Bangan Wang

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RESEARCH INTERESTS

Micro Aerial Robotics, Mechatronics Design, System Integration, Bio-Inspired Design, 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.

3. 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.
2. 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.
1. Y. Zhang, S. Malladi, **B. Wang**, D. O. Son, B. Hinz, E. L. Chaikof, and A. Günther, "Microfluidic Production of Ultrathin, Handleable Collagen Sheets Exhibiting Toe-heel Tensile Behavior," in ***Advanced Materials Technologies***, vol. 10, 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 schematic and PCB layout, integrating an nRF54L15 **wireless MCU**, optical sensors, and peripheral circuitry onto a **9 × 9 mm, 0.1 g, four-layer, double-sided PCB**, enabling onboard state estimation and control within the vehicle's mass budget.
- 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 beacon-triggered voltage transitions in a side-facing phototransistor; applied a phase-locked loop (PLL) to recover rotational phase, enabling lateral motion through phase-dependent motor commands.
- Established bidirectional BLE GATT communication for **remote waypoint commands** and **live flight data streaming at 30 Hz.**
- Implemented separate PID controllers for planar position and altitude, achieving autonomous 3D waypoint tracking.

Independent Research Collaboration **Toronto, ON**

Independent Researcher, 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)

- Designed and evaluated the reward function for initial policy training in CARLA, tuning its weights through grid search.
- Designed a Safety-Bridge transition stage incorporating realistic safety-critical scenarios, strengthening policy robustness before real-world deployment.
- Fine-tuned the policy across increasingly complex Safety-Bridge scenarios using a PAC-Bayesian objective with KL regularization, limiting its deviation from the simulation-trained prior while improving sim-to-real generalization.

Guenther Laboratory, University of Toronto **Toronto, ON**

Undergraduate Research Assistant, Advisor: Prof. Axel Guenther *May 2023 – Sep. 2023*

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

- Designed and implemented a force controller with synchronized acquisition of load and specimen deformation data for a custom uniaxial microtensile platform.
- Programmed automated monotonic tensile and cyclic fatigue test modes for 1.8–2.2 μm-thick collagen sheets; characterized their nonlinear toe-heel stress-strain response and fatigue behavior.

- Fine-tuned a pretrained YOLO-based instance-segmentation model to segment droplet-templated voids in microscopy images, automating quantification of pore size, spacing, and void fraction.

SELECTED ENGINEERING PROJECTS

TidyVerse: Agentic Whole-Body Mobile Manipulator **Philadelphia, PA**

Robotics Systems Developer, Figueroa Robotics Lab, University of Pennsylvania *Sep. 2025 – Dec. 2025*

Project Objective: A high-payload holonomic mobile-manipulation platform supporting Franka Panda and KUKA iiwa 7 arms.

- Designed and assembled the mobile-manipulator hardware; configured an onboard Intel NUC with the ROS 2 stack, teleoperation system, and user interfaces.
- Created the complete URDF model and set up full-system simulations in PyBullet and Isaac Sim for controller and policy testing.
- Implemented a QP-based **whole-body** velocity controller coordinating simultaneous base-arm motion for pose tracking.
- Built a backend hosting the low-level robot controllers, routing high-level commands from OpenClaw to the hardware.
- Developed a low-level safety layer that triggered trajectory backtracking to the last safe state upon safety-constraint violations, enabling high-level policy deployment without continuous human supervision.

Thermal Control Unit for CFC 3D Printing **Toronto, ON**

Senior Design Project, ARL-MLS Lab, University of Toronto *Sep. 2024 – Apr. 2025*

Project Objective: A thermal control unit maintaining an Anisoprint A3 CFC printer chamber at setpoints from 40 to 65 °C.

- Designed and prototyped an 840 W chamber thermal control unit using forced airflow through a PTC heater.
- 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.
- Built a full-scale chamber testbed instrumented with 15 temperature sensors for thermal characterization and controller validation.
- Calibrated a compensation model to estimate chamber-wide mean temperature using the control unit's sole sensor, enabling accurate temperature feedback in a highly compact design.
- Developed and experimentally tuned an adaptive PD controller, regulating the mean chamber temperature to within **0.5 °C** of the setpoint while limiting fluctuations about the mean to **below 0.5 °C**.

OTHER EXPERIENCE

AutOmics Biotechnology Inc. **Toronto, ON / Remote**

Chief Technology Officer (CTO) *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 supporting the company's admission to the **HKSTP Ideation Program** and selection as one of the **Alibaba JUMPSTARTER 2026 Top 30 Startups**.

AGS Automotive Systems **Toronto, ON**

Mechanical Engineering Intern, Manufacturing & Process Engineering *Sep. 2023 – May 2024*

- Produced 3D models of production equipment and automotive components for facility reconfiguration and maintenance planning.
- Validated automated material-handling sequences through kinematic simulations, clearance analysis, and motion studies.
- Standardized manual workflows using ergonomic assessments and the Maynard Operation Sequence Technique (MOST) to improve operator efficiency.

HONORS & AWARDS

- Alibaba JUMPSTARTER 2026 Top 30 Startups *Mar. 2026*
- 1st Place Senior Design, Mechanical Engineering ($1,000), University of Toronto *May 2025*
- MIE Undergraduate Summer Research Award ($7,500), University of Toronto *May 2023*
- Dassault Systèmes Certified SOLIDWORKS Professional – Advanced Surfacing *Sep. 2022*
- Dassault Systèmes 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), microsoldering (down to 0201 SMD components).
Robotics and Simulation: ROS 2, PyBullet, Isaac Sim, motion capture (Vicon).
Languages: English (fluent), Mandarin (native).