Akshay DHARMAVARAM

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EDUCATION

Carnegie Mellon University (CMU) - School of Computer Science, Pittsburgh, USA Aug 2022
M.S. in Robotics (Fully-Funded Research Master's) **GPA**: 4.22/4.00

Birla Institute of Technology and Science, Pilani (BITS), Goa, India May 2020
B.E. (Hons.) Double Majored in Computer Science and Electrical Engineering **GPA**: 3.73/4.00

SKILLS AND AWARDS

Expertise: Machine Learning, Computer Vision, Reinforcement Learning, Deep Learning, Generative Models, Time-Series,
Languages & Tools: Python, Java, C++, Shell, PyTorch, Tensorflow, Keras, Scikit-learn
Scholarships & Awards: Graduate Tuition Waiver + Stipend (2020-22) **[Top 5%]**, Senior Thesis Research Scholarship (2019)
[Top 1%], Excellency in TAship (2017-18) **[Top 1%]**, Undergraduate Tuition Waiver (2016) **[Top 2%]**

SELECTED RESEARCH EXPERIENCE

Advanced Agent Robotics Technology Lab, Robotics Institute, CMU JAN 2020 - PRESENT
Graduate Research Assistant | **Master's Thesis**: Self-Supervised Imitation Learning Advisor: Prof. Katia Sycara
  - Collaborated with DARPA to develop a novel Imitation Learning framework for behavior prediction and control
  - Reduced policy training time by 70% for predicting and controlling multi-modal future trajectories of agents
  - Achieved a 3x and 10x reduction in mean & variance in expert imitation by designing a novel curriculum
  - Improved zero-shot trajectory matching by 12x by creating a new graph neural network for reinforcement learning
  - Beat state-of-the-art trajectory prediction by 90% in a noisy and open-ended setting with multiple interacting agents
  Under Review at an A* conference [Pre-Print]

Stochastic Systems Laboratory, Indian Institute of Science (IISc), Bangalore MAY 2019 - MAY 2020
Undergraduate Research Assistant | **Bachelor's Thesis**: Average Reward Option-Critic Advisor: Prof. Shalabh Bhatnagar
  - Formulated a hierarchical reinforcement learning framework that can learn optimal strategies for repetitive tasks
  - Developed a mathematical framework to prove its convergence and demonstrated a 15% increase in rewards/cycle
  - Improved the sample-efficiency by 2.8x for data expensive settings by mathematically correcting gradient updates
  - Reduced training time by 95% by distributing the sampling and gradient calculations across 128 cores, using A3C
  Published at AAAI 2020

SELECTED PROJECTS

Sketch-to-Image Generation with GANs [Code] [Report] CMU | 2021
  - Designed novel method for sketch-to-image generation that has improved gradient propagation and faster convergence
  - Developed image-to-image translation model between GAN latent-spaces and sketches that works with unpaired images
  - Beat state-of-the-art accuracy by 47% in just 50% of training steps, by avoiding overfitting and eliminating spurious features

Object-Detection in the Absence of Ground-Truth Bounding-Boxes [Code] CMU | 2021
  - Developed a PyTorch implementation of "Weakly Supervised Deep Detection Networks" for object localization
  - Increased accuracy by 21% against a strong baseline and generated human-interpretable heatmaps for visualization

Visual Question Answering (VQA) using Hierarchical Question-Image Co-Attention [Code] CMU | 2021
  - Created an alternating attention architecture for question answering over images from the PASCAL VOC 2007 dataset
  - Improved relevance of answers to questions and images, thereby increasing accuracy by 26% over standard baselines

Tackling Causal Misidentification in Robotic Manipulation [Report] CMU | 2020
  - Demonstrated zero-shot transfer from simulation to real-world by identifying causal features by exploration in simulation
  - Interfaced to the Gazebo simulator using PyRobot and collected counterfactual data from simulation, based on curiosity
  - Deployed a low-cost object-detection pipeline on a LoCoBot and successfully pick-and-placed boxes into a bin

PUBLICATIONS

1) **Dharmavaram, A**; Gupta, T; Li, J; Sycara, K "SS-MAIL: Self-Supervised Multi-Agent Imitation Learning" *(Under Review)* [Arxiv]
2) **Dharmavaram, A**; Riemer, M, Bhatnagar, S "Hierarchical Average Reward Policy Gradient Algorithms" **AAAI 2020** [Arxiv] [OJS]