

Vihaan Akshaay Rajendiran

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EDUCATION

- **University of California, Santa Barbara** Santa Barbara, CA
M.S. in Computer Science; GPA: 4.0 September 2022 - Ongoing
- **Indian Institute of Technology, Madras** Madras, India
M.Tech in Robotics & B.Tech in Mechanical Engineering; GPA: 8.62/10 July 2017 - May 2022

RESEARCH PROJECTS & EXPERIENCES

- **Bi-Directional Goal-Conditioning for State Space Search Problems** Dec 2022 – Sept 2023
NeurIPS 2023, Goal-Conditioned Reinforcement Learning Workshop [Paper] Mentors: Prof. Lei Li & Prof. Yu-Xiang Wang
 - Developed the ‘**SRE-DQN**’ (Scrambler-Resolver-Explorer) framework, leveraging bi-directional task generation through ‘**Foresight Relabelling**’ and **goal-conditioned DQN**. This approach smartly synthesizes samples from forward, backward and intermediate tasks to learn from, enhancing the agent’s performance on the main task.
 - Empirically demonstrated the effectiveness of **multi-directional goal-conditioning** with **knowledge of goal states** on classical state space search tasks.
- **Unsupervised Behaviour Recognition in Mice using Deep RL** Sept 2021 – June 2022
Indian Institute of Technology Madras, Masters Thesis [Report] Mentors: Prof. B Ravindran & Dr. Vivek Kumar
 - Contributed to the development of unsupervised techniques for identifying mouse behaviors, using **Hierarchical Reinforcement Learning** and **Option Discovery** to analyze video data from The Jackson Laboratory.
 - Implemented **sim2real** techniques in a project to map 2D video data to 3D joint locations in a Blender mouse model, and experimented with **Generative Adversarial Networks (GANs)** to address discrepancies between synthetic and real images, showcasing challenges in applying theoretical models to practical scenarios
- **AI for Earth - Landslide Detection** Jun 2023 – Ongoing
Graduate Student Researcher, University of California Santa Barbara Mentors: Prof. Lei Li & Prof. Gen Li
 - Developing a deep learning model for landslide prediction using **Multi-band Satellite Imagery**, benchmarking against **Mask RCNN** and **YOLO models** for effective instance segmentation across diverse regions.
 - Developing a **Continuous learning system** using a **Masked Auto Encoder** to reconstruct and analyze satellite image streams, focused on analyzing inter-band correlations for applications in landslide prediction & forecasting.
- **Mixed Kernelized ensemble Deep Random Vector Functional-Link Network** Jan 2023 – Ongoing
Graduate Student Researcher, Nanyang Technological University, Singapore Mentor: Prof. P. N. Suganthan
 - Created a mathematical framework for a **Mixed Kernelized Ensemble Deep Random Vector Functional-Link Network**, which innovatively combines kernelized and original neural network models using randomization-based techniques unique to RVFL (Random Vector Functional-Link) networks.
 - Conducted thorough performance testing of this advanced network framework on **UCI datasets for classification tasks**, showcasing its potential in enhancing machine learning applications through a closed-form solution approach.
- **DQN Stability Analysis** May 2021 – Aug 2021
Undergraduate Summer Research Internship, Georgia Tech, Atlanta [Report] [Code] Mentor: Prof. Siva Theja Maguluri
 - Replicated Deepmind’s **Deep Q-Network** algorithm to analyze key stability factors like Q-Targets, Experience Replay, and Gradient Truncation, by testing on OpenAI environments that simulate classic control theory problems.
- **ARTEMIS - Railroad Crack Detection Robot** Jan 2018 – June 2021
Centre For Innovation, Robotics Club Head Mentors: Dr. Boby George & Dr. Asokan Thondiyath
 - Designed and enhanced a patented **Railroad Crack Detection Robot**, an International James Dyson Prize winner, by innovating autonomous traversal and fault reporting features for effective operation on active railway tracks, substantially aiding in the prevention of train derailments.
- **Edge-Attention U-Net for Shoreline Detection** Sept 2021 – June 2022
CMPS 281B - Advanced Topics in Computer Vision Course Project [Report] [Code]

- Developed a U-Net with **Edge-based Attention mechanism** for Binary Semantic Segmentation, enhancing shoreline detection accuracy on the **Satellite-2 Water Edge Dataset** compared to standard U-Net and Attention U-Net models.

- **Interactive Traffic Classification using Semi-Supervised Graphical Approaches** Jan 2023 – March 2023
CMPSC 292F - ML on Graphs Course Project
 - By leveraging graphical machine learning models (such as **GCN** and **DGCNN**), using **psuedo-labeling** and exploiting the dependencies between bursts, we achieved near State-of-the-Art performance in interactive network traffic classification with smaller models (**0.2% the size of a BERT-based model**).

COURSEWORK

- **Computer Science:** Scalable Internet Services, Machine Learning (Graduate), Advanced Topics on Computer Vision, ML on Graphs, Matrix Computational Analysis, Reinforcement Learning, Multi-Arm Bandits, Stochastic Optimization.
- **Robotics:** Multi Body Dynamics & Applications, Mechanics and Control of Serial Robots, Field & Service Robotics
- **Controls:** Linear Dynamical Systems, Network Control, Process Optimization, Measurements Instrumentation & Control.

LEADERSHIP & VOLUNTEERING

- **Centre For Innovation (CFI) - iBot (Robotics) Club** March 2018 – May 2020
Indian Institute of Technology Madras
 - **Club Head:** Led a team of **30 students**, responsible for motivating and guiding students interested in Robotics • Mentored and nurtured projects with an allocated fund of **80,000 dollars** from the institute.
 - **Club Coordinator:** Conducted various robotics-oriented sessions with **over 200 participants** to improve the robotics culture in the institute • **Mentored freshmen**, providing guidance and inspiration for building innovative robots.
- **DIC Terrace Farming Robot Challenge, IIT Roorkee.** December 2019
Indian Institute of Technology Madras
 - **Robotics Lead:** Lead a team of **top 10 roboticists** from IIT Madras and built an **Autonomous agricultural robot** that can climb up and down steps in hills and perform terrace farming activities • Silver Prize
- **AIoT Lab, Roboticist** Since May 2019
Ramakrishna Mission
 - **Robotics Engineer Intern:** Collaborated on ‘**Biley Bot**’, an interactive humanoid representation of young Swami Vivekananda for the Vivekananda House Museum • Explored **humanoid design principles** to achieve the desired robot form factor and employed **3D Printing techniques** for its exterior construction • Incorporated core hardware components, including **Qualcomm RB3** and **NVIDIA Jetson** chips with sensors like **Intel RealSense** into the robot’s architecture.
- **Madras Chimps - RoboCup** April 2020 – July 2020
Indian Institute of Technology Madras
 - **Founding Team:** Started and lead the institute’s official team competing in the **Robocup 3D simulation league** • Worked on Nao Robot dynamics, utilizing a **ZMP-IP based model** for bipedal walking and stability control strategies.

TEACHING

- **CS6700: Reinforcement Learning** [IIT Madras, Spring 2022] - Lead TA with [Prof. B Ravindran](#)
- **CMPSC 160A: Artificial Intelligence** [UCSB, Spring 2023] with [Prof. Yu-Xiang Wang](#)
- **CMPSC 130A: Data Structures & Algorithms** [UCSB, Fall 2023] with [Prof. Eric Vigoda](#)

HONORS AND AWARDS

- **Best Presentation Award:** Graduate Machine Learning Course University of California Santa Barbara
- **Best Presenter:** Mechatronics, Autonomous and Robotics System Design Student Academic Conference, IIT Bombay
- **Winners:** 54-Hour Tech Hackathon Techstars Startup Weekend (Chennai Edition)
- **Runners-up:** Coding Hackathon (Public Sector Domain) Yet Another Hackathon 2k19 (Among 35 Finalist Teams)
- **Winner:** CliqTrix (Emotional Well-Being Chatbot) Zoho App Building Contest 2022 (Among 14 Finalist Teams)
- **3rd Prize:** Tech and Innovation Fair, Shastra Indian Institute of Technology Madras

SKILLS

Python, C++, Ruby, HTML, MATLAB, Mathematica, TensorFlow, Keras, PyTorch, Scikit-Learn, OpenCV, PCL (Point Cloud Library), Blender, ROS (Robot Operating System), RViz, Gazebo, Git, Jupyter, Fusion360