Boda Huo

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Education

Carnegie Mellon University Aug 2024 – May 2026 (expected)
M.S. in Mechanical Engineering (Research) **GPA: 3.84/4.00**
Relevant Coursework: *Intro to Machine Learning; Generative AI; Computer Vision; Modern Control Theory*

University of California, Santa Barbara Sep 2020 – Jun 2024
B.S. in Mechanical Engineering **GPA: 3.86/4.00**
Relevant Coursework: *Introduction to Robotics; Statics; Dynamics; Fluid & Thermal Sciences*

Research Experience

Visuo–Tactile Sensor
Safe AI Lab (CMU) June 2025 – Dec 2025
- Designed & developed a new vision–tactile sensor that captures both tactile deformation and overlaid color/text cues, providing richer information than prior baselines and improving downstream recognition.
- Demonstrated robust contact detection and feature extraction on extremely soft/low-stiffness materials (e.g., water droplets, facial cream, thin plastic film).
- Integrated the sensor with a VLM to sort resistors by color codes, achieving >90% accuracy end-to-end.

Dynamic Quadrupedal Transport with Tactile
Safe AI Lab (CMU) Sep 2024 – May 2025
- Designed and fabricated a 221-taxel piezoresistive tactile array; currently improving the manufacturing process (repeatability, yield) and updating the PCB for eliminating cross-talk + improving frame rates.
- Contributed to developing a tactile-aware transport policy using the distributed tactile array with a teacher–student pipeline (PPO → DAgger) and reliable PD tracking.
- Demonstrated zero-shot sim-to-real transport of unsecured objects over long distances and varied terrains.

Vine Robot for Mars Rover
Hawkes Lab (UC Santa Barbara) Mar 2022 – May 2024
- Designed compliant vine–robot anchoring mechanisms acting as rover "locks" to secure and stabilize tooling on sand–pebble–dust (Mars–regolith analog) surfaces.
- Built a 3×3×2 m granular-media testbed with regolith analogs and a Raspberry-Pi–based sensing/control + CV evaluation stack for anchoring and load-transfer experiments.
- Formulated a planar rover–vine model; implemented an LQI pose regulator with MRAC augmentation for gusts and soil/contact changes; validated on the testbed under varying friction and lateral loads.

Course Project

VTLA: Visuo–Tactile Learning for Contact-Rich Manipulation Jan 2026 – Present
Robot Learning Engineer
- Developed an end-to-end visuo–tactile data-collection pipeline for robot manipulation, synchronizing wrist RGB, dual tactile sensors, robot proprioception, gripper state, and demonstration actions.
- Trained and analyzed ACT-style multimodal policies for contact-rich manipulation; compared absolute joint-position and delta-action representations to improve robustness under deployment-time state shifts.
- Evaluated diffusion-policy and VLA-based learning pipelines, with ongoing work toward fine-tuning $\pi_{0.5}$ on tactile-guided manipulation demonstrations.
- Focused on tactile-critical grasping tasks involving extremely soft or fragile objects, such as tofu and chips.

Publications

Peer-Reviewed Publications
- Lin, C.; Song, Y. R.; **Huo, B.**; *et al.* (2025). *LocoTouch: Learning Dynamic Quadrupedal Transport with Tactile Sensing.* Conference on Robot Learning (CoRL '25), PMLR 305: 2779–2801.
  PMLR: `https://proceedings.mlr.press/v305/lin25a.html`
- Lin, C.†; **Huo, B.**†; *et al.* (2026). *LightTact: A Visual-Tactile Fingertip Sensor for Deformation-Independent Contact Sensing.* Robotics: Science and Systems (RSS '26). † Equal contribution.
  arXiv: `https://arxiv.org/abs/2512.20591`

Relevant Skills

- **Robotics/ML:** Control (LQR/MRAC), RL (PPO), sim-to-real, policy evaluation, Isaac Sim