Dhruv Shah

Contact Information

Berkeley AI Research
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Google Scholar

Education

University of California, Berkeley — August 2019 – Present
Ph.D. Candidate in Electrical Engineering & Computer Science
Advisor: Prof. Sergey Levine; GPA: 4.0/4.0

Indian Institute of Technology, Bombay — July 2015 – May 2019
B.Tech. (with Honors) in Electrical Engineering; GPA: 9.54/10

Research Experience

Berkeley Artificial Intelligence Research (UC Berkeley) — August 2019 – Present
Conducting research on building general-purpose mobile robots that operate in-the-wild.

Embodied AI @ FAIR (Meta AI) — May 2023 – Dec 2023
Developed a unified memory representation for lifelong learning with mobile robots.

Robotics @ Google DeepMind — May 2021 – Jan 2022
Developed representation learning algorithms for long-horizon planning and reasoning.

University of Sydney — May 2019 – August 2019
Worked on underwater robot perception using time-of-flight imaging.

Imperial College London — May 2018 – July 2018
Worked on dexterous aerial manipulation using non-linear optimization.

Robotics Institute (Carnegie Mellon University) — May 2017 – July 2017
Developed algorithms for subterranean robot localization and aerial inspection.

Indian Institute of Technology, Bombay — July 2017 – May 2019
Worked on computational imaging and algorithms for multi-agent robot coordination.

Honors and Awards

Research Mentorship Award, UC Berkeley — 2023
Best Systems Paper Award (Finalist), Robotics: Science and Systems — 2022
Google Research Academic Grant, UC Berkeley — 2022
Berkeley Fellowship, UC Berkeley (<0.2% of graduate applicants) — 2019–24
Berkeley AI Research Ignition Award, UC Berkeley — 2019
Undergraduate Research Award, IIT Bombay (<4%) — 2019
National Academy of Engineering Award (INAE), India ×2 — 2019 & 2018
EE Departmental Award for exceptional contribution to the department (1/120) — 2019
Institute Academic Prize, IIT Bombay (1/120) — 2017–18
Gold Medal in the Indian National Chemistry Olympiad (<0.1% Nationwide) — 2015
National Talent Search Scholarship, India (<0.2% Nationwide) — 2011–18

Refereed Publications

[1] **Grounded Decoding: Guiding Text Generation with Grounded Models for Robot Control**
Advances in Neural Information Processing Systems (NeurIPS) 2023
W. Huang, F. Xia, ***Dhruv Shah***, D. Driess, A. Zeng, Y. Lu, P. Florence, I. Mordatch, S. Levine, K. Hausman, B. Ichter

[2] **SACSoN: Scalable Autonomous Data Collection for Social Navigation**
IEEE Robotics and Automation Letters (RA-L) 2023
Conference on Robot Learning (CoRL) 2023 (Live Demo)
IROS 2023 Workshop on Social Robot Navigation (Spotlight Presentation)
Noriaki Hirose, ***Dhruv Shah***, Ajay Sridhar, Sergey Levine

[3] **ViNT: A Foundation Model for Visual Navigation**
Conference on Robot Learning (CoRL) 2023 (Oral Presentation & Live Demo, 6.6%)
BayLearn Machine Learning Symposium 2023 (Oral Presentation, <8%)
Dhruv Shah†, A. Sridhar†, N. Dashora†, K. Stachowicz, K. Black, N. Hirose, S. Levine

[4] **Navigation with Large Language Models: Semantic Guesswork as a Heuristic for Planning**
Conference on Robot Learning (CoRL) 2023
Dhruv Shah†, Michael Equi†, Blazej Osinski, Fei Xia, Brian Ichter, Sergey Levine

[5] **FastRLAP: A System for Learning High-Speed Driving via Deep RL and Autonomous Practicing**
Conference on Robot Learning (CoRL) 2023
Kyle Stachowicz†, ***Dhruv Shah***†, Arjun Bhorkar†, Ilya Kostrikov, Sergey Levine

[6] **HomeRobot: An Open Source Software Stack for Mobile Manipulation Research**
AAAI Fall Symposium: Unifying Representations for Robot Application Dev. 2023
C. Paxton, A. Wang, B. Shah, B. Matulevich, ***Dhruv Shah***, K. Yadav, S. Ramakrishnan, S. Yenamandra, Y. Bisk

[7] **GNM: A General Navigation Model to Drive Any Robot**
International Conference on Robotics and Automation (ICRA) 2023
Dhruv Shah†, Ajay Sridhar†, Arjun Bhorkar, Noriaki Hirose, Sergey Levine

[8] **ExAug: Robot-Conditioned Navigation Policies via Geometric Experience Augmentation**
International Conference on Robotics and Automation (ICRA) 2023
Noriaki Hirose, ***Dhruv Shah***, Ajay Sridhar, Sergey Levine

[9] **Learning Robotic Navigation from Experience: Principles, Methods, and Recent Results**
Philosophical Transactions of the Royal Society of London: B 2022 (Invited Paper)
Sergey Levine, ***Dhruv Shah***

[10] **Offline Reinforcement Learning for Visual Navigation**
Conference on Robot Learning (CoRL) 2022 (Oral Presentation, 6.5%)
Dhruv Shah†, A. Bhorkar†, H. Leen, I. Kostrikov, N. Rhinehart, S. Levine

[11] **LM-Nav: Robotic Navigation with Large Pre-Trained Models of Language, Vision, and Action**
Conference on Robot Learning (CoRL) 2022
BayLearn Machine Learning Symposium 2022 (Oral Presentation, <8%)

Dhruv Shah†, Blazej Osinski†, Brian Ichter, Sergey Levine

[12] **ViKiNG: Vision-Based Kilometer-Scale Navigation with Geographic Hints**
Robotics: Science and Systems (RSS) 2022 (Oral Presentation)
Best Systems Paper Award (Finalist, <2%)
Dhruv Shah, Sergey Levine

[13] **Value Function Spaces: Skill-Centric State Abstractions for Long-Horizon Reasoning**
International Conference on Learning Representations (ICLR) 2022
Dhruv Shah, Peng Xu, Yao Lu, Ted Xiao, Alex Toshev, Sergey Levine, Brian Ichter

[14] **Hybrid Imitative Planning with Geometric and Predictive Costs for Off-road Environments**
International Conference on Robotics and Automation (ICRA) 2022
N. Dashora†, D. Shin†, *Dhruv Shah*, H. Leopold, D. Fan, A. Agha, N. Rhinehart, S. Levine

[15] **Rapid Exploration for Open-World Navigation with Latent Goal Models**
Conference on Robot Learning (CoRL) 2021 (Oral Presentation, 6.5%)
ICLR 2021 Workshop on Never-Ending Reinforcement Learning (Oral Presentation)
Dhruv Shah, Benjamin Eysenbach, Nicholas Rhinehart, Sergey Levine

[16] **ViNG: Learning Open-World Navigation with Visual Goals**
International Conference on Robotics and Automation (ICRA) 2021
Dhruv Shah, Benjamin Eysenbach, Gregory Kahn, Nicholas Rhinehart, Sergey Levine

[17] **Aerial Manipulation Using Hybrid Force and Position NMPC Applied to Aerial Writing**
Robotics: Science and Systems (RSS) 2020
D. Tzoumanikas, F. Graule, Q. Yan, *Dhruv Shah*, M. Popovic, S. Leutenegger

[18] **The Ingredients of Real World Robotic Reinforcement Learning**
International Conference on Learning Representations (ICLR) 2020 (Spotlight Presentation, 4.1%)
H. Zhu†, J. Yu†, A. Gupta†, *Dhruv Shah*, K. Hartikainen, A. Singh, V. Kumar, S. Levine

[19] **Swarm Aggregation without Communication and Global Positioning**
IEEE Robotics and Automation Letters (RA-L) 2019
International Conference on Robotics and Automation (ICRA) 2019
Dhruv Shah, Leena Vachhani

[20] **Projection Design for Compressive Source Separation using Mean Errors and Cross-Validation**
International Conference on Image Processing (ICIP) 2019
Dhruv Shah, Ajit Rajwade

[21] **Designing Constrained Projections for Compressed Sensing: Mean Errors and Anomalies with Coherence**
Global Conference on Signal and Information Processing (GlobalSIP) 2018
Dhruv Shah†, Alankar Kotwal†, Ajit Rajwade

† *Equal Contribution*

Pre-Prints

[22] **GOAT: GO to Any Thing**
Science Robotics (Under Review), arXiv Pre-Print 2023
T. Gervet†, M. Chang†, M. Khanna†, S. Yenamandra†, *Dhruv Shah*, T. Min, C. Paxton, D. Batra, R. Mottaghi, D. S. Chaplot, J. Malik

[23] **Open X-Embodiment: Robotic Learning Datasets and RT-X Models**
arXiv Pre-Print 2023
CoRL 2023 Workshop Towards Generalist Robots (Oral Presentation)
Open X-Embodiment Collaboration

[24] **NoMaD: Goal Masked Diffusion Policies for Navigation and Exploration**
arXiv Pre-Print 2023
CoRL 2023 Workshop on Pre-Training for Robot Learning (Oral Presentation)
Ajay Sridhar, ***Dhruv Shah***, Catherine Glossop, Sergey Levine

Invited Talks

Guiding Robotic Planning with Large Pre-Trained Models
Invited Speaker, VLM3 Workshop @ ICRA 2024 — May 2024
Invited Speaker, Semantic Decision Making Workshop @ ICRA 2024 — May 2024

Learning General-Purpose Robot Navigation
Invited Speaker, ML4AD Workshop @ NeurIPS 2023 — December 2023
AirLab Seminar, Carnegie Mellon University — November 2023
Bay Area Robotics Symposium — October 2023
MILA Robot Learning Seminar, Universite de Montreal — September 2023
Bay Area Machine Learning Symposium — October 2023
Seminar Series, Vayu Robotics — July 2023
ARL DCIST PI Meeting, University of Pennsylvania — June 2023

Intuitive Interfaces for Learning from Offline Data
Bay Area Robotics Symposium — October 2022
Scientific Speaker Series, Wayve — September 2022

Kilometer-Scale Navigation with Geographic Hints
ML Seminar, Toyota Research Institute — March 2022
RACER Seminar, NASA Jet Propulsion Laboratory — March 2022
Berkeley Deep Drive Seminar, UC Berkeley — February 2022

Skill-Centric State Abstractions for Planning
Google Brain/DeepMind Open Research Talks, Google Research — November 2021

Learning to Explore Open-World Environments
Google Brain/DeepMind Open Research Talks, Google Research — November 2021

Press Coverage

GOAT: GO to Any Thing — November 2023
MarkTechPost, ITinAI (Singapore)

Open X-Embodiment: Robotic Learning Datasets and RT-X Models — October 2023
VentureBeat, Tech Times, Synced Review (Canada), TechForge (UK)
Analytics India Magazine (India)

FastRLAP: A System for Learning High-Speed Driving — May 2023
TechXplore, SyncedReview (Canada), MarkTechPost, TechEBlog

GNM: A General Navigation Model to Drive Any Robot — December 2022
MarkTechPost

LM-Nav: Robotic Navigation with Large, Pre-Trained Models — August 2022
Two Minute Papers, Utmel (Hong Kong)

ViKiNG: Kilometer-Scale Exploration in the Real World — March 2022

IEEE Spectrum, ZDNet, Wevoler (Netherlands)

DARPA RACER (JPL/UC Berkeley/MIT/GeorgiaTech) January 2022
IEEE Spectrum, Caltech News, DARPA News, The Defense Post

RECON: Rapid Exploration with Latent Goal Models December 2021
RSIP Vision (Israel)

Blog Posts

Scaling up Learning Across Many Different Robot Types October 2023
Google DeepMind Blog

Extracting Skill-Centric State Abstractions from Value Functions April 2022
Google AI Blog

Learning to Explore the Real World with a Ground Robot November 2021
Berkeley AI Research (BAIR) Blog

The Ingredients of Real World Robotic Reinforcement Learning April 2020
Berkeley AI Research (BAIR) Blog

Teaching Experience

CS 182/282A: Deep Neural Networks Spring 2023
University of California, Berkeley
Graduate Student Instructor with Prof. Anant Sahai

CS 285: Deep Reinforcement Learning Fall 2021
University of California, Berkeley
Head Graduate Student Instructor with Prof. Sergey Levine

CS 101: Introduction to Programming × 2 Spring 2019, Summer 2016
Indian Institute of Technology, Bombay
Teaching Assistant with Prof. Deepak B. Phatak and Prof. Ganesh Ramakrishnan

MA 207: Partial Differential Equations Fall 2018
Indian Institute of Technology, Bombay
Head Teaching Assistant with Prof. Swapneel Mahajan

Research Mentoring

I have had the fortune of working with and mentoring some fantastic student collaborators.

Undergraduate & Masters Students

Arjun Bhorkar (2021 – Present, BS/MS @ UC Berkeley; Siebel Scholar; *Graduating '24*)
Ajay Sridhar (2022 – Present, BS @ UC Berkeley; CRA Nominee; *Graduating '24*)
Nitish Dashora (2020 – 23, BS @ UC Berkeley; Astronaut Scholarship; *Graduating '24*)
Hrish Leen (2022 – Present, BS/MS @ UC Berkeley; *Graduating '24*)
Chongyi Zheng (2023, MS @ CMU; *Graduating '24*)
Michael Equi (2022 – 23, BS @ UC Berkeley; Now at 1X.tech)

PhD Students

Jonathan Yang (Stanford University; Summer 2023 – Present)
Hongbo Zhang (Chinese University of Hong Kong; Spring 2023 – Present)
Catherine Glossop (UC Berkeley; Fall 2023 – Present)
Kyle Stachowicz (UC Berkeley; Fall 2022 – Spring 2023)
Blazej Osinski (University of Warsaw; Spring 2022 – Spring 2023)
Raven Huang (UC Berkeley; Spring 2021 – Spring 2022)

Service

Workshop Organization

6th Workshop on Robot Learning @ NeurIPS 2023 (Lead Organizer)
2nd Workshop on Language and Robot Learning @ CoRL 2023 (Lead Organizer)
2nd Workshop on Learning from Diverse, Offline Data @ ICRA 2023
1st Workshop on Language and Robot Learning @ CoRL 2022 (Lead Organizer)
1st Workshop on Learning from Diverse, Offline Data @ RSS 2022

Peer Reviewing

Robotics — CoRL, RSS, RA-L, ICRA, T-RO, AuRo, IROS, ISRR, Humanoids
Machine Learning — ICLR, NeurIPS, ICML
Computer Vision — T-PAMI
Workshops at the intersection of ML, CV, and Robotics.

Admissions

Mentor, Equal Access to (PhD) Application Assistance Program	2022–Present
Committee Member, UC Berkeley EECS PhD Admissions	2020–2022

Outreach and Inclusion

BAIR Undergraduate Mentorship Program	2020–Present
Outreach Talk at Independence High School, San Jose CA	2022
Co-Founder and Organizer, Berkeley AI Ambassadorship Program	2020
Mentor, National Service Scheme at IIT Bombay	2015–2017
Instructor, Rural Computer Learning Initiative at IIT Bombay	2016

References

Available upon request.