

TIANZE HU

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EDUCATION

Northwestern University Evanston, IL
Incoming Ph.D. Student in Mechanical Engineering Starting Sep. 2026

University of Michigan Ann Arbor, MI
B.S.E. in Mechanical Engineering; GPA: 3.91/4.0 Sep. 2023 - Dec. 2025
Courses: Dynamic Systems, Discrete Math, Programming, Fluid Mechanics, Numerical Mathematical Engineering, Dynamics & Vibrations & Application, Thermodynamics, Laser Material Processing

University of California, Santa Barbara Santa Barbara, CA
B.S.E. in Mechanical Engineering; GPA: 3.91/4.0 Sep. 2022 - Jun. 2023

RESEARCH EXPERIENCE

Pneumatic Fabric Logic (Modeling & System Design) Ann Arbor, MI
Research Assistant, Advisors: Prof. Diann Brei and Dr. Jonathan Luntz Jan. 2025 – Mar. 2026

- Developed first-principles models and Simscape/Simulink simulations for cotton resistors, channels/vias, pouch capacitors, and kink valves; identified parameters (permeability k , Forchheimer β , threshold model).
- Created a “fabric transistor” abstraction and designed ring oscillators using model-based sizing (pull-down area, pouch size, channel width, inlet pressure).
- Validated predictions against hardware; period–pressure trends match experiment within 20% error, enabling reliable frequency tuning.
- Produced a reusable blockset and design charts for rapid, simulation-first system design of integrated fabric logic.

EV Lithium Battery TR Product-Gas Mitigation (CFD & Monolith Design) Ann Arbor, MI
Research Assistant, Advisor: Prof. Massoud Kaviany Aug. 2025 – Dec. 2025

- Built a 3D CFD model of the battery pack vent path to predict PG flow, pressure drop, and cooldown under TR-like transients.
- Proposed and simulated a porous dry-scrubbing catalytic outlet using porous-media momentum/heat terms and simple reaction kinetics to reduce outlet temperature/toxicity with minimal added back pressure.

Pneumatically Controlled Constrained Layer Inflatable Valve Ann Arbor, MI
Research Assistant, Advisors: Prof. Diann Brei and Dr. Jonathan Luntz Sep. 2024 – Dec. 2024

- Developed a compact, lightweight, and well-functioning inflatable valve that can be integrated into fabric-based inflatables.
- Used a kink mechanism to shut off flow; conducted parametric studies on control-chamber geometry and cross-section, then integrated the valve with fabric-based flat inflatables.
- Conducted exploratory parametric studies on the relationship between main tube pressure, control chamber pressure, and flow rate.

PUBLICATIONS & PRESENTATIONS

1. **Hu, T.**, et al. (2026) Fabric Logic Library: A Framework for Integrated Mechanical Circuitry in Smart Pneumatic Fabrics. *Journal of Intelligent Material Systems and Structures (JIMSS)*, OnlineFirst. <https://doi.org/10.1177/1045389X261433617>.
2. **Hu, T.**, et al. (2025) Pneumatic Fabric Logic: Modeling & System Design. *ASME Conference on Smart Materials, Adaptive Structures, and Intelligent Systems (SMASIS 2025)*, St. Louis, MO, 2025.
3. Poster Presentation: **Hu, T.**, et al. (2024) Pneumatically Controlled Constrained Layer Inflatable Valves. *ME Undergraduate Symposium*, Ann Arbor, MI, 2024. (**Best Poster Award**)

INTERNSHIP EXPERIENCE

Technical Intern | Dingna Automation Equipment Jun. 2024 – Aug. 2024

- Drew CAD models for automated inspection equipment parts.
- Learned to recognize and assemble automated inspection equipment in the workshop.

Technical Intern | KingLong Buses Jun. 2023 – Aug. 2023

- Drew a 5-km map for a self-driving sweeper and learned how to use RoadRunner.
- Analyzed OpenDRIVE-format map data and conducted preliminary autonomous vehicle simulation.

PROJECTS

Snail-Inspired Microplastics Collection Robot | ME450 Capstone Sep. 2025 – Dec. 2025

- Led mechanical/system design of a solar-powered surface robot that removes 0.1–5 mm microplastics from lakes while minimizing bycatch, sponsored by Prof. Maha Haji.
- Designed and fabricated a snail-inspired modular intake around an existing undulating plate, including a passive one-way valve and container/gear modules so users can swap meshes, tune drive setups, and replace single modules instead of rebuilding the robot.
- Modeled hydrodynamic drag (0.05–0.2 m/s), buoyancy, and stability to ensure non-negative net buoyancy, roll/pitch under 20° with 5 kg collected debris.

3D Printing Projects | Individual Project Feb. 2024 - Present

- Designed a 3D-printed electric guitar that is ergonomically optimized and allows users to change guitar bodies easily according to preference.
- Designed and printed a pair of taillights, a trunk spoiler, and replacement parts for my 1997 Miata.
- Designed and printed replacement parts for an old film camera to repair and restore it.
- Designing a device for automatically developing film under room-light conditions.

Gaucha Racing | UC Santa Barbara Sep. 2022 - Jun. 2023

- Designed vehicle chassis components using SolidWorks and welded chassis components in the team workshop.

LEADERSHIP EXPERIENCE

Founder | UMich Chinese Photography Club Sep. 2023 - Dec. 2025

- Recruited about 25 active members and a total of 105 members.
- Organized several outdoor street photography events and posted on the club's social media account.

Organizer & Instructor | 3D Printing Design to Spec Workshop Sep. 2025

- Led a hands-on session for 8 students on turning research questions into testable parameters and building quick fixtures.
- Guided a gear-tooth fatigue example by building a low-cost cyclic loading rig with a water tank and pump, mapping pump speed to water pressure and resulting force.

HONORS AND AWARDS

William E. Bandemer Scholarship Aug. 2025

James B. Angell Scholar Mar. 2025, Mar. 2026

Dean's List Dec. 2023, Apr. 2024, Dec. 2024, Apr. 2025, Dec. 2025

University Honors Dec. 2023, May 2024, Dec. 2024, May 2025, Dec. 2025

SKILLS

Programming Languages: C++, MATLAB, Python, Java**Software & Tools:** SolidWorks, Arduino, Ansys, Cricut, COMSOL, Bambu Studio**Languages:** Mandarin Chinese (Native), English (Fluent)