CHUHAN ZHANG

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RESEARCH INTERESTS

Dynamic robots across locomotion, manipulation, and medical robotics, at the intersection of *model-based control* and *reinforcement learning* — building complete systems from mechanism and real-time control to sim-to-real learning.

EDUCATION

- **Johns Hopkins University** — *M.S.E. in Robotics (Medical Robotics track)* 2026 – 2027 (Expected)
- **Technion – Israel Institute of Technology** — *B.S. in Mechanical Eng. and Robotics* (GPA 3.7/4.0) 2022 – 2026
- **The Chinese University of Hong Kong** — *Visiting Research Student* Summer 2025

PUBLICATIONS

1. **Chuhan Zhang**, H. Zhang, Y. Chen, Y. Tang, Y.-H. Liu, M. Liu, X. Chu. Propeller-Assisted Robust 3D Hopping Robot with Hierarchical Force Allocation. *IEEE CASE*, 2026. (**Best Student Paper Award Finalist**) [arXiv] [Video]
2. T. Lin†, Y. Zheng†, **Chuhan Zhang**, R. Chen, Y. Or, M. Liu. Dynamics, Stability, and Energy Efficiency of an Energy-Recycling Rimless Wheel with Spring-Clutch Legs. *Robotica*, 2026. (Under review) [arXiv] [Video]
3. **Chuhan Zhang**, Xiangyu Chu. Co-Designing towards Deployable Hopping: An LLM Shapes a Hopper's Leg and Rotors. Submitted to *Sim-to-Real-to-Field: The Science of Transfer*, CoRL 2026 Workshop (non-archival).

RESEARCH EXPERIENCE

Robotic Temporal-Bone Drilling Sep 2026 – Present
Graduate Researcher, LCSR, Johns Hopkins University Advisors: Dr. Manish Sahu, Prof. Russell Taylor

- Robot-assisted harvesting of cadaveric temporal bones (UR5e + surgical drill), accelerating inner-ear pathology processing from ∼1 month to days; responsible for **high-level control and drill-path planning** (**SDF-based layered planning** on segmented bone models, in simulation).
- Validated **pivot calibration** and **admittance control** on synthetic data (tip recovery to 0.014 mm).

Propeller-Assisted 3D Hopping Robot (Pro-OMEGA) Jul 2025 – Present
Research Assistant, CUHK Advisor: Prof. Xiangyu Chu

- Built Pro-OMEGA, a propeller-assisted 3D monopedal hopper pairing an active 3-RSR parallel leg with a trunk-mounted tri-rotor; first-author CASE 2026 paper.
- Proposed a single-rigid-body **Hierarchical Force Allocation** controller: stance wrench from a friction- and torque-constrained **QP** on the leg, residual attitude moment from the tri-rotor; built the **500 Hz real-time stack** (LCM, 3-RSR IK, Raibert foot placement) on Raspberry Pi.
- Hardware-validated with one fixed controller: continuous 3D hopping at ∼1.6 m/s, abrupt start-stop and reversals, grass-to-wood transition, push recovery within 1–3 hops.
- Trained **PPO** hopping policies in **Isaac Gym / MuJoCo MJX**; encoder-decoder policy for flight-phase underactuation, domain randomization and actuator-delay modeling for **sim-to-real** of the closed kinematic chain.
- Extended the robot into a **hop-wheel platform** (hop ↔ drive switching at rest and in motion, 1–10 cm hop-height tracking) and used the leg for **pedipulation** (button pressing, cart pushing) with onboard RGB-D; demonstrated a continuous outdoor multi-mode mission.

Energy-Efficient Legged Robot via Energy Recycling Nov 2023 – Jul 2025
Research Assistant, Technion Advisor: Prof. Mingyi Liu

- Modeled **hybrid dynamics** of a passive walker (Lagrangian; **Poincaré-map** stability analysis); designed a **spring-clutch mechanism** to recycle collision energy.
- Motion-capture experiments validated the model: **60% reduction in cost of transport** (to 0.02).

COMPETITION EXPERIENCE

RoboMaster University League — Mechanical Adviser, Technion (Shantou) Oct 2024 – Mar 2025
Co-founded the campus robotics club; designed an omnidirectional Standard Robot with gimbal and visual auto-targeting; Second Prize, China RMUL.

VEX-EDR & Innovation Competitions — Team Leader, Fuzhou No. 8 Middle School Sep 2015 – Dec 2020
Founded and led teams 9698B / 96666A through CAD, fabrication, and autonomous control across the "Nothing But Net" and "Tower Takeover" seasons.

HONORS & AWARDS

Israel Innovation Prize (Undergraduate Category), 2026 · Second Prize, China RoboMaster University League (2025) · Dean's List Scholarship, Technion, top 15% (2022–2026) · Gold Award, VEX Asia-Pacific Championship (2019) · China Youth Science & Technology Innovation Award (2018) · Champion, VEX Robotics World Championship (2016)

TECHNICAL SKILLS

Programming: C++, Python, MATLAB. **Tools:** Isaac Gym, MuJoCo MJX, ROS 2, LCM, SolidWorks, AutoCAD, Blender, Illustrator. **English:** TOEFL iBT 110/120.