

# Kaustubh Sridhar

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## Education

- 2019 - Present **University of Pennsylvania,** Philadelphia, PA.  
**PhD Candidate, Electrical and Systems Engineering,** GPA: 3.94/4.  
**ASSET** and **PRECISE** Center  
**Thesis Committee:** Prof Dinesh Jayaraman, Prof Insup Lee, Prof George Pappas, Prof Nikolai Matni, Prof Dorsa Sadigh
- 2015 - 2019 **Indian Institute of Technology Bombay,** Mumbai, India.  
Bachelor Of Technology (with Honors) In Aerospace Engineering, GPA: 9.07/10.  
Minor in Systems and Control Engineering Class Rank 2.

## Research Interests

I am interested in creating adaptive generalist agents that are parameter- and sample-efficient, for the digital and physical worlds. Towards this goal, I have worked on generative models, in-context learning, deep reinforcement and imitation learning, and robust deep learning. My recent work on a [retrieval-augmented generalist agent](#) directly aims for this goal.

## Selected Publications and Preprints

- [Preprint 2024B] [REGENT: A Retrieval-Augmented Generalist Agent That Can Act In-Context In New Environments](#)  
**Kaustubh Sridhar**, Souradeep Dutta, Dinesh Jayaraman, Insup Lee  
➤ Under review at the International Conference on Learning Representations (**ICLR**) 2025  
➤ **NeurIPS 2024** workshops on Adaptive Foundation Models and Open World Agents.
- [Preprint 2024A] [A Retrieval-Enhanced Mixed-Modal Foundation Model for Ophthalmology](#)  
**Kaustubh Sridhar**, Aditya Rangamani, Kuk Jang, Insup Lee  
➤ In Preparation.
- [2023B] [Memory-Consistent Neural Networks for Imitation Learning](#)  
**Kaustubh Sridhar**, Souradeep Dutta, Dinesh Jayaraman, James Weimer, Insup Lee  
➤ International Conference on Learning Representations (**ICLR**) 2024 (Acceptance rate: 31%).
- [2023A] [Guaranteed Conformance of Neurosymbolic \(World\) Models to Natural Constraints](#)  
**Kaustubh Sridhar**, Souradeep Dutta, James Weimer, Insup Lee  
➤ **ICLR 2023** workshop on Neurosymbolic Generative Models,  
➤ Conference on Learning For Dynamics and Control (**L4DC**) 2023.
- [2022D] [Exploring with Sticky Mittens: Reinforcement Learning with Expert Interventions via Option Templates](#)  
S. Dutta\*, **K. Sridhar\***, O. Bastani, E. Dobriban, J. Weimer, I. Lee, J. Parish-Morris  
➤ Conference on Robot Learning (**CoRL**) 2022 (Acceptance rate: 39%).
- [Preprint 2022C] [Predict-and-Critic: Accelerated End-to-End Predictive Control for Cloud Computing through Reinforcement Learning](#)  
**Kaustubh Sridhar**, Vikramank Singh<sup>†</sup>, Murali Narayanaswamy<sup>†</sup>, Abishek Sankararaman<sup>†</sup>  
➤ Under review (<sup>†</sup>**Amazon AWS AI Labs**).
- [2022B] [CODiT: Conformal Out-of-distribution Detection in Time-series Data](#)  
Ramneet Kaur, **Kaustubh Sridhar**, Sangdon Park, Susmit Jha<sup>†</sup>, Anirban Roy<sup>†</sup>, Oleg Sokolsky, Insup Lee (<sup>†</sup>SRI International)  
➤ **ICML 2022** workshop on Principles of Distribution Shift,  
➤ International Conference on Cyber-Physical Systems (**ICCPS**) 2023 (Acceptance: 25.6%).  
➤ **Best paper award nomination** at ICCPS 2023.
- [2022A] [Improving Neural Network Robustness via Persistency of Excitation](#)  
**Kaustubh Sridhar**, Oleg Sokolsky, Insup Lee, James Weimer  
➤ American Control Conference (**ACC**) 2022.

- [2021B] [Real-Time Detectors for Digital and Physical Adversarial Inputs to Perception Systems](#)  
Yiannis Kantaros, Taylor Carpenter, **Kaustubh Sridhar**, Yahan Yang, Insup Lee, James Weimer  
➔ International Conference on Cyber-Physical Systems (ICCPS) 2021 (Acceptance rate: 26%).
- [2021A] [Real-Time Data-Predictive Attack-Recovery for Complex Cyber-Physical Systems](#)  
Lin Zhang, **Kaustubh Sridhar**, Mengyu Liu, Pengyuan Lu, F. Kong, Oleg Sokolsky, Insup Lee  
➔ IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS).
- [2019] [Finite-time, Event-triggered Tracking Control of Quadrotors](#)  
**Kaustubh Sridhar**, Srikant Sukumar  
➔ Conference on Guidance, Navigation and Control (EuroGNC) 2019.

## Experience

- Aug 2019 - Present **University of Pennsylvania**, *PhD Candidate*, Philadelphia, PA.  
Advised by [Prof Insup Lee](#).  
Closely collaborated with [Prof Dinesh Jayaraman](#), [Prof James Weimer](#), [Prof Oleg Sokolsky](#).  
  - Developed a generalist agent, without large models and vast datasets, that can generalize to new environments via retrieval-augmentation & in-context learning [[Preprint 2024B](#), [videos](#)].
  - Building a foundation model for ophthalmology trained on a synthetic mixed-modal dataset created from uni-modal vision-language datasets with retrieval [[Preprint 2024A](#)].
  - Strengthened imitation learning with any neural network – diffusion models, transformers, or MLPs, via a novel semi-parametric model class called the MCNN [[2023B](#), [videos](#)].
  - Created a tool for guaranteed conformance of generative models to constraints [[2023A](#), [gifs](#)].
  - Boosted deep hierarchical RL sample-efficiency by two-orders-of-magnitude [[2022D](#), [videos](#)].
  - Enhanced adversarial robustness of NN's with guarantees [[2022A](#)].
  - Developed out-of-distribution detectors with guarantees [[2022B](#)] that run in real-time [[2021B](#)].
- May - Aug 2023 **Amazon Web Services (AWS) AI Labs**, *Applied Scientist Intern*, Santa Clara, CA.  
Hosts: [Dr. Abishek Sankararaman](#), [Dr. Vikram Nathan](#), [Dr. Murali Narayanaswamy](#)  
  - Improved generalization in offline RL by incorporating transformer model based forecasts in conservative Q learning; applied to cloud resource allocation problems.
- May - Aug 2022 **Amazon Web Services (AWS) AI Labs**, *Applied Scientist Intern*, Santa Clara, CA.  
Hosts: [Dr. Abishek Sankararaman](#), [Dr. Murali Narayanaswamy](#)  
  - Accelerated datacenter resource allocation by combining model-free RL with mixed integer linear programs [[Preprint 2022C](#)].
- May - Aug 2021 **Argo AI (Ford & VW's Self-Driving Partner)**, *Systems Research Intern*, Dearborn, MI.  
Product Security and Sensor Functional Safety Team  
  - Built threat models for object detection and segmentation algorithms on autonomous vehicles.
- May - Jul 2018 **Duke University**, *Undergraduate Summer Research Fellow*, Durham, NC.  
Advised by [Prof Miroslav Pajic](#), Cyber-Physical Systems Lab  
  - Developed a self-driving platform for intrusion detection testing [[videos](#)].
- Jan - Dec 2018 **Indian Institute of Technology Bombay**, *Undergraduate Research Assistant*, India.  
Advised by [Prof Srikant Sukumar](#),  
  - Bachelor's thesis on real-time quadrotor control [[2019](#)].

## Awards

- 2023 **Best Paper Award Nomination** for CODiT [[2022B](#)] at ICCPS 2023
- 2022 **Top Reviewer (top 10%)**, NeurIPS 2022
- 2022 **Outstanding Reviewer (top 10%)**, ICML 2022
- 2023 **NSF Travel Grant**, International Conference on Cyber-Physical Systems (ICCPS) 2023
- 2022 **Student Travel Grant**, American Control Conference 2022
- 2019 **The Dean's Fellowship**, University of Pennsylvania
- 2019 **The Howard Bradwell Fellowship**, University of Pennsylvania
- 2018 **SN Bose Scholarship**, Govt. of India and the Indo-U.S. Science and Technology Forum
- 2015 **KVPY Fellowship**, Govt. of India

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## Invited Talks

- 2024 **Training Adaptive and Sample-Efficient Generalist Agents.**
  - Google Deepmind
  - Apple MLR
- 2023 **Learning Better Policies and Dynamics Models with Memory-Consistent and Memory-Constrained Neural Networks.**
  - University of Pennsylvania (GRASP Lab) [[video](#)]
- 2023 **Memory-Consistent Neural Networks Boost Your Diffusion Policies, Behavior Transformers, and Behavior Cloning Agents.**
  - University of Pennsylvania (Perception Action Learning Group)
- 2023 **Guaranteed Conformance of Neurosymbolic Generative (Dynamics) Models to Physics and Medical Constraints**
  - Johns Hopkins University (CISS Session on Learning for Optimization and Control)
  - Amazon Science (Deep Earth Reading Group)
  - University of Pennsylvania (Formal Methods and Machine Learning Reading Group)

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## Press Coverage

- 2023 [Making Better Decisions with AI](#), Penn Engineering Today (USA).

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## Service and Mentorship

- 2022 - Present **Reviewer**  
[ICLR](#) 2025, 2024, [ICML](#) 2024, 2023, 2022, [NeurIPS](#) 2024, 2023, 2022, [L4DC](#) 2023, [ICCPs](#) 2022
- 2020 - 2021 **Organizer**, *Reading Group in Robust Deep Learning*, University of Pennsylvania
- 2018 - 2019 **Team Lead**, *Department Academic Mentorship Program*, IIT Bombay  
Led a team of 22 senior mentors to counsel 89 sophomores, 29 under-performing students.

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## Technical skills

- Languages Python, C, C++
- Machine Learning Pytorch, OpenAI Gym, Tensorflow, JAX, CUDA, Sklearn, Pandas
- Robotics Mujoco, Bullet, CARLA, ROS, Gazebo

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## Key Coursework

- Graduate Deep Learning, Reinforcement Learning, Convex Optimization, Probability, Computer Aided Verification
- Undergraduate Data Structures and Algorithms, Linear and Nonlinear Control Theory, Adaptive and Optimal Control

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## Other Projects

- Apr - May 2023 "[Fixing Reward Hacking with Large Language Models.](#)"
  - o Created a framework for an RL agent in Deepmind AI Safety environments to leverage GPT4 to detect reward hacking, fix its own reward function, and adapt quickly to the new reward.

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## Teaching

- Spring 22, Fall 24 **Teaching Assistant**, *CIS 541: Embedded Software for Life-Critical Systems*, UPenn
- Spring 2021 **Teaching Assistant**, *CIT 595: Computer Systems Programming*, University of Pennsylvania