

EDUCATION

- **Indian Institute of Technology (BHU), Varanasi** Varanasi, India
Bachelors of Technology in Electrical Engineering; GPA: 9.15 *Jul. 2019 – present*
- **Seshadripuram Pre-University College** Bangalore, India
class XII Secondary Education; Percentage(best of three): 90.1% *Jul.2017 – Jul. 2019*

PUBLICATION

1. **Somnath Sendhil Kumar**, Pratik Chattopadhyay, Lipo Wang, "BGaitR-Net: Occluded Gait Sequence reconstruction with temporally constrained model for gait recognition", (Under review)

EXPERIENCE

- **Indian Institute of Science** Bangalore, India
Summer Research Internship Under Dr. Shishir N Kolathaya, IISc. *April 2021 - Present*
 - **ROS Developement and Optimal Control:** Developed the Stochlite (Quadruped Robot) ROS Package and Integrated a Model Predictive Control for the quadruped
 - **Reinforcement Learning:** Worked on the Linear Policy based Controller Designed for the platform [\[link\]](#). And also worked on Model based Learning methods for challenging irregular terrains. All training was done in Isaac gym
- **Indian Institute of Technology(BHU)** Varanasi, India
Winter Research Internship Under Dr. Pratik Chattopadhyay *Dec 2020 - March 2021*
 - **GAIT Occlusion Reconstruction:** Reconstruction of Occluded Frames using Variational AutoEncoder and Bi-LSTMs

PROJECTS

- **Graph Neural Network based communication in Multi Agent Reinforcement learning**
Implemented a GNN based communication with baseline QMIX for improving communication in Multi Agent Reinforcement Learning. Implemented this on StarCraft II using pyc2 by Deepmind. This improved inter unit communication which leads to easier task sharing between different unit and making the algorithm learning more efficient which is seen in the result. [\[link\]](#)
- **Multi Agent Optimal Coverage Control** MultiAgent and ROS
A trajectory optimization for MultiAgent Systems in ROS as a Global Planner. This optimizer maximizes the coverage of the whole terrain for optimal distribution of sensor capabilities. This is a centralized global planner which computes based on Voronoi diagram calculated using Fortune's Algorithm. This was used in swarm of 4 wheeled omni-drive robot to be used as Vacuum Cleaners. [\[link\]](#)
- **Optimal control and Trajectory optimization for Quadruped**
under Dr.Shishir Kolathaya, [\[link\]](#)
Implemented the following in ROS package to deploy it on our hardware, i.e., Model predictive control for Stabilizing the Torso while walking and trotting, Implemented a Whole Body Impulse Control for being able to trace the estimated Foot forces, and Trajectory Optimization using TOWR for our quadruped Stochlite.
- **RL aided Model Predictive Control for micro aerial vehicles**
Designed an RL aided MPC for Constrained systems like MAVs, such that it is highly reliable as well as can run at a desired rate. Here I have tried to increase rate of converge by using RL's solution as an hot solution to the MPC. We aim to implement this on our custom build hardware named 'Quil'. [\[link\]](#)

- **Abstraction of collective swarm behaviour for modular robot** Multi Agent and Hierarchical RL
iOTA is a modular bot platform that was intended to be a baseline for a multi-agent cooperative system. ^[link] The main objective was to experiment this with Hierarchical and Multi-Agent Reinforcement Learning for learning generalized planner in the task domain to be able to use the swarm behaviour across different tasks.
- **KiloBot-MultiAgentMulti-Agent Reinforcement Learning**
^[link] This is a simple implementation of Deep Reinforcement Learning [paper] based on the Swarm robot Platform ^T “KiloBot” by Harvard University.

SKILLS AND INTERESTS

- **Areas of Interests** : Reinforcement Learning, Natural Language Processing, Robot Control, Computer Vision.
- **Languages and Libraries** :
 - C++, Python, MATLAB, SQL, Java, Bash, Javascript, Kotlin, Dart
 - CMake, PyTorch, Tensorflow, OpenAI gym, OpenCV, PyBullet, Drake
- **Technologies** :
 - Robotic Operating System, Nvidia Isaac, Ray, Deep Learning, Machine Learning.
 - MultiAgent RL, Natural Language Processing and Generation and Graph Neural Network.
 - Linux, 3D Computer Vision, SLAM.

COURSE'S TAKEN

- **Mathematics:** **MA-101** Engineering Mathematics-I(Real analysis), **MA-202** Probability and Statistics, **Linear Algebra** by MIT OpenCourseWare.
- **Machine Learning:** **Machine Learning** and **Deep Learning** by Andrew NG on Coursera, **Reinforcement Learning Specialization** by University of Alberta on Coursera.
- **Robotics:** **Modern Robotics** by NorthWestern University on Coursera, **EE211** Linear Control Systems

ACHIEVEMENTS

- Secured **Second** place in **All Indian Institute of Technology Robotics Association 2021** Challenge by building efficient multi-agent algorithm for maximum coverage, This was a national level event against all prestigious institutions in India, I lead the team and was the major contributor.
- Secured a **65th rank** out of 3000 teams in the **Amazon ML Challenge 2021** with a accuracy of 63.7% (against the winning team with 70.3% accuracy). This competition was with DataSet that had 30 Million records, consisting of Text inputs of products with multi-class classification on 9000+ classes.
- Participated in **Google KickStart'21** Round D and secured a rank of **1433**.
- Secured a rank of 361 Nationwide and Qualified into Level two of **Flipkart Grid Robotics challenge** under Autonomous Indoor Drone Theme.
- Secured an All India Rank of 3421 in **JEE Advanced** Examination, This is top 0.3% of people that appeared for the national level exam.
- Presented **iOTA** project at the **Engineer's Conclave**. And also lead the team for **DRDO DGRE Vision Based Obstacle Avoidance Drone** at the InterIIT Tech meet held on March 2021 at IIT Guwahati.
- **Memberships and Leadership:**
 - Member of Association of Computational Linguistics (ACL), Pennsylvania, United States.

- Student Member of IEEE.
- **Joint Secretary** of the Club of Programmers, IIT (BHU)^[link].
- **Tech lead** at RoBoReG ^[link], A student research group in the domain of Intelligent Robotics at IIT(BHU), Varanasi.
- **Founding Member** of IG group^[link], A student based research group in the field of Machine learning focusing majorly on NLP and RL at IIT(BHU), Varanasi.