JACKY LIANG

jackyliang42@gmail.com ◇ www.jacky.io

EDUCATION

Carnegie Mellon University *August 2018 - December 2022*
PhD
Robotics Institute

University of California Berkeley *August 2014 - December 2017*
Bachelor of Science GPA: 3.93
Electrical Engineering and Computer Science, High Honors

RESEARCH

Research Scientist, Robotics at Google *June 2023 - Present*

My research focuses on developing and applying foundation models for robotics.

PhD Student, Carnegie Mellon University, IAM Lab *August 2018 - December 2022*

Co-advised by Professor Oliver Kroemer and Professor Maxim Likhachev.

My research focused on enabling robust and generalizable robot manipulation by incorporating structured priors into learning-based methods like reinforcement learning and self-supervised learning [5-6, 10-16].

My thesis "Learning with Structured Priors for Robust Robot Manipulation" can be viewed at www.jacky.io/links/thesis. A recording of the defense can be found at www.jacky.io/links/defense

Research Intern, Google Brain *May 2022 - September 2022*

I worked on using Large Language Models (LLMs) to reason and plan robot tasks, applying action-oriented multi-modal foundation models to robotics. In [17] we used language-based reasoning with grounded visual feedback to enable more robust high-level task planning. In [18] we used code-generation as the medium for LLMs to express robot policies, enabling zero-shot completion of a wide-variety of language-specified tasks. Hosted by Andy Zeng and Pete Florence.

Research Intern, Nvidia *May 2019 - August 2019*

Worked on using GPU-accelerated physics simulation and BioTac contact feedback for vision-free, in-hand object pose tracking during dexterous manipulation [9]. Hosted by Ankur Handa.

Research Intern, Nvidia *January 2018 - June 2018*

Worked on large-scale distributed Deep Reinforcement Learning with GPU-accelerated robotics simulation [4]. Hosted by Viktor Makoviychuk.

Undergraduate Research Assistant, UC Berkeley, Autolab *October 2015 - December 2017*

Advised by Professor Ken Goldberg.

Dexterity Network (Dex-Net) - We used analytical grasp metrics to supervise convolutional neural networks to rate grasp quality from depth images [2]. This is one of the earliest works applying large-scale deep learning to plan robust robot grasps.

Deep Imitation Learning - Deep learning of vision-feedback policies for bilateral manipulation tasks from human demonstrations collected via a custom real-time teleoperation system [3].

PREPRINTS

[18] **Jacky Liang**, Wenlong Huang, Fei Xia, Peng Xu, Karol Hausman, Brian Ichter, Pete Florence, Andy Zeng. *Code as Policies: Language Model Programs for Embodied Control.* September 2022. https://arxiv.org/abs/2209.07753

CONFERENCE PUBLICATIONS

[17] Wenlong Huang*, Fei Xia*, Ted Xiao*, Harris Chan, **Jacky Liang**, Pete Florence, Andy Zeng, Jonathan Tompson, Igor Mordatch, Yevgen Chebotar, Pierre Sermanet, Noah Brown, Tomas Jackson, Linda Luu, Sergey Levine, Karol Hausman, Brian Ichter. *Inner Monologue: Embodied Reasoning through Planning with Language Models.* Conference on Robot Learning (CoRL). December 2022. https://arxiv.org/abs/2207.05608

[16] **Jacky Liang**, Xianyi Cheng, Oliver Kroemer. *Learning Preconditions of Hybrid Force-Velocity Controllers for Contact-Rich Manipulation.* Conference on Robot Learning (CoRL). December 2022. https://arxiv.org/abs/2206.12728

[15] **Jacky Liang***, Mohit Sharma*, Alex LaGrassa, Shivam Vats, Saumya Saxena, Oliver Kroemer. *Search-Based Task Planning with Learned Skill Effect Models for Lifelong Robotic Manipulation.* International Conference on Robotics and Automation (ICRA). May 2022. https://arxiv.org/abs/2109.08771

[14] Vicky Zeng, Timothy E. Lee*, **Jacky Liang***, Oliver Kroemer. *Visual Identification of Articulated Object Parts.* International Conference on Intelligent Robots and Systems (IROS). September 2021. https://arxiv.org/abs/2012.00284

[13] **Jacky Liang**, Oliver Kroemer. *Contact Localization for Robot Arms in Motion without Torque Sensing.* International Conference on Robotics and Automation (ICRA). May 2021. https://arxiv.org/abs/2011.03142

[11] Mohit Sharma*, **Jacky Liang***, Jialiang Zhao, Alex LaGrassa, Oliver Kroemer. *Learning to Compose Hierarchical Object-Centric Controllers for Robotic Manipulation.* Conference on Robot Learning (CoRL). Plenary Presentation. November 2020. https://arxiv.org/abs/2011.04627

[10] **Jacky Liang**, Saumya Saxena, Oliver Kroemer. *Learning Active Task-Oriented Exploration Policies for Bridging the Sim-to-Real Gap.* Robotics: Science and Systems (RSS). July 2020. https://arxiv.org/abs/2006.01952

[9] **Jacky Liang**, Ankur Handa, Karl Van Wyk, Viktor Makoviychuk, Oliver Kroemer, Dieter Fox. *In-Hand Object Pose Tracking via Contact Feedback and GPU-Accelerated Robotic Simulation.* International Conference on Robotics and Automation (ICRA). May 2020. https://arxiv.org/abs/2002.12160

[8] Ankur Handa, Karl Van Wyk, Wei Yang, **Jacky Liang**, Yu-Wei Chao, Qian Wan, Stan Birchfield, Nathan Ratliff, Dieter Fox. *DexPilot: Vision Based Teleoperation of Dexterous Robotic Hand-Arm System.* International Conference on Robotics and Automation (ICRA). May 2020. https://arxiv.org/abs/1910.03135

[6] Austin S. Wang, Wuming Zhang, Daniel Troniak, **Jacky Liang**, Oliver Kroemer. *Homography-Based Deep Visual Servoing Methods for Planar Grasps.* International Conference on Intelligent Robots and Systems (IROS). November 2019.

[5] Jialiang Zhao, **Jacky Liang**, Oliver Kroemer. *Towards Precise Robotic Grasping by Probabilistic Post-grasp Displacement Estimation.* Field and Service Robotics (FSR). August 2019. https://arxiv.org/abs/1909.02129

[4] **Jacky Liang***, Viktor Makoviychuk*, Ankur Handa*, Nuttapong Chentanez, Miles Macklin, Dieter Fox. *GPU-Accelerated Robotic Simulation for Distributed Reinforcement Learning.* Conference on Robot Learning (CoRL). October 2018. https://arxiv.org/abs/1810.05762

[3] **Jacky Liang**, Jeffrey Mahler, Michael Laskey, Pusong Li, Ken Goldberg. *Using dVRK Teleoperation to Facilitate Deep Learning of Automation Tasks for an Industrial Robot.* Conference on Automation Science and Engineering (CASE). Xian, China. August 2017. Finalist, Best Student Paper Award.

[2] Jeffrey Mahler, **Jacky Liang**, Sherdil Niyaz, Michael Laskey, Richard Doan, Xinyu Liu, Juan Aparicio Ojea, Ken Goldberg. *Dex-Net 2.0: Deep Learning to Plan Robust Grasps with Synthetic Point Clouds and Analytic Grasp Metrics.* Robotics: Science and Systems (RSS). MIT Cambridge, MA. July 2017.

[1] Menglong Guo, David V. Gealy, **Jacky Liang**, Jeffrey Mahler, Aimee Goncalves, Stephen McKinley, Ken Goldberg. *Design of Parallel-Jaw Gripper Tip Surfaces for Robust Grasping.* International Conference on Robotics and Automation (ICRA). Singapore. May 2017.

**Equal Contribution*

OTHER PUBLICATIONS

[12] Kevin Zhang*, Mohit Sharma*, **Jacky Liang***, Oliver Kroemer. *A Modular Robotic Arm Control Stack for Research: Franka-Interface and FrankaPy.* November 2020. `https://arxiv.org/abs/2011.02398`

[7] Nathan Zhang*, **Jacky Liang***, Amanda Tomlinson*, Frank Boensch, Anant Sahai. *Undergraduate-Led Survey Class to Improve CS Education for New Students.* SIGCSE '20: Proceedings of the 51st ACM Technical Symposium on Computer Science Education. February 2020.

**Equal Contribution*

OPEN-SOURCE SOFTWARE

Language Model Programs, Interactive colab notebook that implements language model programs for a simulated table-top manipulation domain.
`https://colab.research.google.com/drive/124TE4TsGYyrvduzeDclufyvwcc2qbbrE`

FrankaPy, Python interface for the Franka Emika Panda robot arm.
`https://github.com/iamlab-cmu/frankapy`

IsaacGym-Utils, Python library that provides simpler APIs for the Nvidia Isaac Gym robot simulator.
`https://github.com/iamlab-cmu/isaacgym-utils`

Simple-ZMQ, Python library that uses zmq to send arbtirary objects over a network.
`https://github.com/jacky-liang/simple_zmq`

Async-Savers, Python library for asynchronously saving data in shards.
`https://github.com/jacky-liang/async_savers`

Data-Learning-Boilerplate, Boilerplate Python code for collecting data and training neural networks using Weights and Biases and PyTorch Lightning.
`https://github.com/jacky-liang/data-learning-boilerplate`

YuMiPy, Python interface for the ABB YuMi robot arm.
`https://github.com/BerkeleyAutomation/yumipy`

OUTREACH AND SERVICE

Editor, Last Week in AI (`https://lastweekin.ai/`) *November 2018 - Present*

Mentor, CMU Project Ignite. Led local high school students in a project that uses derivative-free optimization to improve cookie recipes. *Spring 2021*

Mentor, CMU AI Mentoring Program *Fall 2019, Fall 2020, Fall 2021*

Editor, Berkeley AI Research Blog (`bair.berkeley.edu/blog`) *August 2017 - December 2017*

Tutoring and Education Officer, UC Berkeley Eta Kappa Nu *January 2016 - May 2017*

TEACHING

CMU January 2021 - May 2021
Teaching Assistant

· 16-350 Planning Techniques for Robotics. Topics include graph search, sampling-based planning, symbolic planning.

CMU January 2020 - May 2020
Teaching Assistant

· 16-662 Robot Autonomy. Topics include task-space control, motion planning, task planning, grasping.

UC Berkeley August 2016 - December 2017
Undergraduate Student Instructor

· CS188 Introduction to Artificial Intelligence. Topics include search, games, probabilistic graphical models, reinforcement learning, and deep learning.
· EE16A Design of Information Devices and Systems. Topics include linear algebra, signals and systems, and circuit design.

AWARDS AND HONORS

Graduate Research Fellow, National Science Foundation *August 2018*

Finalist, Best Student Paper, Conference on Automation Science and Engineering *August 2017*

Member, UC Berkeley Tau Beta Pi, Engineering Honors Society *December 2016*

Member, UC Berkeley Eta Kappa Nu, EECS Honors Society *May 2016*

Regent's and Chancellor's Scholar, UC Berkeley *August 2014*

STUDENTS MENTORED

Jeff Tan, Learning robust 3D representations for manipulation. *February 2021 - May 2022*

Vicky Zeng, First-author on *Visual Identification of Articulated Object Parts.* Currently PhD Student at Johns Hopkins University *March 2020 - May 2021*