

Bangan Wang

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in Bangan Wang

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Website

RESEARCH INTERESTS

Micro Aerial Robotics, Mechatronics Design, System Integration, Dynamics and Control.

EDUCATION

University of Pennsylvania

Philadelphia, PA

M.S.E in Mechanical Engineering and Applied Mechanics

Sep. 2025 – Present

- Cumulative GPA: 4.0 / 4.0, Coursework: Dynamical Systems, Learning in Robotics, Machine Perception.

University of Toronto (St. George Campus)

Toronto, ON

BASc in Mechanical Engineering (High Honors, Top 5% of cohort)

Sep. 2020 – Jun. 2025

- Cumulative GPA: 3.85 / 4.0, Coursework: Robotics, Control System Design, Mechatronics Design, Embedded Systems and Microprocessor.

PUBLICATIONS

*equal contribution

- E. Steager, **B. Wang**, and M. Yim, “The Effect of Miniaturizing on Autonomous Gram-Scale Self-Powered Micro Aerial Vehicles,” manuscript submitted to *2027 IEEE International Conference on Robotics and Automation (ICRA)*, under review.
- H. Li *, T. Peng *, **B. Wang ***, R. Zhang, B. Gao, N. Qiao, Z. Guan, J. Li, and T. Shi, “Safedrive Dreamer: Navigating Safety-Critical Scenarios in Autonomous Driving with World Models,” in *Alexandria Engineering Journal*, vol. 111, pp. 92-106, 2025
- Y. Zhang, S. Malladi, **B. Wang**, D. O. Son, B. Hinz, E. L. Chaikof, and A. Günther, “Microfluidic Formation of Ultrathin, Handleable Collagen Sheets Exhibiting Toe-heel Tensile Behavior,” in *Advanced Materials Technologies*, 2401810, 2025.

RESEARCH EXPERIENCE

ModLab, University of Pennsylvania

Philadelphia, PA

Graduate Researcher, Advisor: Prof. Edward Steager, Prof. Mark Yim

Jan. 2026 – Present

Research Topic: Design and control of a 3-g, 34-mm-diameter, self-spinning underactuated micro aerial vehicle powered by one motor. ⁽³⁾

- Designed the electrical schematic and PCB layout in Altium Designer, integrating an nRF54L15 **wireless MCU**, onboard optical sensors, and peripheral circuit onto a **9 x 9 mm, 0.1 g, four-layer, double-sided PCB**.
- Built onboard optical localization firmware that triangulated 3D position from infrared timing signals emitted by two HTC Vive Lighthouses, achieving static measurement variation **below 1 mm**.
- Devised onboard yaw-estimation from periodic voltage transitions at the output of a side-facing phototransistor as vehicle rotated past a visible-light beacon; tracked signal phase with a phase-lock-loop, achieving **0.01%** relative error in time-averaged spin rate.
- Established bidirectional wireless communication via BLE GATT protocol, enabling **remote waypoint commands** and **real-time** onboard flight-data streaming at 30 Hz.
- Implemented onboard flight control using separated PID controllers for planar position and altitude; applied phase-dependent motor commands during each revolution to generate lateral motion, enabling 3D waypoint tracking.

Independent Collaborative Research

Toronto, ON

Research Collaborator, Primary Collaborator: Dr. Tianyu Shi

Jan. 2024 – May. 2024

Research Topic: World-model-based safe reinforcement learning with PAC-Bayesian sim-to-real adaptation for autonomous driving. ⁽²⁾

- Formulated and evaluated the reward function used for initial policy training in CARLA.
- Designed a Safety-Bridge stage between initial simulation training and hardware deployment, incorporating more realistic safety-critical driving scenarios to improve policy robustness.
- Progressively fine-tuned the policy across increasingly complex Bridge scenarios and adapted a PAC-Bayesian regularizer based on KL divergence to limit deviation from the simulation-trained prior, reducing overfitting and improving sim-to-real generalization.

Guenther Laboratory, University of Toronto

Toronto, ON

Undergraduate Research Assistant, Advisor: Prof. Axel Günther

May. 2023 – Sep. 2023

Research Topic: Control and automation of microtensile testing for ultrathin collagen sheets. ⁽¹⁾

- Designed and implemented a force controller with real-time force and displacement acquisition for a custom uniaxial microtensile platform.

- Programmed automated monotonic tensile and cyclic fatigue testing routines for 1.8–2.2 μm -thick collagen sheets, enabling precise characterization of their nonlinear toe-heel stress-strain response.
- Fine-tuned a pretrained YOLO-based instance-segmentation model to identify droplet-templated voids in microscopy images, automating measurements of pore size, spacing, and void fraction.

SELECTED ENGINEERING PROJECTS

TidyVerse: Whole-Body Mobile Manipulator

Robotics Systems Developer, Figueroa Robotics Lab, University of Pennsylvania

Philadelphia, PA

Sep. 2025 – Dec. 2025

- Project Aim: A high-payload holonomic mobile manipulation platform supporting Franka Panda and KUKA iiwa 7 arms.
- Designed and assembled the mobile-manipulator hardware; configured its onboard computing platform, ROS 2 stack, teleoperation system, and user interfaces.
 - Created a complete URDF model and set up full-system simulations in PyBullet and Isaac Sim.
 - Implemented a QP-based **whole-body** velocity controller that coordinated simultaneous base and arm motion for pose tracking.
 - Implemented low-level hard safety constraints that detected violations of the robot’s operating limits and triggered backtracking along its recorded trajectory to the last safe state, enabling high-level policy direct deployment without continuous human supervision.

Thermal Control Unit for CFC 3D Printing

Senior Design Project, ARL-MLS Lab, University of Toronto

Toronto, ON

Sep. 2024 – Apr. 2025

- Project Aim: A thermal-control unit maintaining an Anisoprint A3 CFC printer chamber at setpoints from 40 to 65 °C.
- Designed and prototyped a forced-convection thermal-control unit that directed air through a PTC heater and into the printer chamber.
 - Optimized internal air-duct and outlet-shutter geometries through full-factorial design of experiments (DOE) and response-surface modeling, achieving **±2°C** chamber-wide temperature uniformity.
 - Implemented and experimentally tuned an adaptive PD controller, maintaining the mean chamber temperature within **±0.5°C** of the setpoint while limiting fluctuations about the mean to **below 0.5°C**.
 - Calibrated a compensation model to estimate spatially averaged chamber temperature from a single-point sensor and feed corrected measurements to the controller.
 - **Placed 1st** among more than 80 projects in the University of Toronto MIE Senior Design Competition.

OTHER EXPERIENCES

AutOmics Biotechnology Inc.

Chief Technology Officer (CTO)

Toronto, ON

May. 2025 – Present

- Designed a fully automated, end-to-end histopathology platform integrating continuous 5-μm tissue sectioning, staining, imaging, computer-vision analysis, and 3D organ reconstruction for intuitive localization of abnormal tissue.
- Prepared business plans and pitch materials; admitted into **HKSTP Ideation Program** and selected as one of the **Alibaba JUMPSTARTER 2026 Top 30 Startups**.

AGS Automotive Systems

Mechanical Engineering Intern, Manufacturing & Process Engineering

Toronto, ON

Sep. 2023 – May. 2024

- Produced 3D models of production-line and automotive components to support facility reconfiguration and maintenance planning.
- Validated the functionality and clearances of automated production equipment through kinematic simulation and motion studies.
- Standardized manual workflows using ergonomic assessments and the Maynard Operation Sequence Technique (MOST), improving operator efficiency.

HONORS & AWARDS

- Alibaba JUMPSTARTER 2026 Top 30 Startups

Mar. 2026
- 1st Place Senior Design, Mechanical Engineering (\$1000), University of Toronto

May. 2025
- MIE Undergraduate Summer Research Award (\$7500), University of Toronto

May. 2023
- Dassault Systems Certified SOLIDWORKS Professional - Advanced Surfacing

Sep. 2022
- Dassault Systems Certified SOLIDWORKS Professional - Mechanical Design

Aug. 2022

SKILLS

Programming: C, Python, MATLAB, LabVIEW

Mechatronics Design: SOLIDWORKS, Altium Designer, Autodesk Eagle, AutoCAD.

Technical: FDM 3D printing (Bambu Lab), SLA 3D printing (Formlabs), Micro soldering (down to 0201 SMD), Motion capturing (Vicon).

Language: English (fluent), Mandarin (native).