

VIMARSH SHAH

[Website](#) | vimarsh244@gmail.com | [Linkedin](#) | [Github](#)

EDUCATION

Birla Institute of Technology and Science - Pilani, Goa

B.E. Computer Science Engineering, MSc. (Hons) Physics

CGPA: 8.24/10

2022 - 2027 (expected)

EXPERIENCE

CSIR: CEERI (Central Electronics Engineering Research Institute)

Research Intern

Pilani, India

May 2024 - July 2024

- Developed an automated drone-based leachate site detection system under the guidance of [Dr. Kaushal Kishore](#) using segmentation models, aligning drone navigation to predicted centroids for sample collection. Implemented and tested in simulation and hardware.
- Worked on various Reinforcement learning techniques of indoor environments, applying virtual repulsive and attractive potential fields for navigation and exploration in unknown spaces. [[Technical Report](#)]
- Integrated Intrinsic Curiosity Module (ICM) for exploration, achieving total reward increases by aligning intrinsic and extrinsic rewards.

Data, Systems and HPC (DaSH) Lab

Undergraduate Researcher

BITS Goa

August 2024 - Present

- Researching federated learning under [Prof. Arnab K. Paul](#), focusing on identifying and mitigating infrastructure drift in distributed FL workloads.
- Investigating optimization techniques to improve model performance and prevent infrastructure drift in heterogeneous cluster & non-IID datasets.

PROJECTS

Snakebot: Modular snake robot | [Source Code](#)

January 2024 - Present

- Worked on engineering of a modular wheel-less robot with 2 degrees of freedom (DoF) per joint, and working on implementing specific gait patterns for inchworm and serpentine locomotion.
- Supervising the design of a scalable, daisy-chainable PCB based on the RP2040 microcontroller, for modular expansion and inter-segment communication with serial protocol and independent power management for each module.

Kratos: Mars Rover Team | [Source Code](#) & [Website](#)

September 2023 - Present

- Migrated the electronics stack to a newer platform by designing a custom PCB based on ESP32 family of microcontrollers.
- Integrated an array of environmental and gas sensors (VOC, CO₂, methane) for the Life Detection module.
- As part of the Controls subsystem, developed an open-loop control system for the Life Detection assembly and implemented a closed-loop PID control system for robotic arm.
- Ranked 6th in [International Rover Challenge '24](#) and 3rd in Arm task. Scored 93/100 points in [University Rover Challenge](#) SAR submission and qualified for onsite finals.

Vulcan: Humanoid Robot | [Source Code](#)

April 2023 - Present

- Integrated various Large Language Models (LLMs) with computer vision models for real-time facial expression analysis and speech recognition. Integrated with hardware movement of eyelids, eyeballs and mouth systems.
- Developed a real-time image processing pipeline for combining image feeds from both cameras in each eye, followed by image stitching, and feature-based object classification on the stiched image.

Team Moonshot | [Source Code](#)

November 2023 - August 2024

- Developed an autonomous lunar rover capable of traversing Moon-like terrain while avoiding obstacles. Used ROS, RTABMap, and other custom algorithms for non-GPS localization and mapping.
- Implemented frontier-based exploration for efficient area coverage and integrated use of tracking and depth camera for accurate obstacle detection and avoidance.
- Developed a 3-DoF robotic arm with simple CV based payload detection, inverse kinematics to calculate the joint angles, and autonomous pick-and-place capabilities for collection and cache storage of the payload.
- Participated in [ISRO Robotics Challenge-URSC 2024](#) and secured a **top 20** place among 1200+ registered teams.

Independent Projects

- **Micrograd implementation in C:** A simple implementation of autograd engine in C, which can be used to train an MLP. [\[Code\]](#)
- **Pruning & Sparsity Experiments:** Implemented fine-grained and channel-based pruning on VGG-16, achieving 86% reduction with iterative pruning and finetuning on CIFAR-10 dataset (without any loss in performance). [\[Code\]](#)
- **Implementation of a VAE and analysis with different sampling techniques:** Constructed a VAE for MNIST dataset, compared latent space sampling from Normal, Gaussian and Beta distribution to qualitatively analyze generation quality. [\[Code\]](#)
- **Softmax variations in CNNs:** Analyzed the impact of different implementations of Softmax on ResNet classifier on CIFAR-10. Found that log-variants demonstrate superior performance and faster convergence. [\[Report\]](#)
- **Transformer Implementation:** Implementation of Transformer blocked as mentioned in “Attention is All You Need” using PyTorch, including multi-head attention and positional encoding mechanisms. [\[Code\]](#)
- **FinanceGPT:** A financial data query and answering system using vector embeddings, Langchain, and FAISS to extract insights from annual reports of BSE-listed companies, deployed using Flask. [\[Code\]](#)
- **Fine-tuning an LLM:** Finetuned an TinyLlama using Low Rank Adaption for function calling. [\[Model on HF\]](#)

LEADERSHIP

Electronics & Robotics Club | *Research Head*

April 2024 – Present

- Overseeing project direction and research initiatives for the student-run robotics club (60+ students), managing daily operations and outreach events. [\[Website\]](#)
- Developed a ROS2-based robotics hackathon utilizing BITS Goa’s map for pathfinding and navigation in Gazebo. [\[Problem Statement\]](#)
- Implemented a PCB design mini-project for club inductions, focusing on custom motor driver creation to teach fundamental electronics and PCB design principles.

Sandbox Innovation Labs | *Committee Member*

January 2024 – Present

- Member of student committee responsible for managing the student run fabrication and prototyping lab of our university. [\[Website\]](#)

TECHNICAL SKILLS

Languages & Frameworks: Python, C, Java, ROS, Gazebo, Pytorch, OpenCV

Tools: GIT, Kicad, Autocad, Fusion360

Others: Deep Learning, Arduino, Raspberry pi, ESP32, STM32, Linux

Relevant Coursework: Computer Programming, Linear Algebra, Differential Equations, Classical Mechanics, Non-Linear Dynamics and Chaos, Physics of Semiconductor Devices