

Bangan Wang

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EDUCATION

University of Pennsylvania • Master of Science in Mechanical Engineering, GRASP Lab.

- Cumulative GPA: 4.0 / 4.0

Sep. 2025 – Present

University of Toronto (St. George Campus) • Bachelor of Applied Science in Mechanical Engineering

- Cumulative GPA: 3.85 / 4.0, graduated with High Honors (top 5%)

Sep. 2020 – Jun. 2025

PUBLICATIONS

- Zhang, Y., Malladi, S., Wang, B., Son D.O., Hinz B, Chaikof, E.L., & Günther, A. (2025). Microfluidic Formation of Ultrathin, Handleable Collagen Sheets Exhibiting Toe-heel Tensile Behavior. (*Advanced Materials Technologies*)
- Li, H. *, Peng, T. *, Wang, B. *, Zhang, R., Gao, B., Qiao, N., Guan, Z., Li, J., & Shi, T. (2025). Safedrive Dreamer: Navigating Safety-Critical Scenarios in Autonomous Driving with World Models. (*Alexandria Engineering Journal*)

RESEARCH EXPERIENCE

Single-Rotor Micro Aerial Flyer (UNO) • ModLab, University of Pennsylvania

Mar. 2025 – Present

Developing a 34 mm underactuated, self-spinning micro aerial vehicle that uses a single off-center motor for closed-loop Cartesian position control.

- Hardware design & PCB:** Designed the onboard electronics schematic and integrated Lighthouse infrared tracking sensors, a phototransistor-based yaw sensor, and an nRF54L15 module into a compact 4-layer PCB measuring under 1 cm × 1 cm; customized BLE GATT services to enable bidirectional wireless communication.
- Perception & State Estimation:** Implemented TS4112-based decoding of infrared Lighthouse beacon signals to achieve ±1 mm XYZ localization. Developed phototransistor-based yaw estimation by leveraging vehicle self-spin to sample a lateral visible-light beacon through an ADC input, then applying a phase-locked loop (PLL).
- Controls:** Implemented a closed-loop 3D position controller for XYZ tracking, integrating real-time position and yaw estimates to generate thrust and motor-command inputs for stable flight.

TidyVerse, A Mobile Manipulator Platform • Figueroa Lab, University of Pennsylvania

Sep. 2025 – Feb. 2026

Built a mobile manipulation platform (holonomic base + 7-DoF arm) for mobile pick-and-place, integrating onboard compute, ROS2 stack, whole-body control, teleoperation, and safety recovery.

- Hardware & bring-up:** Built the entire robot system; implemented low-level controllers and system bring-up/testing.
- Simulator setup:** Set up the robot URDF in PyBullet and Isaac Sim.
- Software integration (ROS2):** Integrated teleoperation, arm/base control interfaces, and runtime nodes into ROS 2 pipeline.
- Whole-body control:** Designed and deployed a velocity-level QP whole-body controller to coordinate all joints to reach target poses; achieved robust trajectory tracking and disturbance recovery.
- Safety & autonomy:** Implemented a safety-boundary and collision recovery feature that automatically rewinds to a safe state when exceeding user-defined boundaries or detecting collisions.

SafeDrive Dreamer (World-Model + Safe RL for Autonomous Driving) • University of Toronto

Jan. 2024 – May. 2024

Designed an autonomous driving framework that combines world models with safety-aware reinforcement learning to improve sample efficiency and reduce sim-to-real performance drop.

- Reward design:** Designed and implemented the reward function to encode safety-critical objectives (e.g., constraint satisfaction, stable progress, and penalty shaping), and integrated it into the training loop to guide policy learning under risk-aware constraints.
- PAC-Bayes sim-to-real module:** Built a PAC-Bayes sim-to-real transfer module using KL-regularized policy adaptation to bridge the simulation prior and real-world posterior. Reduced the sim-to-real gap.
- Hardware validation:** Defined customized performance metrics and validated the framework on a hardware mobile platform.

Uni-axial Tensile Tester for Ultrathin Collagen Sheets • Guenther Laboratory, University of Toronto

May. 2023 – Sep. 2023

Designed and integrated a tensile-testing workflow for ultrathin collagen sheets, including actuator control, microscopy characterization, and vision-based surface feature extraction.

- Low-level control:** Designed and implemented a force controller in LabVIEW for a uni-axial tensile tester. Enabled single-pull tensile tests and fatigue tests to characterize collagen sheet's loading properties, under Prof. Axel Günther's supervision.
- TEM microscopy:** Performed TEM imaging and microscopy data collection to assess sheet surface characteristics.
- Computer vision analysis:** Built a YOLO-based segmentation pipeline (dataset curation + fine-tuning + evaluation) to segment droplet-like surface patterns of the collagen sheet.
- Awarded the "2023 University of Toronto MIE Undergraduate Summer Research Award" (\$7500).

COURSE & HIGHLIGHTED PROJECTS

CFC 3D Printer Chamber Temperature Controller • Senior Design Project, ARL-MLS Lab, University of Toronto *Sep. 2024 – Apr. 2025*

Designed and prototyped a chamber temperature controller for a CFC 3D printer, integrating air-duct design, electronics, control, and data-driven optimization to improve thermal uniformity and control accuracy.

- **Mechatronics system design:** Produced CAD models, electronics schematic, and assembled the design.
- **Data-driven optimization:** Ran full-factorial DOE and response-surface optimization on duct and outlet-shutter geometry, achieved 2°C chamber temperature uniformity.
- **Low-level control:** Developed a PD controller with self-adaptive parameters; tuned parameters via data-driven experiments, achieved $\pm 0.5^\circ\text{C}$ regulation accuracy.
- **Sensor calibration:** Designed and calibrated an adaptive compensation model to estimate chamber-spatial-average temperature using a single-point sensor reading and feed corrected measurements to the controller for consistent control.
- Awarded “**1st Place Senior Design (Mechanical Engineering, \$1000)**” among over 80 capstone projects.

Hexapod “Eclipse” • Personal Project, Toronto

Jul. 2024 – Aug. 2024

Designed, simulated, and prototyped a bio-inspired multi-legged robot, leveraging kinematic simulation, mechatronics integration, and locomotion control.

- **Mechatronics design:** Designed and built the robot system. Fabricated a 4-layer servo driver PCB to support dual power rails and drive up to 24 servos with peripherals (7.5V / 15A max input).
- **Simulation:** Built kinematic/dynamic models in MATLAB Simscape Multibody to validate gait timing, balance, and collision-free motion.
- **Locomotion control:** Implemented an IMU-feedback gait controller, dynamically adjusting step timing and regenerating leg trajectories in real time.

WORK & INTERNSHIP EXPERIENCES

AutOmics Biotechnology Inc. • Toronto, Canada

Chief Technology Officer (CTO)

May. 2025 – Present

- Led the system design of an automated pathological analysis platform integrating tissue embedding, continuous 5 μm tissue-sectioning, staining, imaging, computer vision analysis, and 3D organ reconstruction.
- Prepared business plans and pitch materials; admitted into **HKSTP Ideation** and selected as an **Alibaba JUMPSTARTER 2026 Top 30 Startup**.

AGS Automotive Systems • Toronto, Canada

Mechanical Design Engineer Internship

Sep. 2023 – May. 2024

- **Mechanical design:** 3D modeling for production-line equipment and automotive components to support facility reconfiguration and maintenance.
- **FEA:** Performed FEA and kinematic simulations to validate structural integrity and functional requirements of mechanical systems.
- **Ergonomics & process management:** Performed ergonomic and motion studies. Utilized MOST methodology to standardize manual tasks, delivering over 10% efficiency improvements in multiple assembly stations.

CERTIFICATION & AWARDS

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| • Alibaba JUMPSTARTER 2026 Top 30 Startup | <i>Mar. 2026</i> |
| • 1st Place Senior Design, Mechanical Engineering (\$1000), University of Toronto | <i>Jun. 2025</i> |
| • MIE Undergraduate Summer Research Award (\$7500), University of Toronto | <i>May. 2023</i> |
| • Dassault Systèmes Certified SOLIDWORKS Professional - Advanced Surfacing (CSWPA-SU) | <i>Sep. 2022</i> |
| • Dassault Systèmes Certified SOLIDWORKS Professional - Mechanical Design (CSWP) | <i>Aug. 2023</i> |

SKILLS

- **Mechatronics Design & Integration:** Proficient in SOLIDWORKS, AutoCAD, Altium Designer, Autodesk Eagle, ANSYS.
- **Programming:** Proficient in Python, C, MATLAB, LabVIEW.
- **Prototyping:** Proficient in 3D printing (FDM & SLA), PCB design and fabrication.

HOBBIES

- **Electronic Music Production:** My music has been signed and published by renowned record labels (Sirup Music GmBh, 325K YouTube subscribers) and supported by top artists worldwide.