Aryaman Gupta

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Education

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

Publication

1. **Aryaman Gupta**, Kaustav Chakraborty, Somil Bansal, "**Detecting and Mitigating System-Level Anomalies of Vision-Based Controllers**", *Submitted to ICRA'24*

Experience

- **University of Southern California** — Los Angeles, CA
  Summer Research Internship under Dr. Somil Bansal — *May 2023 - Present*
  - **Robustifying Perception Controller via leveraging Failure Case Analysis**: Improving Vision-Based Navigation Policy on its Failure Cases computed through Hamilton-Jacobi Reachability Analysis for Autonomous Aircraft Taxiing and Autonomous Ground Robot.
- **Carleton University** — Ottawa, Canada
  Research Internship under Dr. Hashim Mohamed — *January 2023 - Present*
  - **Vision-Based VTOL Docking on Offshore Platforms**: Building a Vision-Based Docking Mechanism for VTOL UAVs on Offshore Charging Platforms having Hydrodynamic Disturbances using Deep Q-Networks and Proximal Policy Optimization.
- **Indian Institute of Science** — Bengaluru, India
  Summer Research Internship under Dr. Bharadwaj Amrutur — *May 2022 - July 2022*
  - **Multi-Agent Ground Vechicles**: Worked on decentralized collaborative autonomous mapping with multiple VOLTA ground robots. **[Link]**
  - **Dynamic Obstacle Avoidance**: Implemented dynamic obstacle avoidance through simultaneous map updates using 3D object detection on infrastructure cameras.
- **Changwon National University** — Changwon, South Korea
  Research Internship under Dr. Oh-Seol Kwon — *March 2022 - July 2022*
  - **Joint Super Resolution and Object Detection**: Built a model by combination of Faster R-CNN and Edge Enhanced SRGAN architectures which can detect objects in low resolution aerial images. **[Link]**

Projects

- **Multi-Agent Warehouse Cleaning**: Built a Swarm of omnidrive robots for collaborative autonomous mapping and vacuum cleaning of unknown terrains. Mapped the terrains using RRT-Based Multi-Robot Exploration. Implemented terrain distribution by computing Voronoi cells using Fortune's Algorithm and a Polygon Coverage Planner to traverse Boustrophedon Paths. **[Link]**
- **Small World IoT Networks (Supervised by Dr. Om Jee Pandey, IIT BHU)**: Implemented Small-World Phenomenon on Wireless Sensor Networks(WSNs) using Actor Critic Reinforcement Learning, and Dynamic Fault Node Prediction using DBSCAN Anomaly Detection Algorithm to Improve Network's Performance. **[Link]**
- **UAV Swarming**: Built a Cascaded PID-Based Position and Height Control, and Trajectory Traversal System for Pluto Drones. Implemented Flocking Algorithm for a Swarm of Drones and Developed a Python Wrapper for Manual Movements and Control. **[Link]**
- **Multi-Purpose Household Robot (Supervised by Dr. Shyam Kamal, IIT BHU)**: Designed a Household Robot which can perform Vision-Based Autnomous Navigation, and is capable of performing tasks like Autonomous Floor Coverage and Cleaning, Child Monitoring, Threat Detection, and Home Security. Fabricated the robot in hardware and implemented the software stack on it. **[Link]**
- **Pipe Traversing Robot**: Designed a 16-DOF Quadruped robot in PyBullet simulation that can Travel in Subterranean Pipes Environment. Trained the Deep Deterministic Policy Gradient(DDPG) Algorithm for Linear Motion. **[Link]**
- **UAV Guided UGV Navigation**: Performed UGV Navigation in Snowy Mountainous Terrain in Gazebo simulation with Aid of an Overhead UAV. Performed Road Segmentation to Map the Terrain using UAV and Localized the UGV through Detection and Tracking in UAV's RGB-D Camera Feed. **[Link]**

Skills and Interests

- **Areas of Interest**: Safety Citical Control, Autonomous Navigation, SLAM, Self Driving, Robotics, Computer Vision, Reinforcement Learning
- **Languages and Libraries**: Python, MATLAB, C, C++, X-Plane, PyBullet, OpenAI Gym, Carla, PyTorch, Tensorflow, Keras, OpenCV, NumPy
- **Technologies**: ROS, ROS2, Deep Learning, Machine Learning, AutowareAI, Linux, Git, LaTeX

Relevant Coursework

- **Mathematics**
  - **MA-101** Engineering Mathematics-I (Real analysis)
  - **MA-102** Engineering Mathematics-II (Linear Algebra)
  - **MA-202** Probability and Statistics
- **Machine Learning**
  - **Machine Learning** and **Deep Learning** by Andrew NG on Coursera
  - **Reinforcement Learning Specialization** by University of Alberta on Coursera
  - **CS-231n** Deep Learning for Computer Vision(Stanford)
  - **CSO-332** Ubiquitous Computing
  - **CSE-458** Soft Computing

Achievements

- Among **Top-15** students selected for **IUSSTF-Viterbi Scholarship 2023** to pursue Research Internship at 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** for Maximum Coverage of Warehouse using Multiple Agents among all prestigious institutions in India.
- Among **Top-10** teams in **National Robotics Competition** for Innovative Robotics Consumer Product Development conducted by Unacademy.
- 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 in the domain of Intelligent Robotics at IIT (BHU) Varanasi.
- **Core Member** of **Robotics Club** at IIT (BHU) Varanasi, where I guide juniors, help in conducting events, and manage funds and inventory.