Ajay Sridhar

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Education

B. S. Electrical Engineering and Computer Science, UC Berkeley, **GPA: 4.00/4.00** (Dean's List) **Graduation: May 2024**
EECS Honors Program, Minor in Logic

Courses: Machine Learning; Artificial Intelligence; Deep Reinforcement Learning; Optimization Models; Probablity; Algorithms; Discrete Math Linear Algebra; Math Logic; Circuits; Signal Processing; Robotics

Research Experience

Machine Learning and Robotics Research, Prof. Sergey Levine **February 2022 — Present**
University of California, Berkeley *Berkeley, CA*

- Researching how general goal-conditioned models for vision-based navigation and exploration can be trained on data obtained from many distinct robots to enable broad generalization across environments and embodiments.
- Main contributor to **a public GitHub repository** with over 200 stars containing code and pre-trained models to support future research in the field of autonomous robotic navigation and learning.

Machine Learning Research, Prof. Thomas G. Dietterich & Dr. Kiri Wagstaff **May 2021 — February 2022**
Oregon State University *Corvallis, OR*

- Applied temperature scaling to Domain Adversarial Neural Networks (DANNs) on a novel image recognition task related to domain generalization and calibration.
- Achieved promising results on the novel classification task using the Office-Home benchmark dataset, and presented findings at the EECS Undergraduate Research Program at OSU.

Awards & Honors

2024 CRA Outstanding Undergraduate Researcher Award Finalist
2023 Cal Alumni Leadership Scholarship
2023 EECS Honors Program
2023 EECS Evergreen Undergraduate Research Award
2021 Tau Beta Pi (TBP) - Engineering Honors Society
2020 Cal Alumni Leadership Scholarship
2019 Congressional App Challenge Winner

Research Papers

1. **GNM: A General Navigation Model to Drive Any Robot**

   Dhruv Shah,* **Ajay Sridhar***, *Arjun Bhorkar, Noriaki Hirose, Sergey Levine* **(*Equal contribution)**

   - *Description:* In vision-based navigation, the development of effective learning-based policies is often constrained by the limited availability of training data. Our research aimed to address this by exploring the potential of a General Navigation Model (GNM) that combines datasets from diverse robot types. This approach culminated in the creation of an 'omnipolicy', enabling the control of new robots in challenging environments. By training on such a heterogeneous dataset, our GNM exhibits enhanced robustness, making it highly beneficial for downstream navigation applications.
   - *Publication:* International Conference on Robotics and Automation (ICRA) 2023

2. **ViNT: A Foundation Model for Visual Navigation**

   Dhruv Shah,* **Ajay Sridhar***, *Nitish Dashora*, Kyle Stachowicz, Kevin Black, Noriaki Hirose, Sergey Levine* **(*Equal contribution)**

   - *Description:* We trained a flexible Transformer-based architecture, ViNT on diverse navigation datasets from multiple robotic platforms. It excels in various navigational tasks, outperforming specialized models, and offers adaptability through techniques like prompt-tuning. Its design facilitates exploration of new environments and addresses kilometer-scale navigation challenges, marking a significant advancement in mobile robotics.

- *Publication:* Conference on Robot Learning (CoRL) 2023 **(Oral Presentation & Live Demo, 6.6%)**
- *Symposium:* BayLearn Machine Learning Symposium 2023 **(Oral Presentation, <8%)**

3. **NoMaD: Goal Masking Diffusion Policies for Navigation and Exploration**

   Ajay Sridhar, *Dhruv Shah, Catherine Glossop, Sergey Levine*

   - *Description:* Robotic navigation in unfamiliar settings requires both task-oriented navigation (reaching known goals) and goal agnostic-exploration (exploring with no goals). Traditionally, separate models manage these functions, often using subgoal planning or varied navigation tactics. We developed a unified diffusion policy, trained using a Transformer-based approach, that handles both goal-directed navigation and goal-agnostic exploration, outperforming traditional methods. Real-world evaluations on a mobile robots reveal improved goal-reaching performance and reduced collision over previous baselines.
   - *Workshop:* NeurIPS 2023 Worshop on Foundation Models for Decision Making **(Oral Presentation, <6%)**
   - *Workshop:* CoRL 2023 Workshop on Pre-Training for Robot Learning **(Oral Presentation)**

4. **ExAug: Robot-Conditioned Navigation Policies via Geometric Experience Augmentation**

   Noriaki Hirose, Dhruv Shah, **Ajay Sridhar**, *Sergey Levine*

   - *Description:* We addressed the challenges of learning from varied experiences derived from different cameras and sensors across multiple robots. We introduced the ExAug framework, which bolsters a robot's vision-based navigation using self-supervised depth estimation. This geometric framework is capable of extracting 3D information from single images, thereby facilitating navigation models to seamlessly adapt to a diverse range of robot configurations.
   - *Publication:* International Conference on Robotics and Automation (ICRA) 2023

5. **SACSoN: Scalable Autonomous Data Collection for Social Navigation**

   Noriaki Hirose, Dhruv Shah, **Ajay Sridhar**, *Sergey Levine*

   - *Description:* SACSoN is a method for robots to navigate socially unobtrusively, focusing on recognizing and respecting non-verbal cues and human personal space. To gather interaction data, we developed the HuRoN system, which autonomously collects extensive human-robot interaction data in various environments. Using data collected in office settings, we trained a model (SACSoN) that ensures robots navigate without disrupting human activities. Despite some limitations, the HuRoN system presents new ways for enhancing robot navigation in human-populated spaces, underpinned by datasets that capture rich human-robot interactions.
   - *Publication:* IEEE Robotics and Automation Letters (RA-L) 2023
   - *Workshop:* IROS 2023 Workshop on Social Robot Navigation **(Spotlight Presentation)**

Teaching Experience

Teaching Assistant for Introduction to Artificial Intelligence (CS 188), Prof. Stuart Russell **January 2022 — Present**
University of California, Berkeley *Berkeley, CA*

- Teaching fundamental concepts in AI such as search, game playing, knowledge representation, inference, planning, reasoning under uncertainty, machine learning, and perception.
- Responsible for holding weekly discussion sections, writing exam questions, grading homework assignments, and holding project office hours.

Laboratory Tutor for Designing Information Devices and Systems II (EECS 16B) **September 2021 — December 2021**
University of California, Berkeley *Berkeley, CA*

- Taught students fundamental concepts in machine learning, circuit design, control, and signal processing through different labs: 4-bit ADC, band-pass filters, and a voice-controlled robot car.
- Ensured all 40-50 students in each lab section received help with debugging physical circuits and Python code.