PRISHITA RAY

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EDUCATION

[Cornell University](#)   *Dec 2022*
M.Eng. in Computer Science (spec. in Robotics and Machine Learning)
GPA: 3.75/4.0
Related courses: *Mathematical Foundations of ML, Introduction to Computer Vision, Foundations of Robotics, Principles of Large-Scale ML Systems, Digital Systems Design using Microcontrollers, Grad. Special Topics in Statistics (Graphical Models and Causal Discovery)*

[Vellore Institute of Technology, Vellore](#)   *June 2021*
B.Tech. in Computer Science and Engineering
GPA: 9.1/10.0
Related courses: *Data Structures and Algorithms, Natural Language Processing, Robotics and its Applications, Reinforcement Learning, Machine Learning [1], Data Mining, Compilers, Databases, Networks, Operating Systems, Statistics, Computer Architecture, Digital Logic and Design, Theory of Computation, Microprocessors*

RESEARCH INTERESTS

I am interested in researching **continual/lifelong robot learning strategies** to improve **task performance** and **robustness** from sim2real transfer in **deployable robots**, through methods such as interactive RL, inverse RL, curriculum RL and imitation learning. Also would like to leverage recent trends in **foundation models** to aid in these learning strategies.

RESEARCH EXPERIENCE

I. Improving Environment Robustness of Deep Reinforcement Learning Approaches for Autonomous Racing Using Curriculum Learning   Aug 2022 - Present
Supervisors: [Prof. Mark Campbell](#)   Cornell University

Developed two **Curriculum Learning** methods to train **Reinforcement Learning agents** that are more robust to adversarial environments for the purpose of **Autonomous Racing**.

- i. In the first method, more-robust curricula were chosen through **Bayesian Optimization** over a **quadratic function** mapping RL agent **training epochs-based turnpoints to agent final reward** that successively generated more adversarial environments during training. (environment parameters: turnrates and obstacle probabilities)
- Published at [Learning Robot Super Autonomy workshop, IROS 2023](#) [2].

- ii. In the second method, more-robust curricula were chosen through a more **sample-efficient automatic curriculum generation** algorithm that increased environment parameter difficulty level (turnrates and obstacle probabilities) over RL agent training epochs based on **gradients of estimated average value** with respect to the current environment parameters difficulty.
- Also applied **parameter-based** and **policy embedding-based** distribution shift regularizations to the above to boost performance.
- Under preparation.

II. Performing Human Shadow Detection for Camera-Based Privacy-Preserving Human-Robot Interactions Feb 2022 - Aug 2024
Supervisors: Prof. Guy Hoffman Cornell University

· Proposed a method for **preserving privacy** for **detection and tracking of humans in home environments** in real-time based on **physically obstructing** the robot's **camera input** to obtain a low-fidelity version, and **computer vision** methods to improve comfort-level and safety in the interactions.
· Published at IEEE RO-MAN 2024 [3] as part of the NSF NRI:INT: Ad-Hoc Collaborative Human-Robot Swarms project

III. Personalized Medication Message Design using Inverse Bandits, Reinforcement Learning and Large Language Models May 2024 - Present
Supervisors: Prof. Ritu Agarwal Johns Hopkins University

· Working at the Center for Digital Health and Artificial Intelligence to use **inverse contextual bandits, reinforcement learning** and **large language models** for personalized message design and prescription generation based on different patient cohort type pools.

IV. Stochastic Games for Energy Management in Microgrids May 2019 - July 2019
Supervisors: Prof. Shalabh Bhatnagar Indian Institute of Science

· Proposed a **Multi-Agent Reinforcement Learning** solution for **demand and supply management in Microgrids** using the RapSim simulator, using two DQN networks for scheduling of jobs (ADL Network) and trading energy (ET network) through a Dynamic Pricing scheme.
· Published at the IEEE-PES ISGT Europe 2020 [4] and funded through the Indian Academy of Sciences Summer Research Fellowship Programme (IAS SRFP 2019).

V. Scheduling Strategies to control flooding in a Renewable Energy Powered Automatic Water Dam Control System Jan 2021 - Jun 2021
Supervisors: Prof. Geraldine Bessie Amali D. Vellore Institute of Technology

· Experimented with **three scheduling algorithms** (RL-based(*) and Evolutionary Algorithms): Soft Actor Critic with Emphasized Recent Experience and Prioritized Experience Replay (SAC+ERE+PER)*, Proximal Policy Optimization (PPO)* and Natural Evolution Strategies (NES).
· Ensured maximum usage of available **renewable resources with lesser pollution** while controlling flooding optimally.
· Published at IEEE ICAIGE 2023 [5].

VI. Automated Multimodal Annotation using FrameNet Jun 2020 - Aug 2020
Supervisors: Prof. Tiago Timponi Torrent, Prof. Ely Edison Matos UFJF, Brasil

· Designed a **semi-automated annotation framework** for **multimodal corpora**, with the core and non-core frame elements present in the FrameNet database.
· Published at the LAW-XVI LREC 2022 workshop [6] and funded by the Google Summer of Code program (GSoC 2020).

VII. Malware Classification with Reduced Label Dependency Dec 2019 - Sep 2021
Supervisors: Prof. Kakelli Anil Kumar Vellore Institute of Technology

· Performed multiclass classification of **network intrusion malwares** by extracting relevant features from log files of running processes in the web server system using variants of autoencoders and the FSFC Clustering algorithm.
· Used those features to classify each malware using **limited labeled examples** for training through Ladder Networks.
· Published at ICIIC 2021 [7] and received the Best Paper Award for presentation.

PUBLICATIONS

[1] P. Ray, R. Kaluri, T. Reddy, K. Lakshmanna, *et al.*, "Contemporary developments and technologies in deep learning–based iot," *Deep Learning for Internet of Things Infrastructure, CRC Press, Taylor and Francis*, 2021. DOI: 10.1201/9781003032175-3.

[2] R. Banerjee*, P. Ray*, and M. Campbell, "Improving environment robustness of deep reinforcement learning approaches for autonomous racing using bayesian optimization-based curriculum learning," *Learning Robot Super Autonomy Workshop, IROS 2023*, 2023. DOI: 10.48550/arXiv.2312.10557.

[3] Y. Hu*, P. Ray*, and G. Hoffman, "Performing human shadow detection for camera-based privacy-preserving human-robot interactions," in *2024 33rd IEEE International Conference on Robot and Human Interactive Communication (RO-MAN)*, IEEE, Preprint, 2024.

[4] S. Nayak, C. A. Ekbote, A. P. S. Chauhan, *et al.*, "Stochastic game frameworks for efficient energy management in microgrid networks," in *2020 IEEE PES Innovative Smart Grid Technologies Europe (ISGT-Europe)*, IEEE, 2020, pp. 116–120. DOI: 10.1109/ISGT-Europe47291.2020.9248952.

[5] P. Ray and G. B. A. D., "An intelligent rl-based scheduler to control flooding in a renewable energy powered automatic water dam control system," in *2023 IEEE International Conference on Artificial Intelligence Green Energy (ICAIGE)*, 2023, pp. 1–6. DOI: 10.1109/ICAIGE58321.2023.10346395.

[6] F. Belcavello, M. Viridiano, E. Matos, and T. Timponi Torrent, "Charon: A FrameNet annotation tool for multimodal corpora," in *Proceedings of the 16th Linguistic Annotation Workshop (LAW-XVI) within LREC2022*, Marseille, France: European Language Resources Association, Jun. 2022, pp. 91–96. [Online]. Available: https://aclanthology.org/2022.law-1.11.

[7] P. Ray, T. Nandan, L. Anne, and K. A. Kumar, "A new combined model with reduced label dependency for malware classification," in *3rd International Conference on Integrated Intelligent Computing Communication Security (ICIIC 2021)*, Atlantis Press, 2021, pp. 23–32. DOI: 10.2991/ahis.k.210913.004.

ACHIEVEMENTS/HONORS

Academic Excellence Recognition (GPA: 3.9/4.0), CS department, Cornell University	*Spring 2022*
Best Paper Award, ICIIC Conference 2021	*Aug 2021*
Google Summer of Code 2020 (2.77% acceptance rate), Google	*Summer 2020*
Summer Research Fellowship (0.83% acceptance rate), Indian Academy of Sciences	*Summer 2019*
VIT Academic Merit Scholarship (Branch Rank 4, GPA: 9.6/10.0), VIT	*Spring 2018*
National Talent Search Examination (NTSE) Scholarship (State Rank 19)	*Summer 2015-2016*

SERVICE

Peer Reviewer, IEEE RO-MAN Conference	*2024*
Peer Reviewer, Journal of Network and Systems Management-	*2020*
Special issue for Cybersecurity management in the era of AI.	

PROFESSIONAL EXPERIENCE/OPEN SOURCE CONTRIBUTIONS

American Express, Engineer III	*Apr 2023-Jan 2024*
HARMAN International, Associate ML Engineer	*Sep 2021- Jan 2022*
VISA Inc., Software Engineering Intern	*May 2020- Jul 2020*
Google, Google Summer of Code Program	*Jun 2020- Aug 2020*
Hewlett Packard Enterprise, CTY Program Intern	*Jan 2020- Jun 2020*
Samsung R&D Institute, PRISM Program Intern	*Oct 2019- Jul 2020*

Programming Languages	Python, LaTeX, C/C++, MATLAB, HTML
Machine Learning Tools	PyTorch, Tensorflow, ROS2, StableBaselines3, JAX
Robotic Platforms	Reachy by Pollen Robotics, Jibo
Microcontrollers and Microprocessors	Raspberry Pi 4B, Arduino Uno, Intel 8086
Hobbies	piano/keyboard, dancing, traveling, art