Prishita Ray

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Education

Cornell University *Ithaca, New York, USA*

Master of Engineering- Computer Science, GPA: 3.75/4.0 *Jan 2022 - Dec 2022*

- Master of Engineering Project I: ShadowSense (Advised by Prof. Guy Hoffman)
- Master of Engineering Project II: RL Testbed for Autonomous Robot Navigation (Advised by Prof. Mark Campbell)

Relevant Coursework: 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, Tamil Nadu, India*

Bachelor of Technology- Computer Science and Engineering, GPA: 9.1/10.0 *Jul 2017 - Jun 2021*

- Merit Scholarship Awardee 2017-18 (GPA: 9.6/10)
- Undergraduate Capstone Project: Efficient Renewable Energy Powered Automatic Water Dam Control System (Advised by Prof. Geraldine Bessie Amali D.)
- Extracurricular Activities: IEEE Computer Society VIT, VIT Music Club

Relevant Coursework: Data Structures and Algorithms, Natural Language Processing, Compilers, Databases, Machine Learning, Data Mining, Networks, Operating Systems, Statistics, Computer Architecture, Digital Logic and Design, Theory of Computation, Microprocessors, Neural Networks

Research Experience

Human Robot Collaboration and Companionship Lab, Cornell University *Ithaca, NY*

Advisor: Prof. Guy Hoffman *Feb 2022 - Present*

- Worked on a human-robot interaction project called ShadowSense to deploy a real-time Reachy robot for tracking motion of human subjects from fuzzy live captures and interacting with them in privacy-preserved home environments.
- Used Transfer Learning to retrain a model on a custom recorded blurry image dataset collected using the robot.
- The trained model was then deployed in the privacy-preserved robot to track detected subjects in real-time using concepts in Computer Vision such as stereo matching (of the two eye cameras) and coordinate transformations.
- Significant mIoU and accuracy scores were obtained on several challenging test sets.
- Research draft and demos currently under preparation

Autonomous Systems Lab, Cornell University *Ithaca, NY*

Advisor: Prof. Mark Campbell *Sept 2022 - Present*

- Developed two different Curriculum Learning approaches to train Reinforcement Learning agents that are more robust to adversarial environments for the purpose of Autonomous Racing.
- The Proximal Policy Optimization on-policy RL algorithm was used to train the agents in the Default OpenAI Gym CarRacing Environment and an obstacles variant environment of the same.
- In the first approach, the curriculum was designed to learn a CNN policy for the RL agents, by expressing the agent final reward as a function of 3 epoch-based turnpoints that successively generated more adversarial environments during training, and more-robust curricula were chosen through Bayesian Optimization over the function.
- In the second approach, the curriculum was automatically designed on-the-fly to control the adversarial environment difficulty during training.
- Results for the first approach are published at the IROS LRSA 2023 workshop and are under preparation for the second approach.

Indian Space Research Organization (ISRO)- in collaboration with VIT Vellore *Bangalore, India*

Advisor: Prof. Santhi V. *Dec 2020- Jan 2021*

- Removed speckle (multiplicative) noise in Synthetic Aperture Radar (SAR) sentinel images using Neuro-fuzzy and Wavelet Transform techniques
- Evaluated the proposed model using the four metrics: Speckle Suppression Index (SSI), Equivalent Number of Looks (ENL), Speckle Mean Preservation Index (SMPI), and Peak Signal to Noise Ratio (PSNR).

School of Computer Science and Engineering, Vellore Institute of Technology *Vellore, India*

Advisor: Prof. Geraldine Bessie Amali D. *Jan 2021- Jun 2021*

- Created the prototype of a Real Time Dam Control System using a Raspberry Pi 4B microcontroller that makes use of an intelligent RL scheduler to manage flooding based on real-time sensor readings.
- Experimented with 3 algorithms: Soft Actor Critic with Emphasized Recent Experience and Prioritized Experience Replay (SAC+ERE+PER), Proximal Policy Optimization (PPO) and Natural Evolution Strategies (NES) to choose the best scheduler on a software simulation of the system and deploy on the actual prototype.
- Ensured maximum usage of available renewable resources with lesser pollution while controlling flooding optimally.
- Results published at the IEEE ICAIGE 2023 conference.

FrameNet Brasil (as part of Google Summer of Code 2020 project) *Online*

Advisors: Prof. Tiago Timponi Torrent, Prof. Ely Edison Matos *Jun 2020- Aug 2020*

- Designed an automated annotation framework using identified objects and textual data from multimodal corpora, with the core and non-core frame elements present in the FrameNet database. Results published in the LAW-XVI Workshop, LREC 2022.

School of Computer Science and Engineering, Vellore Institute of Technology *Vellore, India*

Advisor: Prof. Kakelli Anil Kumar *Dec 2019- Mar 2020*

- 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.
- The combined RAELN classifier using L2-Regularized Autoencoders and semi-supervised Ladder Networks obtained 81% overall classification accuracy and better per-class accuracies over 10 malware classes of the UNSW-NB15 Malware Dataset compared to baseline fully supervised Ladder Networks and SOTA classifiers such as Random Forest and Naive Bayes, and 74% overall classification accuracy over 4 malware classes of the NSL-KDD Malware Dataset
- Results published at the ICIIC 2021 conference.

Computer Science and Automation Department, Indian Institute of Science *Bangalore, India*

Advisor: Prof. Shalabh Bhatnagar *May 2019- Jul 2019*

- 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.
- The Dynamic Pricing model returned higher average rewards than the Constant Pricing model for most microgrids each of which had different energy-generating capabilities.
- Microgrids quoted suitable selling prices for energy exchange based on various factors, to maximize overall profits and engaged in energy trading with other microgrids
- Impending ADL demands were scheduled judiciously in order to shift the load from peak demand time slots and minimize incurred penalty.
- Results published at the ISGT Europe 2020 conference.

Publications

Conference Proceedings- Peer Reviewed

Ray, P., Bessie Amali D., G. 2023. An Intelligent RL-based Scheduler to Control Flooding in a Renewable Energy powered Automatic Water Dam control system. IEEE International Conference on Artificial Intelligence and Green Energy 2023.

Ray, P., Nandan, T., Anne, L., Anil Kumar, K. 2021. A New Combined Model with Reduced Label Dependency for Malware Classification. 3rd International Conference on Integrated Intelligent Computing Communication & Security (ICIIC 2021).

Ray, P., Kaluri, R., Reddy, T., Lakshmanna, K. 2021. Contemporary Developments and Technologies in Deep Learning–Based IoT. Deep Learning for Internet of Things Infrastructure, Taylor and Francis, 61-82, 2021.

Nayak, S., Ajit Ekbote, C., Pratap Singh Chauhan, A., Bharadwaj Diddigi, R., **Ray, P.**, Sikdar, A., Koti Reddy Danda, S., Bhatnagar, S. 2020. Stochastic Game Frameworks for Efficient Energy Management in Microgrid Networks. 2020 IEEE PES Innovative Smart Grid Technologies Europe (ISGT-Europe), 116-120

Workshops

Ray, P.*, Banerjee, R.*, Campbell, M. 2023. Improving Environment Robustness of Deep Reinforcement Learning Approaches for Autonomous Racing Using Bayesian Optimization-based Curriculum Learning. Learning Robot Super Autonomy Workshop at International Conference on Intelligent Robots and Systems (IROS) 2023.

Belcavello, F., Viridiano, M., Edison Matos, E., Timponi Torrent, T. 2022. Charon: a FrameNet Annotation Tool for Multimodal Corpora. Proceedings of the 16th Linguistic Annotation Workshop (LAW-XVI) @LREC 2022. Acknowledged for GSoC 2020 Contribution.

Google Scholar Link: https://scholar.google.com/citations?user=kapU0vUAAAAJ&hl=en

Honors, Awards & Fellowships

2022	**Academic Excellence Recognition- Spring 2022 (GPA: 3.9/4.0)**, Computing and Information Sciences Department, Cornell University
2021	**Best Paper Award**, 3rd International Conference on Integrated Intelligent Computing Communication & Security (ICIIC)
2020	**Google Summer of Code (GSoC)**, Google
2019	**Summer Research Fellowship (SRFP)**, Indian Academy of Sciences
2018	**VIT Academic Merit Scholarship (Branch Rank 4, GPA: 9.6/10.0)**, Vellore Institute of Technology
2015	**National Talent Search Examination (NTSE) Scholarship**, Department of State Education and Training (DSERT), Karnataka

Link to certificates: https://drive.google.com/file/d/18fFbE_ypz-dIJuK7udW18Yo6J4IBpLyd/view?usp=sharing

Service

Peer Reviewer: Journal of Network and Systems Management (2020) Served as a reviewer in their special issue for Cybersecurity management in the era of AI.

Skills

Deep Learning
Frameworks: PyTorch, TensorFlow, Keras, ROS2, StableBaselines3
Domains: Reinforcement Learning, Robotics, Computer Vision
Microcontrollers and Microprocessors: Raspberry Pi, Arduino Uno, Intel 8086, Keil MicroVision, PIL
Programming: Python, C, C++, Java, Matlab, R
Languages: English, French, Hindi, Bengali