Vihaan Akshaay Rajendiran

Applied AI/Robotics Researcher

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Education

2022–2024 **University of California, Santa Barbara**,
Master of Science in Computer Science.
CGPA – 4.0/4.0

2017–2022 **Indian Institute of Technology Madras - Dual Degree (B.Tech + M.Tech)**,
Bachelor of Technology - Mechanical Engineering,
Master of Technology - Robotics,
Minor - Artificial Intelligence.
CGPA – 8.62/10

2015–2017 **Maharishi Vidya Mandir Senior Secondary School - AISSCE**,
Central Board of Secondary Education, Class 12.
Score – 92.8%

Experience

May 2021 – August 2021 **H.Milton Stewart School of Industrial and Systems Engineering, Georgia Tech, Atlanta**, Summer Undergraduate Researcher.

- Implemented the original 'Deep Q-Network' algorithm proposed by Deepmind to test the impact of stability factors such as Q-Targets, Experience Replay and Gradient Truncation introduced in the paper under the guidance of Dr. Siva Theja Maguluri.
- Conducted numerous experiments on OpenAI environments modeled after control theory problems in classic RL literature by varying stability and neural network hyper-parameters. [Code]

October 2020 – March 2021 **School of Electrical & Electronic engineering, Nanyang Technological University, Singapore**, Research Intern.

- Implemented ensemble deep Random Vector Functional Link Neural Netrowks (eD-RVFL) and working on methods to improve its performance under the guidance of Dr. Ponnuthurai Nagaratnam Suganthan
- Currently testing the efficacy of this algorithm by comparing with other neural network frameworks and deep learning approaches to tackle high class imbalance in multi-class classification problem.

May 2020 – June 2020 **Robotics Lab, Indian Institute of Technology Madras, India**, Undergraduate Student Researcher.

- Built a framework for implementing a pipeline to aid custom mobile indoor navigation robots using localization techniques under the guidance of Dr. T Asokan.
- Read several research papers on the topics of localization, bug path planning and mapping algorithms which use geometric properties of images captured from monocular cameras.

May 2019 – July 2019 **Ramakrishna Mission, Chennai, India**, Robotics Engineering Intern.

- Contributed to 'Biley Bot', a life-like, interactive humanoid robot of young Swami Vivekananda, soon to be displayed in Vivekanandar House Museum, Chennai.
- Studied about humanoid designing and various existing models to create the desired form factor for the robot.
- Explored and integrated various existing core hardware like Qualcomm RB3 and NVIDIA Jetson chips along with sensors like Intel RealSense and used 3D Printing method frequently to build the exterior of the robot and the casing of the electronic components used.

Key Projects

October 2022 - Present **Scrambler-Resolver-Explorer Deep Q-Network: A Hindsight & Foresight based Learning Agent**, *Dr. Lei Li & Dr. Yu-Xiang Wang, , University of California, Santa Barbara*.

- Working on a novel DQN-like agent (called the SRE-DQN) that tackles sparse-reward environments by using an internally adversarial type exploration algorithm for generating better trajectories targeted to improve sample efficiency.
- We also propose 'Foresight,' an internal reward mechanism similar to hindsight that creates a potential heuristic for encouraging the agent to map from forward to backward trajectories in stochastic shortest path problems.

September 2021 – June 2022 **Unsupervised Behaviour Recognition in Mice using Deep Reinforcement Learning**, *Dr. Ravindran B, Indian Institute of Technology Madras & Dr. Vivek Kumar, Jackson Labs, Bar Harbor, Maine.*

- The goal is to develop unsupervised techniques to discover and track stereotyped behaviours exhibited by mice moving in a fixed arena.
- Models used for pose estimation from video data recorded by Jackson Labs are improved.
- By modeling behaviours as hierarchies, new option discovery algorithms are implemented on obtained poses to identify repeated behaviours.

January 2018 – June 2021 **ARTEMIS - Railroad Crack Detection Robot**, *Dr. T Asokan, Indian Institute of Technology Madras.*

- Built a railroad crack detection robot (patented) that traverses along railway tracks and reports the location and degree of faults in the tracks autonomously, with the goal of reducing railway mishaps.
- This project has won several awards including international dyson award and is currently in plans of being deployed with the help of the Indian Railways Department.

March 2021 – April 2021 **Time Estimation for Teleport Print**, *Self-motivated.*

- Worked on Demand Modelling Problem of forecasting the traffic of customers in print shops based on various spacio-temporal fators like Location, Time during the day and the day of work.
- Implemented several methods to experiment with the data, including statistical ideas like gaussian mixtures to feed forward neural networks for solving this real world problem.

September 2019 **Real-time Sign Language Translation using hand tracking algorithm [Code]**, *Team Project in Yet Another Hackathon, 2019.*

- An end-to-end program was built which takes in video feed, uses hand tracking algorithm to estimate the pose, and a second custom-trained neural network to map hand postures in in sign language to words.
- Has potential to become a complete communication platform for anybody to interact with differently abled people who practice sign-language by integrating existing solutions to generate animations of hand gestures from voice input.

Relevant Coursework

CS Reinforcement Learning; Multi-armed Bandits; Machine Learning; Deep Learning

Control Linear Dynamical Systems; Allied Topics in Control Systems(Network Control); Process Optimization;

Robotics Multi Body Dynamics & Applications; Mechanics and Control of Serial Robots;

Leadership & Extracurriculars

December 2019 **Contingent Lead**, *DIC Terrace Farming Robot Challenge, IIT Roorkee.*

- Took responsibility for forming a team and building an Autonomous agricultural robot that can climb up and down steps in hills and perform terrace farming activities.
- Won the overall second place (had teams from over 15 IITs)

March 2019 - March 2020 **Club Head**, *iBot(Robotics) - Centre For Innovation, IIT Madras.*

- Lead a team of 30 students, responsible for motivating and guiding students interested in Robotics.
- Conducted various robotics oriented sessions with the aim of improving the robotics culture in the institute.
- Mentored and nurtured projects with an allocated fund of 80,000 dollars from the institute.

April 2020 - July 2020 **Team Lead**, *Robocup - Madras Chimps.*

- Started and lead the institute's official team competing in the Robocup 3D simulation league.
- Worked on the dynamics aspect of the Nao Robot (Standard Platform used) which includes using a ZMP-IP based model for bi-pedal walking and active control strategies for stability.

December 2018 **'Best Presenter' - Student Academic Conference**, *IIT Bombay.*

- Awarded 'Best presenter' in the session on Mechatronics, Autonomous and Robotics System Design, at Inter IIT Tech Meet 2018, IIT Bombay.

Extracurriculars

- Regularly practice speed-solving various types of the rubik's cube.
- Part of my school's official chess team and played in state and national level tournaments.
- Trained in playing keyboard and passed Grade 2 Trinity SELT test.
- Represented school's co-curricular sphere and won several quiz and math competitions in school level.
- Ardent cycling and fitness enthusiast.