Haozhe Lei

New York University
370 Jay St, Brooklyn, NY 11201

hl4155@nyu.edu
Homepage

EDUCATION

New York University Sept. 2022 – Present
Ph.D. in Electrical and Computer Engineering
Advisor: Prof. Sundeep Rangan, Director, NYU Wireless
Award: 2023 Ernst Weber Fellowship

New York University Sept. 2020 – May 2022
M.S. in Computer Engineering

China Agricultural University Sept. 2015 – Jun. 2019
B.E. in Electrical Engineering and Automation

RESEARCH INTERESTS

- **Methods:** RF sensing, ISAC inference, multimodal scene graphs, foundation-model agents, embodied reasoning, physics-informed RL, neuro-symbolic RL
- **Systems and Applications:** indoor localization & navigation, wireless robotics, closed-loop autonomy, multi-band UE connectivity, beam and antenna coordination, radar odometry, object detection

RESEARCH EXPERIENCE

NYU Wireless *Brooklyn, NY, USA*
Research Assistant *Sept. 2022 – Present*

Research at the intersection of **wireless sensing/ISAC, multimodal spatial reasoning, and wireless robotics**.

- **Multimodal spatial reasoning**: Developing a *scene-graph* representation pipeline that fuses egocentric vision with wireless cues to learn graph-structured indoor embeddings (nodes: places/objects; edges: spatial relations). Building VLM-driven agents over these structured representations for object search, spatial grounding, and human activity-aware reasoning.
- **Likelihood-based RF localization for ISAC**: Building a model-free posterior inference pipeline that maps raw radio signals to calibrated spatial *belief* distributions for downstream 6G decision-making (beam management, risk-aware control).
- **Navigation**: Physics-informed reinforcement learning and digital-twin methods for indoor navigation and SLAM, with publications in *ICRA*, *IEEE OJ-COMS*, and *RLC* (*Spotlight*). Designed and built a **TurtleBot4**-based **FR3** wireless indoor navigation platform in **ROS2**; conducting expanded localization and navigation experiments on this platform.
- **Multi-band receiver/antenna switching**: Model-free, estimator-augmented **Transformer** for inference-driven, interference-aware antenna–band coordination in handheld UEs across mid/upper-mid/mmWave bands under high mobility (self-rotation, walking), with publications in *ICC*. Supports co-band or orthogonal sharing and subset selection; balances rate, energy, and switching cost in **3GPP**-compliant, ray-traced channels.

NYU C2SMARTER Center: Traffic mobility control & Digital-twin closed loop *Brooklyn, NY, USA*
Research Assistant *Sept. 2023 – Mar. 2026*

NYU Center for Cybersecurity: Safe adaptive control & Routing control under strategic behavior *Brooklyn, NY, USA*
Research Assistant *Sept. 2021 – Jan. 2024*

KEY PUBLICATIONS

Legend: * co-first author, † corresponding author.

[J1] Tao Li, **Haozhe Lei**, Hao Guo, Mingsheng Yin, Yaqi Hu, Quanyan Zhu, and Sundeep Rangan. "Digital Twin-Enhanced Wireless Indoor Navigation: Achieving Efficient Environment Sensing with Zero-Shot Reinforcement Learning". *IEEE Open Journal of the Communications Society* (2025).

[C1] Ruibin Chen*, **Haozhe Lei***,†, Hao Guo, Marco Mezzavilla, Hitesh Poddar, Tomoki Yoshimura, and Sundeep Rangan. "Transformer-Based Rate Prediction for Multi-Band Cellular Handsets". *IEEE International Conference on Communications (ICC)*. 2026.

[C2] Tao Li, **Haozhe Lei**, Mingsheng Yin, and Yaqi Hu. "Reinforcement Learning with Physics-Informed Symbolic Program Priors for Zero-Shot Wireless Indoor Navigation". *Reinforcement Learning Conference (RLC)*. selected as a spotlight paper. 2025.

[C3] **Haozhe Lei**, Yunfei Ge, and Quanyan Zhu. "ADAPT: A Game-Theoretic and Neuro-Symbolic Framework for Automated Distributed Adaptive Penetration Testing". *IEEE Military Communications Conference (MILCOM)*. 2024.

[C4] Mingsheng Yin*, Tao Li*, **Haozhe Lei***, Yaqi Hu, Sundeep Rangan, and Quanyan Zhu. "Zero-Shot Wireless Indoor Navigation through Physics-Informed Reinforcement Learning". *2024 IEEE International Conference on Robotics and Automation (ICRA)*. 2024.

Ongoing / Under Review

[W1] **Haozhe Lei**†, Hao Guo, and Sundeep Rangan. *Wireless Localization via Likelihood-Based Posterior Inference*. Target venue: IEEE Transactions on Wireless Communications (journal). 2025.

[W2] **Haozhe Lei**†, Hao Guo, Tommy Svensson, and Sundeep Rangan. *Beyond Point Estimates: Likelihood-Based Full-Posterior Wireless Localization*. arXiv:2509.25719. 2025.

INTERNSHIPS

Astrabeam — *New York, NY, USA*
Research Intern — *Jun. 2025 – Aug. 2025*

- Doppler-based mmWave radar processing in ROS2 for odometry & object detection.

JD.com, Inc. — *Beijing, China*
Algorithm Engineer Intern — *Jan. 2021 – Feb. 2021*

- CenterNet (PIoU) rotational detection; on-site deployment to manufacturing lab.

AWARDS

- Ernst Weber Fellowship (NYU Tandon School of Engineering), 2023
- School of Engineering Fellowship (NYU Tandon School of Engineering), 2022
- Tandon Research Excellence Exhibit, Project: *AI-Driven Interactive Safe Autonomous Driving*, 2022
- Mathematical Contest in Modeling (S Prize), 2018
- Beijing Higher Education Association Mathematical Contest, Second Prize, 2017
- China National University Student Innovation & Entrepreneurship Training Program, Project: *Research on Smart Home Household Intelligent Power Grid Management System*, 2017-2019

TECHNICAL EXPERTISE

- **Programming & Tools:** Python, Linux/Shell scripting, MATLAB, R, LaTeX, Kubernetes (HSRN cluster)
- **Simulation & Frameworks:** ROS2, Sionna, Remcom (Wireless), SUMO & CARLA (Transportation)
- **Robotics & Wireless Hardware:** Turtlebot4, TI mmWave radar (AWR1642, AWR6843), DCA1000