-fidelity methods for path integral and safe control." Under Review for Automatica.

Wang, Z.*, Jing, H.*, Kurniawan, C., Chern, A., & Nakahira, Y. "Myopically verifiable probabilistic certificates for safe control and learning." Under Review for IEEE Transaction on Automatic Control (TAC).

Shi, W., Huang, G., Song, S., **Wang, Z.**, Lin, T., & Wu, C. "Self-supervised discovering of interpretable features for reinforcement learning." In IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2020.

Conference Proceedings

Wang, Z., Romagnoli, R., Azizzadenesheli, K., & Nakahira, Y. "Neural spline operators for risk quantification in stochastic systems." In IEEE Conference on Decision and Control (CDC), 2025.

Wang, Z., Romagnoli, R., Ratchford, J., & Nakahira, Y. "Physics-informed deep B-spline networks for dynamical systems." Under Review, 2025.

Wang, Z.*, Deng, X.*, Hoshino, H.*, & Nakahira, Y. "Online adaptive probabilistic safety certificate with language guidance." Under Review, 2025.

Wang, Z., Jia, T., Rajborirug, P., Ramesh, N., Okuda, H., Suzuki, T., Kar, S., & Nakahira, Y. "Safe driving in occluded environments." Under Review, 2025.

Wang, Z., Keller, R., Deng, X., Hoshino, K., Tanaka, T., & Nakahira, Y. "Physics-informed representation and learning: Control and risk quantification." In AAAI Conference on Artificial Intelligence, 2024.

Pandya, R.*, **Wang, Z.***, Nakahira, Y., & Liu, C. "Towards proactive safe human-robot collaborations via data-efficient conditional behavior prediction." In IEEE International Conference on Robotics and Automation (ICRA), 2024.

Wang, Z., & Nakahira, Y. "A generalizable physics-informed learning framework for risk probability estimation." In Learning for Dynamics and Control Conference (L4DC), 2023.

Gangadhar, S.*, **Wang, Z.***, Poku, K., Yamada, N., Honda, K., Nakahira, Y., Okuda, H., & Suzuki, T. "An occlusion- and interaction-aware safe control strategy for autonomous vehicles." In IFAC World Congress, 2023.

Wang, Z.*, Jing, H.*, Kurniawan, C., Chern, A., & Nakahira, Y. "Myopically verifiable probabilistic certificate for long-term safety." In IEEE American Control Conference (ACC), 2022.

Gangadhar, S.*, **Wang, Z.***, Jing, H., & Nakahira, Y. "Adaptive safe control for driving in uncertain environments." In IEEE Intelligent Vehicles Symposium (IV), 2022.

* indicates equal contribution.

Funding Proposal Development

"New Sampling Paradigms for Safety-constrained, High-dimensional, and Partially Observable Path Integral Control." NSF DCSD, 2025.

"Probabilistic Safety Certificates for Data-Driven Perception and Control for Multi-agent Systems." NSF CPS, 2022.

Talks and Presentations

"Deep B-Spline Representations in Physics-Informed Neural Networks and Operators" 2025
Mitsubishi Electric Research Laboratories, Cambridge, MA

"Myopically Verifiable Probabilistic Certificate for Long-term Safety" 2022
American Control Conference (ACC), Atlanta, GA

"Long-term Safety for Autonomous Systems" 2022
MIT REALM Lab, Cambridge, MA

Teaching Experience

CMU 18-370: Fundamentals of Control, lead TA and guest lecturer 2023

CMU 18-475: Autonomous Control Systems, lead TA 2023

Tsinghua: Digital Circuits Systems and Design, TA 2019
National Exemplary Course of China

Service & Outreach

Faculty Search Council (CMU ECE) 2024, 2025

IEEE Outreach Program, CMU Chapter 2025

Conference Reviewer: CDC 2023–2025, ACC 2024–2026, NECSYS 2025, AAAI 2024–2026, ICLR 2025-2026, NeurIPS 2025, RSS 2023, L4DC 2026, ECC 2026

Journal Reviewer: TAC, RICO, CONES

Mentorship

Reece Keller — Ph.D., CMU Neuroscience	2023
Xiyu Deng — Ph.D., CMU Electrical and Computer Engineering	2023
Siddharth Gangadhar — M.S., CMU Electrical and Computer Engineering	2021 - 2023
Kofi Puku — M.S., CMU Electrical and Computer Engineering	2022 - 2023
Tongyao Jia — M.S., CMU Electrical and Computer Engineering	2024 -
Lin Zhan — M.S., CMU Electrical and Computer Engineering	2024 - 2025
Neeraj Ramesh — Undergrad, CMU Electrical and Computer Engineering	2023 - 2024

Mentored students include 4 individuals from underrepresented groups in STEM.

Last updated: November 24, 2025