

Bo-Ruei (Ray) Huang

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Education

National Taiwan University (NTU)

Sep 2020 - Jan 2025

B.S. | *Double Major in Computer Science and Information Engineering & Electrical Engineering*

Taipei, Taiwan

- GPA: **4.24/4.3** (3.99/4.0), Rank: 7/260 (Top 3%).
- Honors: Phi Tau Phi Scholastic Honor Society member (**Top 1%** in college); Dean's List Awards (4 semesters, Top 5% in class).

Publications

- [1] **Bo-Ruei Huang**, Chun-Kai Yang, Chun-Mao Lai, Dai-Jie Wu and Shao-Hua Sun. Diffusion Imitation from Observation. In *Neural Information Processing Systems*, 2024. [PDF]
- [2] Xiaolin Fang*, **Bo-Ruei Huang***, Jiayuan Mao*, Jasmine Shone, Joshua B. Tenenbaum, Tomás Lozano-Pérez and Leslie Pack Kaelbling. Keypoint Abstraction using Large Models for Object-Relative Imitation Learning. In *Workshop on Language and Robot Learning at Conference on Robot Learning*, 2024. (**Best Paper**; Under review in ICRA 2025) [PDF]
- [3] Hao-Shu Fan, Branden Romero*, Arthur Hu*, Lirui Wang, **Bo-Ruei Huang**, Edward Adelson, Pulkit Agrawal. DEXO: Hand Exoskeleton System for Teaching Robot Dexterous Manipulation In-The-Wild. In *Preprint*, 2024. (Under review in ICRA 2025) [PDF]
- [4] **Bo-Ruei Huang**, Sihe Chen, Vijay Natraj, Zhao-Cheng Zeng, Yangcheng Luo and Yuk L. Yung. Improving XCO₂ Precision in OCO-2/3 Retrievals through Machine Learning-Enabled Extraction of Volcanic Aerosol Information from L1B Spectra. In *American Geophysical Union Annual Meeting*, 2023. [PDF]

Research Experience

Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology

July 2024 - Present

Visiting Student | Advisor: Joshua B. Tenenbaum

Cambridge, MA

Hand Exoskeleton System for Teaching Robot Dexterous Manipulation In-The-Wild

Advisors: Pulkit Agrawal and Edward Adelson | **ICRA, 2025 (Under review)** | [arXiv]

- Developed exoskeletons for bimanual dexterous robotic arms to enhance data collection through direct haptic feedback and GelSight tactile sensing, eliminating the need for teleoperation.
- Aiming to decouple tactile and visual feedback by composing diffusion models, enabling scalable multimodal learning.

Keypoint Abstraction using Large Models for Object-Relative Imitation Learning

Advisors: Joshua B. Tenenbaum, Leslie P. Kaelbling and Tomás Lozano-Pérez | [Project Page]

- **Workshop on Language and Robot Learning at CoRL, 2024 (Best Paper); ICRA, 2025 (Under review)**
- Proposed a novel framework that uses VLMs to distill task-relevant keypoint abstractions from limited robot demonstrations, improving the data efficiency of downstream learning.
- Demonstrated strong generalization across object poses, camera views, and object instances with only 10 demonstrations.

Robot Learning Lab, National Taiwan University

Mar 2022 - Present

Undergraduate Researcher | Advisor: Shao-Hua Sun

Taipei, Taiwan

Leveraging Robotic Foundation Models as Data++ to Augment Datasets for Imitation Learning

Ongoing

- Developing a method to augment imitation learning datasets by leveraging robotics foundation models to enhance data diversity through synthetic trajectories.
- Currently exploring observation augmentation with video foundation models to introduce diverse trajectories with VLAs.

Diffusion Imitation Learning from Observation

NeurIPS, 2024 | [Project Page]

- Designed a Learning-from-Observation (LfO) algorithm using diffusion models to model state transitions and provide robust rewards to improve policy learning without action labels.
- Achieved SOTA performance in continuous control tasks and superior data efficiency compared to existing LfO methods.

Object-Centric Value-Implicit Pre-Training

RL Course Final Project, Best Project Award (Top 1/30) | [Report]

- Enhanced the Value-Implicit Pre-Training (VIP) framework with Temporal Cycle-Consistency (TCC) to map object and robot arm features, enabling object-centric task adaptation.
- Improved VIP robustness across novel tasks and embodiments, showing adaptability in diverse manipulation settings.

Division of Geological and Planetary Sciences, California Institute of Technology

Jun 2023 - Aug 2023

Summer Undergraduate Research Fellowship (SURF) | Advisor: Yuk L. Yung

Pasadena, CA

Improving XCO₂ Precision in OCO-2/3 Retrievals through Machine Learning-Enabled Extraction of

Volcanic Aerosol Information from L1B Spectra

AGU Annual Meeting, 2023 | [Poster]

- Developed a machine learning model to predict aerosol properties from satellite spectra, significantly improving CO₂ retrieval accuracy in Orbiting Carbon Observatory (OCO) during volcanic events.

Teaching Assistant Experience

Cornerstone EECS Design and Implementation (NTU EE1006)

Spring 2023 & 2024

Instructors: Kun-You Lin, Cheng-Wei Chen, and Jiun-Peng Chen

- Guided open-ended maker projects for first-year students integrating hardware and software skills.

Reinforcement Learning (NTU CommE5069)

Fall 2023

Instructor: Shao-Hua Sun

- Mentored graduate-level RL course final projects with bi-weekly meetings and designed homework for a class of 120 students.

Signals and Systems (NTU EE2011)

Spring 2023

Instructor: Lin-Shan Lee

- Graded homework and term exams and hosted weekly office hours for a class of 200 students.

Extracurricular Activities & Leaderships

NTUEE Night

Sep 2022 – Jul 2023

Event General Coordinator | [\[YouTube Playlist\]](#)

- Coordinated a large-scale event for students featuring over 200 performers across 15 acts, including dance and stage plays.
- Attracted over 500 audiences in a 250-seat auditorium and sponsorship over USD\$2,000 from enterprises.

NTUEE Light Dance

Sep 2021 - Jul 2023

Leader of Software Team | [\[Performance Video\]](#) [\[YouTube Channel\]](#) [\[GitHub\]](#)

- Designed and integrated a software system connecting the web editor to hardware controllers for seamless light choreography.
- Developed an OS-level embedded system on Raspberry Pis to ensure real-time synchronization among over 500 optical fibers, 2,000 LED chips, and the music for a performance by 10 dancers.
- The performance received over 340,000 views on YouTube and was featured in four news outlets.

NTUEE Student Association

Sep 2020 – Jul 2023

Minister of Information Department | [\[GitHub\]](#)

- Led a team of 40 individuals in producing and maintaining student association websites and services, which included 8 long-standing services and various activity-based services, benefiting over 1,000 students.
- Offered technical courses to junior students and trained them in website and service development and maintenance.

NTU College Admissions Mentorship Seed Program

Sep 2021 – Jun 2022

Volunteer Mentor in STEM | [\[Program Website\]](#)

- Aimed to bridge educational disparities by providing equal access to college admissions resources and mentorship, supporting students from diverse backgrounds towards achieving academic success.
- Mentored over 200 underprivileged students (~10 personally) in college entrance exams and applications.

NTUEE Baseball Team

Sep 2020 – Jan 2022

Team Member

Awards & Honors

Fellowships

2023	BaBar SURF Fellowship, <i>California Institute of Technology</i>	Pasadena, CA
2023	Irving T. Ho Memorial Fellowship, <i>Irving T. Ho Memorial Foundation</i>	Taipei, Taiwan

Scholarships

2023	NTUEE Class of 1960 Scholarship, <i>National Taiwan University</i> (Top 2 of the class; USD\$3,500)	Taipei, Taiwan
2022	Jia-Lin Su Memorial Scholarship, <i>National Taiwan University</i> (Top 1 of the class; USD\$2,000)	Taipei, Taiwan

Awards

2024	Best Paper, <i>Workshop on Language and Robot Learning at CoRL</i> (Top 2/60 papers)	Munich, Germany
2024	Best Application, <i>MakeNTU Hackathon</i> (Nationwide)	Taipei, Taiwan
2023	Best Maker, <i>MakeNTU Hackathon</i> (Nationwide)	Taipei, Taiwan
2023	Fourth Place, <i>AIS3 EOF Cybersecurity Competition</i> (Nationwide)	Taipei, Taiwan
2021	Second Place, <i>General Physics Experiment Creative Competition</i> (School)	Taipei, Taiwan
2020	Third Place, <i>Taiwan International Science Fair</i> (Worldwide)	Taipei, Taiwan
2018	Silver Medalist, <i>Taiwan Young Physicists' Tournament</i> (Nationwide)	Taipei, Taiwan

Presentations

2024	Diffusion Imitation from Observation, <i>NeurIPS Poster</i>	Vancouver, Canada
2023	Improving XCO ₂ Precision in OCO-2/3 Retrievals through Machine Learning-Enabled Extraction of Volcanic Aerosol Information from L1B Spectra, <i>AGU Poster</i>	San Francisco, CA
2020	Rhodium-Catalyzed Desymmetrization of Cyclodienones via Domino Reaction with Benzocyclobutenols, <i>Taiwan International Science Fair Poster</i>	Taipei, Taiwan