Varshith Sreeramdass

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Research Interests

I seek to develop robots capable of collaborating with humans in the real world. My interest lies in algorithms for robot learning and human-robot interaction not limited to reinforcement learning, learning from demonstrations, domain and sim-to-real transfer. My career goal is to be an industry practitioner in collaboration with academia.

Experience & Education

Georgia Institute of Technology (GaTech)
Atlanta, US

MS IN COMPUTER SCIENCE | SPECIALIZING IN COMPUTATIONAL PERCEPTION AND ROBOTICS | GPA: 4.0 / 4.0   *2022 - 2024**

- Research on learning human-robot collaboration in racquet sports advised by **Prof. Matthew Gombolay**.
- Coursework: DL for Robotics, Mobile Manipulation, ML with Graphs, Humans and ML. **Expecting*

Frontier Robotics, Honda Innovative Research Excellence (R&D)
Tokyo, Japan

RESEARCH ENGINEER   *2019 - 2022*

- Investigated Offline, Hierarchical, and Residual reinforcement learning for dexterous manipulation tasks.

Indian Institute of Technology Bombay (IITB)
Mumbai, India

B.TECH. IN COMPUTER SCIENCE AND ENGINEERING (WITH HONORS, THESIS) | GPA: 8.72 / 10   *2015 - 2019*

- Thesis on uncertainty quantification and domain adaptation advised by **Prof. Sunita Sarawagi**.
- Coursework: Advanced ML, Foundations of Intelligent Learning Agents, Neuromorphic Engineering, Graphics.

Publications

[P1] **Generalized Behavior Learning from Diverse Demonstrations**
V. Sreeramdass, R. R. Paleja, L. Chen, S. van Waveren, and M. Gombolay.
First workshop on Out-of-Distribution Generalization in Robotics at CoRL 2023 **(Oral)**. **[Paper] [Code] [Poster]**

Key Research

Learning Human-Robot Collaboration in Doubles Tennis from Demonstrations
GaTech

PROF. MATTHEW GOMBOLAY   *Aug '22 - Present*

- Developing imitation learning algorithms for robot-partner policies from **diverse human-human demonstrations**.
- Investigating unsupervised skill learning methods towards generalization to novel collaborative behaviors.
- Developed a novel latent space regularization method to address arbitrary and task-misaligned diversity objectives, achieving **improved generalization performance of 11%** across three continuous control domains (see **[P1]** above).
- Evaluating the developed algorithm for real-world object manipulation and doubles tennis involving humans.

Dexterous In-Hand Manipulation using Data driven Deep Reinforcement Learning
Honda R&D

TADAAKI HASEGAWA, AKINOBU HAYASHI   *Apr '20 - Aug '21*

- Evaluated demonstration-based & offline deep RL methods, designed reward functions for simulated dexterous manipulation tasks of **transitioning among various grasps** involving everyday objects.
- Developed scripted and noisy behavior-cloned policies to collect expert demonstrations and exploration data on **real in-house prototype multi-fingered robot hand** with motion capture for object pose tracking.
- Achieved robustness to init. noise of ranges 4cm, 30° in two resp. tasks with RL fine-tuning on real-setup. **[Press][Video]**

Structured Policies in Reinforcement Learning for Dexterous Manipulation
Honda R&D

PROF. TAKAYUKI OSA, AKINOBU HAYASHI, TADAAKI HASEGAWA   *Apr '20 - Jun '22*

- Investigated (1) hierarchical frameworks with policies **inferring goal & duration** params for Dynamic Motion Primitives, (2) state-based controllers operated by policies providing **residual actions** and **state-transition control**.
- Explored (1) primitive interruption methods, inference cost optimization, (2) joint continuous & discrete action spaces.
- Achieved robustness to init. noise of ranges 5mm (sim) & ∼3mm (real) for a **can-opening task**, with sim-to-real transfer of residual policies using non-linear damping models for the articulated can-tab joint - **demo-ed at IROS '22**. **[Video]**

Leadership Experience

Teaching Assistantships

INTERACTIVE ROBOT LEARNING   *GaTech*
- Offering of Fall '22, (and upcoming Spring '24); 1 of 2 TAs for a class of ∼60 students; by Prof. Matthew Gombolay.
- Setup Gradescope; held office hours for assignments, course-content discussion, course-project consultation.

INTRODUCTION TO COGNITIVE SCIENCE   *GaTech*
- Grading TA for offering of Fall '23, 1 of 10 TAs for a class of ∼300 students; by Prof. Keith McGreggor.

SOFTWARE SYSTEMS LAB   *IITB*
- Offering of Fall '18; Co-head of a team of 10 TAs for a class of ∼150 students; by Prof. Soumen Chakrabarti.
- Delivered guest lectures on Linux Build Tools & Android Dev.; formulated parts of course-content, assignments, exams.
- Received recognition as TA of the Month, Oct '18 (1 among ∼100) in the CSE Department.

Synergy From Diversity   *Honda R&D*
FRONTIER ROBOTICS (DIVISION)   *Apr '21 - Apr '22*
- Co-established a working group to promote cultural sensitivity among different nationalities, and communication in the context of remote work during COVID-19. Organized language exchange sessions and sensitivity workshops.

Academic Mentor   *IITB*
CSE DEPARTMENT ACADEMIC MENTORSHIP PROGRAM   *May '18 - May '19*
- Mentored 7 sophomore students, helped coordinate solutions to common academic problems with CSE Dept.
- Advised a back-logged student under the Academic Rehabilitation Program on academic planning.

Student Volunteer   *GaTech*
CONFERENCE ON ROBOT LEARNING, ATLANTA, US   *Nov '23*

Skills

Algorithms Online RL: SAC, TD3, PPO. Unsupervised RL: DIAYN, CSD. Data-driven/Offline RL: AWAC, DAPG, GAIL/AIRL.
Robotics Frameworks ROS, MoveIt, PyByllet, MuJoCo, Pinocchio (basic)
ML Libraries PyTorch (Core, Lightning, Geometric), TensorFlow (1, 2), CUDA (basic).
Miscellaneous Git, pybind11, OpenGL, LaTeX.

Minor Projects GNNs for cancer detection from whole-slide tissue images, Learning relational representations with VAEs in multi-object scenes; Deep Kalman Filters for time-series forecasting; RL of Spiking Neural Networks for Inverse Pendulum control.

Other Research

Domain Adaptation of Cloud NLP Services though Word Substitutions   *IITB*
PROF. SUNITA SARAWAGI, PROF. SOUMEN CHAKRABARTI | THESIS   *July '18 - May '19*
- Adaptation of cloud NLP services with sub-optimal performance on client domains with obscure tokens.
- Developed a **contextual token substitution** model based on ELMO model architecture trained with RL.
- Achieved performance on par with in-domain models using rewards based on errors in cloud-model predictions.
- Investigated use of sentiment-aware embeddings for improving exploration in sentiment-classification tasks. **[Report]**

Out-of-Distribution metrics for Active Domain Adaptation   *IITB*
PROF. SUNITA SARAWAGI, PROF. SOUMEN CHAKRABARTI   *July '18 - May '19*
- Evaluated out-of-distribution (OOD) detection methods involving image classifiers: likelihood temperature scaling (TS), Variational Information Bottlenecks, multi-label and calibrated NNs, perturbation based detectors (ODIN).
- Investigated applicability of OOD-ness as a **proxy for informativeness** of data samples in Deep Active Learning.
- Extended TS, ODIN to sequence inputs for Active Domain Adaptation in Named Entity Recognition. **[Report]**

Miscellaneous

I speak English, Japanese (JLPT N3 level proficiency), Hindi and Telugu. I spend my free time experimenting with cooking, hiking, watching movies, collecting vintage vinyl, and learning the harmonica.