Baichuan Huang

R&D Interests: robot manipulation, task planning, and perception

baichuan05@gmail.com | baichuan05.github.io | Google Scholar | GitHub

Education

Rutgers University — *New Brunswick, NJ*
Ph.D. in Computer Science, advised by Jingjin Yu — *2019 - 2025*

Brown University — *Providence, RI*
M.S. in Computer Science, advised by Stefanie Tellex — *2017 - 2019*

Xi'an Jiaotong-Liverpool University & University of Liverpool — *China & UK*
B.S. in Computer Science (First Class Degree) — *2013 - 2015 & 2015 - 2017*

Work Experience

Coupang - Senior Robotics Engineer & Intern — *Moutain View, CA*
Manager: Hui Cheng — *Jan. 2024 - Present*

- Spearheaded the end-to-end development of a robotic bin-picking system, successfully transitioning it from initial lab concept to full-scale production and achieving a packing rate of 450 items per hour per arm.
- Engineered and implemented a suite of computer vision solutions, including grasp pose generation, empty-bin detection, bagging-defect detection, and object-tracking to enhance system autonomy and accuracy.
- Developed and optimized the complete robot motion planning stack, creating a real-time controller for smooth trajectory following and implementing advanced trajectory stitching and optimization algorithms.
- Integrated force sensors into motion and constraint planning, significantly reducing item drop rates and improving manipulation reliability.
- Designed and deployed a full-stack, operator-ready hand-eye calibration pipeline, complete with a web-based UI and custom calibration hardware tools for streamlined system setup and maintenance.
- Orchestrated the physical workcell design, conducting robot reachability analysis to determine optimal hardware placement for maximum efficiency and safety.
- Led the integration of the bin-picking system with an autobagger packing system, creating a seamless and automated warehouse workflow from picking to packing.

Mitsubishi Electric Research Laboratories - Research Intern — *Cambridge, MA*
Supervisor: Siddarth Jain — *May. - Dec. 2022*

- Developed real-time active pose tracking algorithms for unseen objects by integrating object detection, 2D object tracking, and 6D pose tracking methods.
- Implemented a control policy in simulation for a UR5 robot to do real-time grasping within a closed-loop control system.
- Transferred (sim-to-real) the control policy to a real UR5 with hand-eye coordination.
- Enabled robot-human interaction, robot can grasp a moving object from the human hand.

Research Experience

Integrating Planning and Learning — *Rutgers University, NJ*
Co-Advisors: Prof. Jingjin Yu and Prof. Abdeslam Boularias — *2019 - 2024*

- Investigated the synergistic integration of diverse manipulation actions (gripper-based push and grasp, suction-based drag and grasp) to address long-horizon task-and-motion planning challenges in robotic systems.
- Accelerated Monte Carlo Tree Search using CPU and GPU parallelism with rigid-body simulations.
- Integrated deep learning into Monte Carlo Tree Search for faster and improved robotic manipulation tasks: clutter removal and object retrieval.
- Designed deep learning models for predicting post-push collision outcomes between objects.
- Established a vision-based object detection and pose estimation pipeline.

Educational Drone Platform Development and Research *Brown University, RI*

Advisor: Prof. Stefanie Tellex *2018 - 2019*

- Engineered a feature-based localization algorithm specifically tailored for deployment on a Raspberry Pi-powered drone.
- Contributed to implementing Simultaneous Localization and Mapping (SLAM) on the drone.
- Conducted research in the domain of human-robot interaction and proposed a framework for autonomous language grounding within a Mixed Reality setting.

Skills

Programming Languages: Python, Java, C

Tools: PyTorch, Isaac Sim/Gym, ROS, OpenCV, PyBullet, CoppeliaSim, Mixed Reality Toolkit, Blender, OptiTrack, Docker, CircleCI, Groot, Curobo, Cura, Autofusion

Robots: ABB Industrial arms, KUKA Industrial arms, UR5, Kinova Gen3

Publications

Published - First Author

Efficiently Manipulating Clutter via Learning and Search-Based Reasoning
Baichuan Huang
Ph.D. Dissertation, 2025

Toward Optimal Tabletop Rearrangement with Multiple Manipulation Primitives
Baichuan Huang, Xujia Zhang, Jingjin Yu
IEEE International Conference on Robotics and Automation (ICRA), 2024

EARL: Eye-on-Hand Reinforcement Learner for Dynamic Grasping with Active Pose Estimation
Baichuan Huang, Jingjin Yu, Siddarth Jain
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2023

Parallel Monte Carlo Tree Search with Batched Rigid-body Simulations for Speeding up Long-Horizon Episodic Robot Planning
Baichuan Huang, Abdeslam Boularias, Jingjin Yu
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022

Interleaving Monte Carlo Tree Search and Self-Supervised Learning for Object Retrieval in Clutter
Baichuan Huang, Teng Guo, Abdeslam Boularias, Jingjin Yu
IEEE International Conference on Robotics and Automation (ICRA), 2022

Visual Foresight Trees for Object Retrieval from Clutter with Nonprehensile Rearrangement
Baichuan Huang, Shuai D Han, Jingjin Yu, Abdeslam Boularias
IEEE Robotics and Automation Letters (RA-L), 2022

DIPN: Deep Interaction Prediction Network with Application to Clutter Removal
Baichuan Huang, Shuai D Han, Abdeslam Boularias, Jingjin Yu
IEEE International Conference on Robotics and Automation (ICRA), 2021

Advanced Autonomy on a Low-Cost Educational Drone Platform
Luke Eller*, Theo Guerin*, **Baichuan Huang***, Garrett Warren*, Sophie Yang*, Josh Roy, Stefanie Tellex
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019. ***RoboCup Best Paper Award Finalist***

Flight, Camera, Action! Using Natural Language and Mixed Reality to Control a Drone
Baichuan Huang, Deniz Bayazit, Daniel Ullman, Nakul Gopalan, Stefanie Tellex
IEEE International Conference on Robotics and Automation (ICRA), 2019

Published - co-author

Monocular One-Shot Metric-Depth Alignment for RGB-Based Robot Grasping
Teng Guo, **Baichuan Huang**, Jingjin Yu
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2025

LGMCTS: Language-Guided Monte-Carlo Tree Search for Executable Semantic Object Rearrangement
Haonan Chang, Kai Gao, Kowndinya Boyalakuntla, Alex Lee, **Baichuan Huang**, Jinjin Yu, Abdeslam Boularias
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024

Minimizing running buffers for tabletop object rearrangement: Complexity, fast algorithms, and applications
Kai Gao, Si Wei Feng, **Baichuan Huang**, Jingjin Yu
The International Journal of Robotics Research, 2023

Learning Generalizable Pivoting Skills
Xiang Zhang, Siddarth Jain, **Baichuan Huang**, Masayoshi Tomizuka, Diego Romeres
IEEE International Conference on Robotics and Automation (ICRA), 2023

Hierarchical planning with state abstractions for temporal task specifications
Yoonseon Oh, Roma Patel, Thao Nguyen, **Baichuan Huang**, Matthew Berg, Ellie Pavlick, Stefanie Tellex
Autonomous Robots, 2022

Stackelberg Strategic Guidance for Heterogeneous Robots Collaboration
Yuhan Zhao, **Baichuan Huang**, Jingjin Yu, Quanyan Zhu
IEEE International Conference on Robotics and Automation (ICRA), 2022

Fast High-Quality Tabletop Rearrangement in Bounded Workspace
Kai Gao, Darren Lau, **Baichuan Huang**, Kostas E Bekris, Jingjin Yu
IEEE International Conference on Robotics and Automation (ICRA), 2022

Toward Fully Automated Metal Recycling using Computer Vision and Non-Prehensile Manipulation
Shuai D Han, **Baichuan Huang**, Sijie Ding, Changkyu Song, Si Wei Feng, Ming Xu, Hao Lin, Qingze Zou, Abdeslam Boularias, Jingjin Yu
IEEE International Conference on Automation Science and Engineering (CASE), 2021

Planning with State Abstractions for Non-Markovian Task Specifications
Yoonseon Oh, Roma Patel, Thao Nguyen, **Baichuan Huang**, Ellie Pavlick, Stefanie Tellex
Robotics: Science and Systems (RSS), 2019

Teaching Experience

Fall 2019 & 2023	**Introduction to Computational Robotics**, Teaching Assistant, Rutgers University
Fall 2020 & 2021	**Introduction to Discrete Structures**, Teaching Assistant, Rutgers University
Spring 2019	**Data Structures**, Teaching Assistant, Rutgers University
Fall 2018	**Introduction to Robotics**, Teaching Assistant, Brown University

Professional Service

Peer Review

IEEE Transactions on Robotics (T-RO)

IEEE International Conference on Robotics and Automation (ICRA)

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

IEEE Robotics and Automation Letters (RA-L)

International Symposium on Experimental Robotics (ISER)

Mentor

Fall 2023	**Xujia Zhang**, Undergrad Research Assistant, Rutgers University