Jason Zhenhao Zhou

1513 University Ave, Madison, WI 53706

+1 6085150802 | zzhou292@wisc.com | github.com/zzhou292 | linkedin.com/in/zhenhaozhou/ | www.researchgate.net/profile/Jason-Zhou-21

Personal Profile

I'm a Ph.D. graduate student double-major in Mechanical Engineering and Computer Science at the University of Wisconsin Madison. My research focuses on the development and validation of digital twins and their applications in control designs of robotic systems and autonomous vehicles.

Education

University of Wisconsin-Madison *Madison, WI*

Doctor of Philosophy in Mechanical Engineering *Jan 2021 - May 2025*

University of Wisconsin-Madison *Madison, WI*

Master of Science in Mechanical Engineering *Jan 2021 - May 2023*

University of Wisconsin-Madison *Madison, WI*

Master of Science in Computer Science *Jan 2021 - Dec 2022*

- GPA: 3.9.
- Graduated on Dec. 18, 2022.
- **Courses:** Data Science, Machine Learning, Wireless Communication, Computer Networks, Distributed Computing, Computer Architectures.

University of Wisconsin-Madison *Madison, WI*

Bachelor of Science in Mechanical Engineering *Sep 2017 - Dec 2020*

- GPA: 3.8.
- Graduated on Dec. 13, 2020.
- Graduated with distinctive scholastic achievement awarded by College of Engineering.
- **Courses:** Robotic Systems, Manufacturing Automation, Design Optimization, Thermal Dynamics, Fluid Dynamics, Static and Dynamic Systems

University of Wisconsin-Madison *Madison, WI*

Bachelor of Science in Computer Science *Sep 2017 - Dec 2020*

- GPA: 3.8.
- Graduated on Dec. 13, 2020.
- Graduated with Distinctive Scholastic Achievement awarded by College of Letters & Science.
- **Courses:** Machine Learning, Computer Vision, Computer Graphics, Operating System, Optimization Theory, Database

Work Experience

Simulation-Based Engineering Lab at UW-Madison *Madison, WI*

Graduate Research Assistant *Jan 2021 - Present*

- Advisor: Professor Dan Negrut.
- Autonomous vehicle coordination and simulation of vehicle dynamics, leveraging simulation fidelity and real-time performance for Human-In-The-Loop(HIL) and Software-In-The-Loop(SIL) applications. Head developer of chrono::HIL, a submodule of Project Chrono (`https://projectchrono.org/`) to provide HIL, real-time simulation support for traffic scenarios and vehicle dynamics. chrono:HIL provides flexible simulator hardware coupling capabilities, distributed simulation support, soft real-time simulation support, and multiple vehicle dynamic models. Integrating sensor (lidar/radar/camera sensor) simulation using chrono::sensor into traffic scenarios to assist the development of autonomous vehicle control policies. Providing simulation support for human-factor research conducted by Cognitive Systems Laboratory at UW-Madison. Funded by National Science Foundation OAC2209791.
- Extraterrestrial rover and robot mechanical component simulation. Applications/development/validation of SCM (Soil Contact Model), SPH, and DEM deformable terrain. Developer of the VIPER lunar rover model and the Curiosity mars rover model in the chrono::robot module. Integrating sensor simulation support to provide Lidar/Radar perception data in harsh lunar environment. Funded by NASA to support 2023 VIPER lunar mission.

Simulation-Based Engineering Lab at UW-Madison *Madison, WI*

Undergraduate Research Assistant *Jun 2020 - Dec 2020*

- Advisor: Professor Dan Negrut.
- Development and validation of chrono::granular (later renamed as chrono::gpu), a CUDA solver for granular dynamics. chrono::granular can be used to simulate homogeneous granular material; applications include granular material properties testing and deformable terrian for off-road vehicle research.
- Development of synchronization functionalities in chrono::synchrono - MPI and DDS interfaces of chrono::vehicles; utilization of parallel computing for real-time performance.

Human Computer Interaction Lab at UW-Madison *Madison, WI*

Undergraduate Research Assistant *Sep 2019 - May 2020*

- Advisor: Professor Bilge Mutlu.
- Developing a QR Marker object tracking program based on OpenCV in C++. The program helps educational robots to identify objects and their movements in order to facilitate human-computer interaction.
- Designing and developing of simulation environment for robot localization algorithm using ROS2. The simulation environment allows a Turtlebot model to follow certain trajectories in an indoor environment relying purely on QR codes identified by the machine learning algorithm.
- Creating of the CAD models for robot's parts using Solidworks and 3D printing software.

Alstom *Melbourne, FL*

Software Engineering Intern & Embedded System Engineering Intern *May 2019 - Aug 2019*

- Cooperating with Alstom's System Validation Team to perform system tests and review code (primarily in C++ and Python) on Alstom DAU (Data Acquisition Unit), a vital wayside component of the Alstom's Automatic Railway Signaling System; Debugging lower-level program, scanning and hacking the Apache server installed to search for possible bugs which may lead to the fatal crash of the system.
- Developing a C++ testing program for Alstom's Wayside Linux-Based Core ACE board to meet Hardware Serial Test Specifications including multi-CPU communication (based on C++ socket), I2C, UART, SPI, onboard GPIO connection, Watchdog Timer, and other hardware checks. The testing program includes both lower-level hardware programming (hardware read and write interfaces, UDP socket communication designed for multi-CPU connection, file read and write operations used to check the functionalities of FRAM, Flash Memory, and eMMC) and higher-level software programming (user Interface, comparison algorithm used to determine whether the actual result matches original expectations).
- Participating in technical reviews, technology transfer meetings, and code reviews. Learning the coding standard in Alstom.
- Learning concepts and architectures of the modern autonomous railway system and contributing to the design of the system.

Projects

Mechanical Engineering Senior Design Project *Madison, WI; Milwaukee, WI*

Milwaukee Tool *Feb 2022 - Apr 2022*

- Designing a glove impact testing fixture to quantitatively measure the impact protection provided by impact-resistant gloves.
- Completing three iterations of CAD model design and FEA analysis, and creating engineering drawings for Milwaukee Tool's workshop to manufacture parts
- Working with resistance-based force sensor circuits and related component.
- Designing and creating ready-to-deliver LabView programs to integrate pneumatic system and data acquisition unit (NI C-DAQ)

Mechanical Engineering Senior Design Project *Madison, WI*

University of Wisconsin-Madison *Nov 2018*

- Designing a drone frame and a drone cover which meets the requirements provided with limited ABS Material using Solidworks and PareToWorks
- Performing FEA strustural analysis in Solidworks to ensure the design meets performance and endurance requirement.

Skills

Programming	Python, C/C++, HTML/CSS, Java, JavaScript, Julia, R, SQL.
Engineering/Design	Solidworks, Blender, MSC Adams, ROS, Unity, Unreal Engine, Matlab, Simulink, Rhino, COMSOL Multiphysics.
Miscellaneous	Linux, Shell, Latex, Microsoft Office, Firebase Interface, Windows CMD.

Publication

- Serban, R, Taves, J, **Zhou, Z.** "Real-Time Simulation of Ground Vehicles on Deformable Terrain." Proceedings of the *ASME 2022 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Volume 9: 18th International Conference on Multibody Systems, Nonlinear Dynamics, and Control (MSNDC).* St. Louis, Missouri, USA. August 14–17, 2022. V009T09A012. ASME. https://doi.org/10.1115/DETC2022-89470
- Hu, W., **Zhou, Z.**, Chandler, S., Apostolopoulos, D., Kamrin, K., Serban, R., Negrut, D. Traction control design for off-road mobility using an SPH-DAE cosimulation framework. *Multibody Syst Dyn* 55, 165–188 (2022). https://doi.org/10.1007/s11044-022-09815-2
- Hu, W., **Zhou, Z.**, Serban, R., Negrut, D., Using an SPH-based continuum representation of granular terrain to simulate VIPER rover mobility, 2021/10, *Preprint*, https://www.researchgate.net/publication/358872957_Off-Road_Rover_Mobility_Simulation_Using_a_Continuum_Representation_of_Deformable_Terrains
- Hu, W, **Zhou, Z**, Serban, R, Negrut, D. "Using an SPH-Based Continuum Representation of Granular Terrain to Simulate the Rover Mobility." Proceedings of the *ASME 2021 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Volume 9: 17th International Conference on Multibody Systems, Nonlinear Dynamics, and Control (MSNDC)*. Virtual, Online. August 17–19, 2021. V009T09A028. ASME. https://doi.org/10.1115/DETC2021-71289