Somnath Sendhil Kumar

https://hex-plex.github.io

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Education

- **Indian Institute of Technology (BHU), Varanasi** — Varanasi, India
  Bachelors of Technology in Electrical Engineering; GPA: 9.15 — *Jul. 2019 – May. 2023*

Publication

1. Aditya Shirwatkar, **Somnath Kumar**, Shishir Kolathaya, Bharadwaj Amrutur, Shalabh Bhatnagar, Shamrao Garur, Vinod Kumar, "**Linear Policy based Walking Controller for PlanetaryExploration of a Quadruped Robot**", (Under review submitted to CASE-RAL 2022)

2. **Somnath Sendhil Kumar**, Pratik Chattopadhyay, Lipo Wang, "**BGaitR-Net: Occluded Gait Sequence reconstructionwith temporally constrained model for gait recognition**", (Under review submitted to IEEE Transactions on Pattern Analysis and Machine Intelligence)

Experience

- **Carnegie Mellon University** — Pittsburgh, Pennsylvania
  Research Assistant Under Dr. John Dolan — *Mar 2022 - Present*
  - **Model Based Reinforcement Learning**: Working on Model Inversion to augment and generate Adversarial data for robust safety critical Policies.

- **NimbleEdge** — San Francisco, California
  Research Engineer Intern — *Jan 2022 - Mar 2022*
  - **Federated Learning**: Integrated Meta Learning based Recommendation system in a custom Federated Learning Simulator called EnvisEdge
  - **Distributed Computing**: Implemented Trainer and Actor Methods for Scala based backend to enable deployment of edge computation framework

- **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 quadrupped
  - **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 Chattopadyay — *Dec 2020 - March 2021*
  - **GAIT Occlusion Reconstruction**: Recontruction of Occluded Frames using Variational AutoEncoder and Bi-LSTMs

Projects

- **Black Box Model Extraction Attacks for Video Classification** *[link]*

  Attacking Teacher models to distill into student without Any Data.

- **Graph Neural Network based communication in Multi Agent Reinforcement learning** *[link]*

  Graph Neural Network based communication in MARL based on different heuristics.

- **Optimal control and Trajectory optimization for Quadruped** *[link]*

  ROS Package with MPC, WBiC and TOWR for custom quadruped Stochlite

- **RL aided Model Predictive Control for micro aerial vehicles** *[link]*

  Reinforcement Learning based acceleration of MPC for computationally limited quadrotors.

- **Expert guided manipulation via Reward learning** Inverse Reinforcement Learning
  Learning reward from a expert demonstrations and generalizing behaviour cloning for different tasks. *[link]*
- **Abstraction of collective swarm behaviour for modular robot** Multi Agent and Hierarchical RL
  Using Hierarchies in swarm of robots to efficiently learn policies at different levels of abstractions. *[link]*

Skills and Interests

- **Areas of Interests** : Reinforcement Learning, Computer Vision, Robot Control.
- **Languages and Libraries** : C++, Python, MATLAB, SQL, Java, Bash, CMake, PyTorch, Tensorflow, OpenAI gym, OpenCV, PyBullet, Drake
- **Technologies** : Robotic Operating System, Nvidia Issac, Ray, Deep Learning, Machine Learning, 3D Computer Vision, Optic Flow, SLAM. MultiAgent RL, NLP, NLG and Graph Neural Network.

Relevant Course's Taken

- **Mathematics**:
  - **MA-101** Engineering Mathematics-I (Real analysis)
  - **MA-202** Probability and Statistics
  - **Linear Algebra** by MIT OpenCourseWare [Unofficial].
  - **MA5895** Numerical Optimization by IIT Madras [Unofficial].
- **Machine Learning**
  - **Machine Learning** and **Deep Learning** by Andrew NG on Coursera
  - **Reinforcement Learning Specialization** by University of Alberta on Coursera.
  - **CS224n** Natural Language Processing with Deep Learning by Stanford [Unofficial].
  - **CS294-158-SP20** Deep Unsupervised learning by Pieter Abbeel [Unofficial]
  - **CSO302** Ubiquitous Computing and Federated Learning

Achievements

- Secured **Second** place in **All Indian Institute of Technology Robotics Association 2021** Challenge by for Maximum coverage of warehouse using Mutliple Agents, and stood second against all prestigious institutions in India.
- Lead the team which Secured **Second** place in **Inter-IIT 2022 Bosch's Model Extraction Attack For Video Classification** Challenge by developing blackbox model extraction solution using generative models [More Details]
- Participated in **Google KickStart'21** Round D and secured a rank of **1433**.
- 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.
- **Memberships and Leadership**:
  - Member of Association of Computational Linguistics (ACL), Pennsylvania, United States.
  - **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.