

EDUCATION

- **Indian Institute of Technology (BHU)** Varanasi, India
Bachelor of Technology in Electronics Engineering; GPA: 9.47/10 November 2020 – May 2024

SKILLS AND INTERESTS

- **Areas of Interest:** Safety Critical Control, Self Driving, Robotics, Computer Vision, Reinforcement Learning
- **Languages and Libraries:** Python, MATLAB, C++, X-Plane, Carla, OpenAI Gym, PyTorch, Tensorflow
- **Technologies:** ROS, ROS2, Deep Learning, Machine Learning, AutowareAI, Linux, Git, L^AT_EX

PUBLICATION

1. **Aryaman Gupta**, Kaustav Chakraborty, Somil Bansal, "**Detecting and Mitigating System-Level Anomalies of Vision-Based Controllers**", *Submitted to ICRA'24* [\[Link\]](#)
2. **Aryaman Gupta**, Ali Mohamed Ali, Hashim A.Hashim, "**Deep Reinforcement Learning for Sim2Real Policy Transfer in VTOL-UAVs Offshore Docking Operations**", *In Preparation*
3. **Aryaman Gupta**, Sivala Deepak, Neha Sharma, Om Jee Pandey, "**Joint Node-Fault Prediction and Data Routing in SW-IoT Networks using Actor-Critic RL**", *In Preparation*

EXPERIENCE

- **University of Southern California** Los Angeles, CA
Summer Research Internship | Prof. Somil Bansal May 2023 - Present
 - **Goal:** Improve visual navigation policies by leveraging knowledge of their failure cases.
 - Prepared datasets containig failure samples labelled using **Backward Reachable Tubes(BRTs)**.
 - Trained an **Anomaly Detector** that detect system failures and trigger **Fallback Controller** for safety.
 - BRT failure volume decreased by 12%(avg.) on testing environments unseen during classifier training.
- **Carleton University** Ottawa, Canada
Research Internship | Prof. Hashim Mohamed January 2023 - Present
 - **Goal:** Develop docking mechanism for VTOL UAVs on offshore charging platforms using Deep-RL.
 - Built a custom environment for UAV landing with JONSWAP model-based hydrodynamic disturbances(waves) acting on the docking station making it oscillate on the water surface.
 - Implemented **DQN** and **PPO** algorithms to compare performance among value and policy-based agents.
 - Agents successfully learnt to initially accelerate downwards and then decelerate to land with low velocity.
- **Indian Institute of Science** Bengaluru, India
Summer Research Internship | Prof. Bharadwaj Amrutur May 2022 - July 2022
 - **Goal:** Develop decentralized multi-agent exploration and visual dynamic obstacle avoidance systems.
 - Implemented **Distributed RRT-Exploration** of unknown environments with multiple ground robots.
 - Performed real-time map updates using **3D Object Detection** on multiple infrastructure cameras and used **First-Order Gradient Descent** for optimizing obstacle's 3D real-world position for avoidance.
 - Developed ROS packages that can be configured and implemented on custom hardware testbeds.
- **Changwon National University** Changwon, South Korea
Research Internship | Prof. Oh-Seol Kwon March 2022 - July 2022
 - **Goal:** Develop a deep learning architecture for efficient object detection in low-resolution aerial images.
 - Combined **Faster R-CNN**, **Edge Enhanced Network**, and **SRGAN** architectures for joint task.
 - Performed **End-to-End Training** of the entire pipeline, feeding detector's loss to SRGAN network.
 - Obtained testing accuracies of 95.5% on COWC and 83.2% on OGST datasets.

PROJECTS

- **Multi-Agent Warehouse Cleaning**
 - **Goal:** Develop a Multi-Agent Coverage and Cleaning system for unknown terrains using ground robots. [\[Link\]](#)
 - Built a swarm of **Omnidrive Robots** and mapped the terrains using **RRT-based Multi-Robot Exploration**.
 - Implemented terrain distribution among multiple agents by computing **Voronoi Cells** using **Fortune's Algorithm** and a polygon planner to traverse **Boustrophedon Paths** for coverage.
- **Small World IoT Networks (Supervised by Prof. Om Jee Pandey, IIT BHU)**
 - **Goal:** Introduce Small-World Phenomenon in Wireless Sensor Networks and Detect Faulty Sensor Nodes. [\[Link\]](#)
 - Implemented **Soft Actor Critic(SAC)** algorithm for introducing long-range links in networks.
 - Prepared faulty sensory nodes dataset and used **DBSCAN** algorithm for detection after comparison.
 - Performed data routing and observed increased network lifetime and throughput with lowered energy consumption.
- **UAV Swarming**
 - **Goal:** Develop UAV Position Control using PID controller and Swarm Motion of multiple drones. [\[Link\]](#)
 - Implemented **Cascaded PID** for 3D position control and Python-based socket communication for manual control.
 - Used **Flocking Algorithm** for a swarm motion of drones in PyBullet simulation.
- **Multi-Purpose Household Robot (Supervised by Prof. Shyam Kamal, IIT BHU)**
 - **Goal:** Design a Compact Ground Robot that can perform household tasks like Cleaning and Child-Care. [\[Link\]](#)
 - Designed a **CAD** model and integrated ROS packages for **Exploration, Navigation, and Coverage**.
 - Used **Computer Vision** for tasks like threat detection and child following for child care in households.
 - Fabricated hardware using **Jetson Nano** and **STM Microcontroller** and used **Intel Realsense** for perception.
- **UAV Guided UGV Navigation**
 - **Goal:** UAV-assisted Exploration of mountainous terrains and UGV Navigation in snow-covered roads. [\[Link\]](#)
 - Performed UAV Localization by fusing IMU and GPS data using **Extended Kalman Filtering**.
 - Used **U-Net** for segmenting roads and **Frontier Exploration** on UAV for mapping using RGBD data.
 - Obtained UGV odometry using UAV camera feed and traversed the terrains using waypoint planning.

RELEVANT COURSEWORK

- **Academic Courses:** MA-101(Real Analysis), MA-102(Linear Algebra), MA-202(Probability and Statistics), CSO-102(Data Structures and Algorithms), CSO-332(Ubiquitous Computing), CSO-458(Soft Computing)
- **Online Courses:** ML and DL Fundamentals by Andrew NG, RL Specialization by UoA, Computer Vision by Stanford

ACHIEVEMENTS

- Among **Top-15** students selected across India for the **IUSSTF-Viterbi Scholarship 2023** to pursue a fully-funded summer research internship at the USC Viterbi School of Engineering.
- Selected for **DAAD-WISE Scholarship 2023** to pursue Research Internship in German Public Institutes.
- Selected for **Mitacs GRI Scholarship 2023** to pursue Research Internship in Canadian Institutes.
- Stood **Second** in **All Indian Institutes of Technology Robotics Association 2021 Challenge** among all prestigious institutions in India for maximum coverage of warehouse using multiple agents.
- Among **Top-10** teams in **National Robotics Competition** for developing a consumer-oriented innovative household robot capable of doing household chores and baby care.
- Stood **First** in **Labyrinth**, a ROS based Perception and Path Planning event in Technex, IIT BHU).
- Secured **All India Rank 2400** in JEE Advanced Examination 2020 among one million applicants.

LEADERSHIPS AND COMMUNITY INVOLVEMENTS

- **Technical Lead** of **RoboReG**, a student research group working on Intelligent Robotics at IIT(BHU).
- **Senior Member** of **Robotics Club**, where I guide juniors and help in conducting events at IIT(BHU).
- **Member** of **Research Community**, where I manage resources and promote research at IIT(BHU).
- Conducted Robowars and Pixelate events in Technex, the Techno-Management Fest of IIT(BHU).