Haotian Liu

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EDUCATION

Worcester Polytechnic Institute — **Worcester, MA, U.S**
Undergraduate in Robotics Engineering, Minoring Mathematics — Expected May 2025

WORK EXPERIENCE

Northeastern University — **Boston, MA, US**
Research Intern with Prof. Robert Platt in The Helping Hands Lab — May 2024 – August 2025

PUBLICATIONS (* Indicates co-first author or equal contribution)

[1] **MATCH POLICY: A Simple Pipeline from Point Cloud Registration to Manipulation Policies** *Haojie Huang, **Haotian Liu**, Dian Wang, Robin Walters*, and Robert Platt**, Under Review, PDF

[2] **Imagination Policy: Using Generative Point Cloud Models for Learning Manipulation Policies** *Haojie Huang, Karl Schmeckpeper*, Dian Wang*, Ondrej Biza*, Yaoyao Qian**, **Haotian Liu****, Mingxi Jia**, Robert Platt, and Robin Walters*, Conference on Robot Learning (CoRL) 2024, PDF

[3] **GPS: A Probabilistic Distributional Similarity with Gumbel Priors for Set-to-Set Matching** ***Haotian Liu****, *Ziming Zhang*, Fangzhou Lin*, Jose Morales, Haichong Zhang, Kazunori Yamada, Vijaya B Kolachalama, and Venkatesh Saligrama*, Under Review, Paper upon request

[4] **Loss Distillation via Gradient Matching for Point Cloud Completion with Weighted Chamfer Distance** ***Haotian Liu****, *Fangzhou Lin*, Songlin Hou, Haoying Zhou, Kazunori Yamada, Gregory S. Fischer, Yanhua Li, and Ziming Zhang*, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024 **Oral Presentation**, PDF

[5] **Automated Control of External Ventricular Drain for Neuro-ICU** ***Haotian Liu****, *Yujie Guo*, Haoran Zhang*, Matthew Duncan*, and Christopher Nycz*, **US Patent** (In Progress), **Bachelor Thesis** (Major Qualifying Project), PDF

[6] **Enhancing boundary detection of radiofrequency ablation lesions through photoacoustic mapping** *Shang Gao, **Haotian Liu**, Allison Post, Lukas Jaworski, Drew Bernard, Mathews John, Elizabeth Cosgriff-Hernandez, Mehdi Razavi, and Haichong Zhang,* Scientific Reports (2024), PDF

[7] **Vision-based FDM Printing for Fabricating Airtight Soft Actuators** *Yijia Wu*, Zilin Dai*, **Haotian Liu**, Lehong Wang, and Markus P. Nemitz*, IEEE-RAS International Conference on Soft Robotics (RoboSoft) 2024 **Oral Presentation**, PDF

[8] **STREAM: Software Tool for Routing Efficiently Advanced Macrofluidics** *Lehong Wang, Savita V. Kendre, **Haotian Liu**, Markus P. Nemitz*, Under Review, PDF

[9] **Toward Wearable Multimodal Neuroimaging** ***Haotian Liu****, *Haohao Yi*, Lehong Wang*, Meng Wang*, Wirt Jones*, Yujie Guo*, and Yifu Yuan**, **Bachelor Capstone** (Interactive Qualifying Project), PDF

RESEARCH EXPERIENCE

Point Cloud Registration for Robotic Pick-and-Place (*Pub Index* [1]) **NEU**, **Boston**, **MA**
Supervisor: Prof. Robert Platt May. 2024 - October. 2024
Description:
- Applied learning-based and RANSAC with ICP-based point cloud registration methods for pick and place target matching.
- Conducted real-world robot evaluations for high-precision tasks and multi-step tasks.
- Created task visualizations and video demonstrations for paper submission.

Point Cloud Generation for Robotic Policy Learning (*Pub Index* [2]) **NEU**, **Boston**, **MA**
Supervisor: Prof. Robert Platt May. 2024 - September. 2024
Description:
- Applied various policy learning baselines (single/multi-task), RVT, PerAct, and RPDiff, on our setting to show the superiority of our method's sample efficiency and high success rate.
- Took responsibility for collecting real robot demos (Mug-Tree, Pouring-Ball, Plug-Flower) and conducting real robot evaluations.
- Introduced an articulate object task (open microwave) and a multi-step task (stack chairs) to show the generalization ability of our method.

Statistical Similarity for Point Cloud and Beyonds (*Pub Index* [3]) **WPI**, **Worcester**, **MA**
Supervisor: Prof. Ziming Zhang December. 2023 - June. 2024
Description:
- Proposed a similarity learning framework for set-to-set matching by learning a Gumbel prior with minimum distances between the set items to maximize the likelihood.
- Demonstrate a bilevel optimization problem for the MLE algorithm, where the feature matching forms the lower level, and the MLE forms the upper level.
- Demonstrate comprehensive experiments on point cloud completion and few-shot image classification tasks to show the generalization of our method.

Loss Optimization for Point Cloud Completion (*Pub Index* [4]) **WPI**, **Worcester**, **MA**
Supervisor: Prof. Ziming Zhang September. 2023 - May. 2024
Description:
- Proposed a family of CD-based losses (weighted CD) using a gradient weighting scheme to mimic the teaching NN learning behavior.
- Proposed a novel bilevel optimization formula to train the backbone network based on the weighted CD loss, which needs no data-related parameter tuning.
- Conducted comprehensive experiments with novel networks in both real (KITTI) and synthesis (ShapeNet) datasets to examine the findings.

EVD Automated Control (*Pub Index* [5]) **WPI**, **Worcester**, **MA**
Supervisor: Prof. Christopher Nycz September. 2023 - May. 2024
Description
- Built an automated intracranial pressure leveling system with a pressure sensor, linear actuator, depth camera, and stepper motor.
- Recognized the leveling system as a following stabilization problem, using full state feedback and internal model principle to design controller and analyze system error.
- Conducted validation experiments using the VICON motion capture device to ensure the controlling quality with real-time human motion.

PA Mapping for Ablation Boundary Detection (*Pub Index* [6]) **WPI**, **Worcester**, **MA**
Supervisor: Prof. Haichong K. Zhang September. 2023 - May. 2024
Description
- Conducted photoacoustic (PA) imaging scans and radiofrequency (RF) catheter ablation studies using impedance control in animal experiments for data collection and analysis.
- Studied PA index correlation with lesion boundaries using beamforming techniques.
- Validated results by PA-based necrotic region mapping to quantify the ablation-induced necrosis with respect to non-necrotic tissues.

Close-loop 3D Printing for Airtight Structures (*Pub Index* [7]) **WPI**, **Worcester**, **MA**
Supervisor: Prof. Markus P. Nemitz August. 2023 - November. 2023
Description:
- Proposed a low-cost, vision-based, and close-loop approach to improving the FDM printing quality.
- Achieved airtightness of printed soft pneumatic actuators without fine-tuning printing parameters.
- Validated the approach through extensive underwater testing and numerical analysis.

A Blender Add-on for Efficient Fluid Circuit Generation (*Pub Index* [8]) **WPI**, **Worcester**, **MA**
Supervisor: Prof. Markus P. Nemitz February. 2023 - September. 2023
Description:
- Introduced a software-based workflow that generates printable fluidic networks automatically.
- Proposed a three-dimensional A* algorithm for pathfinding.
- Introduced the concepts of surface-mount technology from PCB design into Macrofludic circuits.

Wearable Multimodal Neuroimaging by EEG (*Pub Index* [9]) **WPI**, **Worcester, MA**
Supervisors: Prof. Ali Yousefi and Prof. Soroush Farzin May. 2022 - September. 2022
Description:
- Constructed a compact wearable EEG chip (based on TGAM) for monitoring sleep spindle.
- Integrated a Bluetooth low-energy chip (RN4870) with Bleak to build a communication system.
- Designed a user-friendly interface for EEG readings.

SKILLS

Languages: Proficient in Chinese and English; Basic in Japanese
Programming: Python, C++, MATLAB
Tools: SolidWorks, Prusa Slicer, Blender, Illustrator, Multisim, Altium Designer.
Robotics: ROS, UR Arms, TurtleBot, PyBullet, OMPL, PDDL, CoppeliaSim
Core Courses: RBE 501 Robot Dynamics; RBE 550 Motion Planning; CS 545 Digital Image Processing; ECE 2049 Embedded System Programming; MA 529 Stochastic Processes; MA 543 Statistical Methods for Data Science

SERVICE

Reviewer: NeurIPS 2024; ICLR 2025; AISTATS 2025; ICML 2025

AWARDS

WPI Presidential Scholarship: a total of $84,000 for undergraduate study;
WPI Alumni Funding: $10,000 each academic year (currently second year) to support the EVD Automated Control project;