

## EDUCATION

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- **University of Southern California** Los Angeles, CA  
*Doctor of Philosophy in Electrical Engineering* August 2024 – Present
- **Indian Institute of Technology (BHU)** Varanasi, India  
*Bachelor of Technology in Electronics Engineering; GPA: 9.42/10* November 2020 – May 2024

## PUBLICATION

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1. **Aryaman Gupta**, Kaustav Chakraborty, Somil Bansal, “**Detecting and Mitigating System-Level Anomalies of Vision-Based Controllers**”, *ICRA '24* [\[Link\]](#)
2. A.M. Ali, **Aryaman Gupta**, H.A. Hashim, “**Deep Reinforcement Learning for Sim2Real Policy Transfer of VTOL-UAVs Offshore Docking Operations**”, *Applied Soft Computing Journal* [\[Link\]](#)
3. Neha Sharma, **Aryaman Gupta**, Sivala Deepak, Om Jee Pandey, “**Node Fault Prediction Assisted Small-World IoT Networks Using ML Frameworks: Towards Performance Improvement**”, *Submitted to IEEE ANTS'24*

## EXPERIENCE

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- **University of Southern California** Los Angeles, CA  
*Research Internship | Prof. Somil Bansal* May 2023 - August 2024
  - **Goal:** Improve visual navigation policies by leveraging knowledge of their failure cases.
  - Prepared datasets containing 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 40% on testing environments unseen during classifier training.
- **Carleton University** Ottawa, Canada  
*Research Internship | Prof. Hashim Mohamed* January 2023 - December 2023
  - **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 safely.
- **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

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- **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**.
  - Distributed terrain among multiple agents by computing **Voronoi Cells** using **Fortune's Algorithm**.
  - Used a polygon planner for computing **Boustrophedon Paths** for each agent for complete coverage.
- **UAV Swarming**
  - **Goal:** Develop UAV Position Control using PID controller and implement Swarm Motion of multiple drones. [\[Link\]](#)
  - Used ArUco marker and Time of Flight(TOF) Lidar sensor for pose estimation with Kalman Filter for correction.
  - 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 software.
- **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 through waypoint following.
- **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 **Actor Critic** methods for introducing long-range links in network (topology optimization).
  - Prepared faulty sensory nodes dataset and used **DBSCAN** algorithm for detection after comparison.
  - Performed data routing and observed increased network lifetime and throughput with reduced latency.

## SKILLS AND INTERESTS

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

## RELEVANT COURSEWORK

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- **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

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- Awarded **Honourable Mention** for my technical achievements and contribution in organizing events and mentoring students for the Science and Technology Council of IIT(BHU).
- Awarded the **Best Undergraduate Thesis Title** among 146 students in ECE department at IIT(BHU).
- 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.
- Awarded **DAAD-WISE Scholarship 2023** to pursue Research Internship in German Public Institutes.
- Awarded **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** winners in **National Robotics Competition** for developing innovative household robot.