Hongru Liu

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EDUCATION

Carnegie Mellon University, Pittsburgh, PA   Dec 2026
Master of Science in Mechanical Engineering - Advanced Study
Relevant Coursework: Modern Control Theory, Robot Dynamics and Analysis, Soft Robots: Mechanics, Design and Modeling, Computer Vision for Engineers

Rensselaer Polytechnic Institute, Troy, NY   May 2025
Bachelor of Science in Mechanical Engineering to be conferred May 2025
Overall GPA: 3.70/4.0 | Dean's Honor List (2021-2024)
Relevant Coursework: Inventor's Studio, Fluid Mechanics, Modeling & Control of Dynamic Systems, thermodynamics

RESEARCH EXPERIENCE

Lunar Soil Mix Printing   Sep 2024 - May 2025
Led by Dr. Semih Akin   *Rensselaer Polytechnic Institute*
- Mixed lunar regolith simulant with resin and fabricated ASTM-compliant tensile bars, enabling strength evaluation across multiple soil ratios(Testing from 20% to 70%), succeeded printed out 20% to 30% simple using clay printer and SLA 3D printer
- Optimized formulations (particle size, resin composition, exposure time) and documented structural performance, providing recommendations to improve printability and material reliability for lunar construction

Thermal Power Dispatch System Design for Nuclear Flexible Plant Operation and Generation   Jan – May 2024
Led by Dr. Shanbin Shi   *Rensselaer Polytechnic Institute*
- Modeled and simulated thermal dispatch systems in MATLAB Simulink, validating assumptions through thermal-hydraulic literature analysis, accomplished 5% of whole Simulink diagram analysis
- Collaborated with graduate researchers to align methodologies, improving accuracy and efficiency of nuclear flexible plant modeling

PROJECT EXPERIENCE

Modern Control Theory — Autonomous Vehicle & Quadrotor Drones Control   Aug 2025 – Dec 2025
- Designed and implemented model-based control algorithms for autonomous ground vehicles and quadrotor Drones, focusing on trajectory tracking, stability, and robustness
- Developed quadrotor flight controllers using PID, LQR, and adaptive control techniques, incorporating dynamic modeling and state feedback for attitude and position control
- Implemented vehicle lateral and longitudinal controllers for path following and maneuvering, integrating discrete-time control and simulation-based validation
- Evaluated controller performance through time-domain simulations and stability analyses in MATLAB/Simulink and Python

Robotics & Dynamics Analysis   Aug 2025 – Dec 2025
- Developed and debugged physics-based dynamic simulation frameworks for robotic systems, including hybrid contact dynamics, mode transitions, and impact modeling
- Implemented numerical integration and constraint-based contact handling to analyze trajectory evolution, stability, and cost under different system configurations.
- Conducted systematic analysis of how modeling assumptions (e.g., contact modes, geometry, integration step size) affect system behavior and performance

Active Flutter Control System for UAS Wing - Modeling and Control   Aug 2023 – Dec 2023
- Developed and implemented PID-based flutter suppression system with accelerometer feedback and piezoelectric actuators in MATLAB/Simulink
- Validated stability through root locus and Bode analyses, achieving effective oscillation suppression at required 118.3km/h airspeed

SKILLS

Modeling: CAD (NX, Fusion, SolidWorks)
Simulation: Finite elements analysis (NX), MATLAB, Simulink
Machining: 3D Printing, Lathe Operations, Milling Machine Operations, Welding, Non-Metallic Fabrication
Language: English (Proficient), Mandarin Chinese (Native)