

Bo-Ruei (Ray) Huang

🏠 borueihuang.com | ✉️ b09901171@ntu.edu.tw | 📞 +1(626)831-3755 | 📧 rayray2002 | 🌐 borueihuang | 🐦 @borueihuang | 🎓 Bo-Ruei Huang

Education

National Taiwan University

Bachelor of Science in Engineering

Taipei, Taiwan

Sep 2020 - Jan 2025

- Majors: **Computer Science and Information Engineering & Electrical Engineering (Double Major)**
- Overall GPA: **4.24/4.30**, Rank: 7/264 (**Top 3%**)
- Dean List Award: **4 Semesters (Top 5%)**
- The Phi Tau Phi Scholastic Honor Society Member (**Top 1%** of the college)

Publications

Keypoint Abstraction using Large Models for Object-Relative Imitation Learning

Xiaolin Fang*, **Bo-Ruei Huang***, Jiayuan Mao*, Jasmine Shone, Joshua B. Tenenbaum, Tomás Lozano-Pérez, Leslie Pack Kaelbling
Preprint, 2024

Diffusion Imitation from Observation

Bo-Ruei Huang, Chun-Kai Yang, Chun-Mao Lai, Dai-Jie Wu, Shao-Hua Sun
NeurIPS, 2024

Improving XCO2 Precision in OCO-2/3 Retrievals through Machine Learning-Enabled Extraction of Volcanic Aerosol Information from L1B Spectra

Bo-Ruei Huang, Sihe Chen, Vijay Natraj, Zhao-Cheng Zeng, Yangcheng Luo, Yuk L. Yung
AGU Fall Meeting, 2023

Research Experience

Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology

Visiting Student

MA, United States

July 2024 - Current

- Conduct robot learning research about representation learning for human-like planning.
- Advisors: **Jiayuan Mao**, **Xiaolin Fang**, **Josh B. Tenenbaum** and **Leslie P. Kaelbling**

Robot Learning Lab, National Taiwan University

Undergraduate Researcher

Taipei, Taiwan

Mar 2022 - Current

- Conduct robot learning research about reinforcement learning and imitation learning.
- Advisor: **Shao-Hua Sun**

Division of Geological and Planetary Sciences, California Institute of Technology

Summer Undergraduate Research Fellowship

CA, United States

Jun 2023 - Aug 2023

- Conduct planetary science research about satellite measurement retrieval.
- Advisor: **Yuk L. Yung**

Teaching Experience

Cornerstone EECS Design and Implementation, National Taiwan University

Teaching Assistant

Taipei, Taiwan

Spring 2024

- Mentor open-ended maker projects for freshmen students integrating hardware and software skills.
- Professors: **Cheng-Wei Chen** and **Jiun-Peng Chen**

Reinforcement Learning, National Taiwan University

Teaching Assistant

Taipei, Taiwan

Fall 2023

- Mentor RL research projects with bi-weekly meetings and grade the homework for 120 students.
- Professor: **Shao-Hua Sun**

Signal and System, National Taiwan University

Teaching Assistant

Taipei, Taiwan

Spring 2023

- Grade the homework and term exams and host weekly office hours for 200 students.
- Professor: **Lin-Shan Lee**

Cornerstone EECS Design and Implementation, National Taiwan University

Teaching Assistant

Taipei, Taiwan

Spring 2023

- Mentor open-ended maker projects for freshmen students integrating hardware and software skills.
- Professors: **Kun-You Lin** and **Jiun-Peng Chen**

Research Projects

Keypoint Abstraction using Large Models for Object-Relative Imitation Learning (KALM)

Massachusetts Institute of Technology

MA, United States

Aug 2024 - Present

- **In Submission (ICRA, 2025)**

- Proposed a state representation that distills keypoint abstraction by prompting and verifying keypoint proposals from large pre-trained models using a small amount of robot demonstration, which is used to train a keypoint-conditioned policy model.
- Demonstrated strong generalization across object poses, camera views, and object instances with only 10 demonstrations.
- **Keywords:** Robot Learning, Representation Learning, Imitation Learning, Diffusion Model.

Diffusion Imitation Learning from Observation (DIFO)

National Taiwan University

Taipei, Taiwan

Apr 2024 - Oct 2024

- **NeurIPS, 2024**

- Developed a learning from demonstration (LfO) algorithm that integrates diffusion models to model state transitions and provide robust rewards to improve policy learning without action labels.
- Achieved superior performance in various tasks, including navigation, locomotion, manipulation, and games.
- **Keywords:** Reinforcement Learning, Imitation Learning, Learning from Demonstration, Diffusion Model.

Learning Long-horizon Robotics Tasks From Video Demonstrations

National Taiwan University

Taipei, Taiwan

Dec 2023 - May 2024

- Solved robotics long-horizon tasks using Large Language Models (LLMs) to plan subgoals and employ Language-Image Value learning (LIV) to learn new skills.
- **Keywords:** Reinforcement Learning, Robot Learning, Unsupervised Learning, Contrastive Learning.

Object-Centric Value-Implicit Pre-Training

National Taiwan University

Taipei, Taiwan

Sep 2023 - Dec 2024

- Leveraged Temporal Cycle-Consistency (TCC) to map features of robot arm and object, making Value-Implicit Pre-training (VIP) network object-centric, to adapt it to robot manipulation tasks.
- **Keywords:** Reinforcement Learning, Robot Learning, Unsupervised Learning, Contrastive Learning.

Robotic Peer Learning

National Taiwan University

Taipei, Taiwan

Oct 2023 - Apr 2024

- Disentangled agent-relevant and task-relevant features from expert demonstration, and use them for unseen agent-task pair.
- Enabled robots to learn new tasks in peer without centralized foundation models.
- **Keywords:** Reinforcement Learning, Robot Learning, Imitation Learning, Contrastive Learning.

Improving XCO₂ Precision in OCO-2/3 Retrievals through Machine Learning-Enabled Extraction of Volcanic Aerosol Information from L1B Spectra

California Institute of Technology

CA, United States

Jun 2023 - Present

- **AGU, 2023**

- Applied machine learning to extract vital aerosol details from OCO data using CALIPSO and MODIS measurements.
- Improved accuracy in CO₂ retrieval, contributes to better climate modeling and scientific insights.
- **Keywords:** Machine Learning, Planetary Science, Aerosols.

Offline Multitask Reinforcement Learning with Decision Transformer

National Taiwan University

Taipei, Taiwan

Sep 2022 - June 2023

- Achieved offline skill merging and interpolation using Decision Transformer.
- Transformed MDP problems into sequence problems to take advantage of transformers.
- **Keywords:** Reinforcement Learning, Offline Learning, Multitask Learning.