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Kaustubh Sridhar

Education

2019 - Present **University of Pennsylvania**, *Philadelphia, PA.*
PhD Candidate, **Electrical and Systems Engineering**, GPA: 3.93/4.
Advised by Prof. Insup Lee, Prof. Oleg Sokolsky, and Prof. James Weimer, 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

Efficient Deep Reinforcement Learning (RL), RL for Combinatorial Optimization, Adversarial Robustness of Neural Networks (NN), Out-of-Distribution (OOD) Detection, Safety and Security of Autonomous Vehicles and Cyber-Physical Systems.

Research Experience

Aug 2019 - Present **PhD Researcher**, *PRECISE Center*, University of Pennsylvania, Philadelphia, PA.
Advised by Prof. Insup Lee, Prof. Oleg Sokolsky, Prof. James Weimer.
Collaborated with Prof. Osbert Bastani, Prof. Edgar Dobriban, Prof. Fanxin Kong.
Highlights:
- Improved deep RL sample-efficiency by two-orders-of-magnitude with option templates [2022B, videos].
- Enhanced adversarial robustness of NN's via persistent excitation [2022C], overdesigning [2022E].
- Developed conformal time-series OOD detectors [2022D] and real-time adversarial detectors [2021].
- Composed sensor attacks and recovery algorithms for cyber-physical systems [2022F, 2022G, 2020].

May - Aug 2022 **Applied Scientist Intern**, *Amazon Web Services (AWS) AI Labs*, Santa Clara, CA.
Collaborated with Murali Narayanaswamy, Abishek Sankararaman, Vikramank Singh
Highlight: Model-free RL augmentations for model-based virtual machine packing in datacenters [2022A].

May - Aug 2021 **Systems Engineer Intern**, *Argo AI (Ford & VW's Self-Driving Partner)*, Dearborn, MI.
Product Security and Sensor Functional Safety Team
Highlight: Threat models for object detection and tracking algorithms for Argo's self-driving cars.

May - Aug 2018 **Summer Research Fellow**, *Cyber-Physical Systems Lab*, Duke University, Durham, NC.
Advised by Prof. Miroslav Pajic,
Highlight: Built a self-driving platform for intrusion detection testing [videos].

Jan - Dec 2018 **Undergraduate Research Assistant**, Indian Institute of Technology Bombay, India.
Advised by Prof. Srikant Sukumar,
Highlight: Bachelor's thesis on real-time quadrotor control [2019, videos].

Publications and Preprints

Deep Reinforcement Learning

2022A **Kaustubh Sridhar**, Vikramank Singh, Murali Narayanaswamy, Abishek Sankararaman, "Predict-and-Critic for Cloud Resource Allocation", Under review at **AAAI 2023**.

2022B 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**.

Robust Deep Learning

2022C **Kaustubh Sridhar**, Oleg Sokolsky, Insup Lee, James Weimer, "Improving Neural Network Robustness via Persistency of Excitation", American Control Conference (**ACC**) **2022**.

2022D Ramneet Kaur, **Kaustubh Sridhar**, Sangdon Park, Susmit Jha*, Anirban Roy*, Oleg Sokolsky, Insup Lee, "CODiT: Conformal Out-of-distribution Detection in Time-series Data", Principles of Distribution Shift (PODS) Workshop at the International Conference of Machine Learning (**ICML**) **2022**.

2021 Yiannis Kantaros, Taylor Carpenter, **Kaustubh Sridhar**, Yahan Yang, Insup Lee, James Weimer, "Real-Time Detectors for Digital and Physical Adversarial Inputs to Perception Systems", ACM/IEEE 12th International Conference on Cyber-Physical Systems (**ICCPS**) **2021**.

2022E **Kaustubh Sridhar**, Souradeep Dutta, Ramneet Kaur, Oleg Sokolsky, Insup Lee, "Towards Alternative Techniques for Improving Adversarial Robustness: Analysis of Adversarial Training at a Spectrum of Perturbations", arXiv:2206.06496.

Safety and Security of Autonomous Vehicles and Cyber-Physical Systems

2022F Mengyu Liu[↑], Lin Zhang[↑], Pengyuan Lu, **Kaustubh Sridhar**, Fanxin Kong[↑], Oleg Sokolsky, Insup Lee, "Fail-Safe: Securing Cyber-Physical Systems against Hidden Sensor Attacks", IEEE Real-Time Systems Symposium (**RTSS**) **2022**. ([↑] Syracuse University)

2022G Pengyuan Lu, Mengyu Liu[↑], Lin Zhang[↑], **Kaustubh Sridhar**, Oleg Sokolsky, Fanxin Kong[↑], Insup Lee, "Recovery from Adversarial Attacks in Cyber-physical Systems: Shallow, Deep and Exploratory Research", Under Review at **ACM Computing Surveys**. ([↑] Syracuse University)

2020 **Kaustubh Sridhar**, Radoslav Ivanov, Marcio Juliato[†], Manoj Sastry[†], Vuk Lesi[†], Lily Yang[†], James Weimer, Oleg Sokolsky, Insup Lee, "A Framework for Checkpointing and Recovery of Hierarchical Cyber-Physical Systems", arXiv:2205.08650 2020. ([†] *Intel Labs*)

Earlier Work in Quadrotor Control

2019 **Kaustubh Sridhar**, Srikant Sukumar, "Finite-time, Event-triggered Tracking Control of Quadrotors", Proceedings of the 5th CEAS Conference on Guidance, Navigation and Control (**EuroGNC**) **2019**.

2018 Hemjyoti Das, **Kaustubh Sridhar**, Radhakant Padhi, "Bio-inspired Landing of Quadrotor using Improved State Estimation", Proceedings of the 5th IFAC Conference on Advances in Control and Optimization Of Dynamical Systems (**ACODS**) **2018**.

Awards

2022 **Outstanding Reviewer (top 10%)**, ICML 2022

2019 **The Dean's Fellowship and 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

Technical skills

Languages Python, C, C++

Robotics OpenCV, ROS, Gazebo, MATLAB

Machine Learning Pytorch, Tensorflow, CUDA, Gym, Sklearn, Pandas

Key Coursework

Graduate Principles of Deep Learning, Reinforcement Learning, Machine Learning, Convex Optimization, Data-driven IoT/Edge Computing, Linear Systems Theory, Advanced Probability, Computer Aided Verification

Undergraduate Data Structures and Algorithms, Linear and Nonlinear Control Theory, Adaptive and Optimal Control

Positions of Responsibility

2022 **Reviewer**, NeurIPS, ICML, ICCPS

2021, 2022 **Teaching Assistant**, University of Pennsylvania
Spring 2022: CIS 441/541: Embedded Software for Life-Critical Systems
Spring 2021: CIT 595: Computer Systems Programming.

2018 - 2019 **Head**, *Department Academic Mentorship Program*, IIT Bombay
- Led a team of 22 senior mentors to counsel 89 sophomores, 29 under-performing students.