Vihaan Akshaay Rajendiran

Email : vihaanakshaay@ucsb.edu
Linkedin: https://www.linkedin.com/in/vihaanakshaayrajendiran/
Webpage: https://vihaanakshaay.github.io//
Github: https://github.com/VihaanAkshaay
Mobile : +1-805-259-5518

Education

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

Research Projects & Experiences

- **LandsatQuake - AI For Earth** — Jun 2023 – Ongoing
  ICLR 2025, Machine Learning for Remote Sensing Workshop *Mentors: Prof. Lei Li & Prof. Gen Li*
  - **Created an open-source dataset leveraging 40 years of historical Landsat imagery** to fully characterize large landslides over extensive mountain ranges. Integrated Digital Elevation Model (DEM) data to enhance detection accuracy by combining slope information with satellite imagery.
  - **Evaluated existing computer vision models and proposed new methodologies** Demonstrated the challenges of applying traditional computer vision algorithms to moderate-resolution Landsat data by evaluating several baselines. The study revealed the necessity for developing new methodologies that address real-world challenges in landslide detection.

- **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.
  - Demonstrated the effectiveness of **multi-directional goal-conditioning** with **knowledge of goal states** empirically 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*
  - Developed unsupervised techniques for identifying mouse behaviors, using **Hierarchical Reinforcement Learning** and **Option Discovery** analysing video data from The Jackson Laboratory to uncover complex behavioral patterns.
  - 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.

- **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 kerneled 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**, winner of the **International James Dyson Prize**, by engineering autonomous traversal and fault reporting systems. Overcame significant technical challenges to ensure reliable operation on active railway tracks, substantially aiding in the prevention of train derailments.

- **Edge-Attention U-Net for Shoreline Detection** Sept 2021 – June 2022
  CMPSC 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, Shaastra 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