

# Kaustubh Sridhar

Philadelphia, PA  
+1 267-290-7947  
✉ [ksridhar@seas.upenn.edu](mailto:ksridhar@seas.upenn.edu)  
📁 [kaustubhsridhar.github.io](https://kaustubhsridhar.github.io)

## Education

- 2019 - Present **University of Pennsylvania,** Philadelphia, PA.  
**PhD Candidate, Electrical and Systems Engineering,** GPA: 3.94/4.  
**ASSET** and **PRECISE** Center.
- 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

In-Context Learning, Deep Reinforcement and Imitation Learning (particularly from offline datasets), Generative Models, Robust Deep Learning

## 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

## Preprints and Publications

### Deep Reinforcement and Imitation Learning, In-Context Learning and Generative Models

- [Preprint 2023C] **Kaustubh Sridhar,** Souradeep Dutta, Dinesh Jayaraman, Insup Lee, "Retrieval-Augmented Decision Transformers Generalize to New Environments In-Context",  
➡ In preparation.
- [Preprint 2023B] **Kaustubh Sridhar,** Souradeep Dutta, Dinesh Jayaraman, James Weimer, Insup Lee, "**Memory-Consistent Neural Networks for Imitation Learning**",  
➡ Under review at International Conference on Learning Representations (ICLR) 2024.
- [2023A] **Kaustubh Sridhar,** Souradeep Dutta, James Weimer, Insup Lee, "**Guaranteed Conformance of Neurosymbolic World Models to Natural Constraints.**",  
➡ ICLR 2023 workshop on Neurosymbolic Generative Models,  
➡ Conference on Learning For Dynamics and Control (L4DC) 2023,
- [2022D] Souradeep Dutta\*, **Kaustubh Sridhar\***, Osbert Bastani, Edgar Dobriban, James Weimer, Insup Lee, Julia Parish-Morris, "**Exploring with Sticky Mittens: Reinforcement Learning with Expert Interventions via Option Templates**",  
➡ Conference on Robot Learning (CoRL) 2022 (Acceptance rate: 39%).
- [Preprint 2022C] **Kaustubh Sridhar,** Vikramank Singh<sup>†</sup>, Murali Narayanaswamy<sup>†</sup>, Abishek Sankararaman<sup>†</sup>, "**Predict-and-Critic: Accelerated End-to-End Predictive Control for Cloud Computing through Reinforcement Learning.**", (<sup>†</sup>Amazon AWS AI Labs)  
➡ Under review.

### Robust Deep Learning

- [2022B] Ramneet Kaur, **Kaustubh Sridhar,** Sangdon Park, Susmit Jha<sup>†</sup>, Anirban Roy<sup>†</sup>, Oleg Sokolsky, Insup Lee, "**CODiT: Conformal Out-of-distribution Detection in Time-series Data**", (<sup>†</sup>SRI International)  
➡ ICML 2022 workshop on Principles of Distribution Shift,  
➡ International Conference on Cyber-Physical Systems (ICCPS) 2023 (Acceptance rate: 25.6%).  
➡ **Best paper award nomination** at ICCPS 2023.

- [2022A] **Kaustubh Sridhar**, Oleg Sokolsky, Insup Lee, James Weimer, "[Improving Neural Network Robustness via Persistency of Excitation](#)",  
 ➔ American Control Conference (**ACC**) **2022**.
- [2021B] Yiannis Kantaros, Taylor Carpenter, **Kaustubh Sridhar**, Yahan Yang, Insup Lee, James Weimer, "[Real-Time Detectors for Digital and Physical Adversarial Inputs to Perception Systems](#)",  
 ➔ International Conference on Cyber-Physical Systems (**ICCPS**) **2021** (Acceptance rate: 26%).

#### Earlier Work in Safety of Autonomous Vehicles and Quadrotor Control

- [2021A] Lin Zhang, **Kaustubh Sridhar**, Mengyu Liu, Pengyuan Lu, Fanxin Kong, Oleg Sokolsky, Insup Lee, "[Real-Time Data-Predictive Attack-Recovery for Complex Cyber-Physical Systems](#)",  
 ➔ IEEE Real-Time and Embedded Technology and Applications Symposium (**RTAS**).
- [2019] **Kaustubh Sridhar**, Srikant Sukumar, "[Finite-time, Event-triggered Tracking Control of Quadrotors](#)",  
 ➔ Conference on Guidance, Navigation and Control (**EuroGNC**) **2019**.

## Research Experience

- Aug 2019 - Present **University of Pennsylvania**, *PhD Candidate*, Philadelphia, PA.  
 Advised by [Prof. Insup Lee](#).  
 Frequent collaborators: [Prof. Dinesh Jayaraman](#), [Prof. James Weimer](#), [Prof. Oleg Sokolsky](#)
- Improving OOD generalization of decision transformers with in-context learning [[Preprint 2023C](#)].
  - Significantly improved generalization in imitation learning with any neural network – diffusion models, transformers, or MLPs, via a novel semi-parametric model class [[Preprint 2023B](#), [videos](#)].
  - Created a tool for guaranteed conformance of deep generative models to any 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 input-driven offline RL by incorporating transformer model based forecasts in conservative Q learning.
- 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 & Volkswagen's Self-Driving Partner)**, *Research Intern*, Dearborn, MI.  
 Product Security and Sensor Functional Safety Team
- Built threat models for object detection and segmentation algorithms on autonomous vehicles.
- May - Aug 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](#)].

## Invited Talks

- 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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## 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 learn to adapt quickly to the new reward function.

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## Service and Mentorship

- 2022 - Present **Reviewer**
- [ICLR](#) 2024, [ICML](#) 2024, 2023, 2022, [NeurIPS](#) 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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## Teaching Experience

- Spring 2022 **Teaching Assistant**, *CIS 541: Embedded Software for Life-Critical Systems*, University of Pennsylvania
- Spring 2021 **Teaching Assistant**, *CIT 595: Computer Systems Programming*, University of Pennsylvania