

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. **Somnath Sendhil Kumar**, Qin Lin, John M. Dolan, "**LatentCBF: Control Barrier Definition on Latent Space**" *Submitted to IROS'23*
2. **Somnath Sendhil Kumar**, Pavan Kulkarni, Yuvaraj Govindarajulu, "**VidModEx: Black Box Model Extraction for Video Classification models with Efficient Query Samples**" *Submitted to ICCV'23*
3. Aditya Shirwatkar, **Somnath Kumar**, Shishir Kolathaya, Bharadwaj Amrutur, Shalabh Bhatnagar, Shamrao Garur, Vinod Kumar, "**Linear Policy based Walking Controller for Planetary Exploration of a Quadraped Robot**" *Submitted to CASE'22*
4. **Somnath Sendhil Kumar**, Pratik Chattopadhyay, Lipo Wang, "**BGaitR-Net: Occluded Gait Sequence reconstruction with temporally constrained model for gait recognition**"

EXPERIENCE

- **Carnegie Mellon University** Pittsburgh, Pennsylvania
Research Assistant Under Dr. John Dolan Mar 2022 - Present
 - **Control Barrier Definition on Latent Space**: Learning Control Barrier functions for a non linear latent space which is aimed to guide the learning to converge to a robust safety critical Policies.
 - **lipschitz Generative Adversarial Networks**: Evaluated lipschitz Conditional GAN for learning representation using bjourck Conv2D for learning a lipschitz representation a constrain for a CBF.
 - **Technologies**: CVXOPT, Torch, QPOases, GAN, Bjorck Conv2D, Reinforcement Learning
- **Indian Institute of Science Supported by Microsoft Research** Bangalore, India
Summer Internship supported by Microsoft Research India May 2022 - Jul 2022
 - **Improving Sample Efficiency in Evolutionary RL using Off-policy Ranking**: A novel off-policy alternative for ranking with state-of-the-art ES method called the Augmented Random Search (ARS). This in MuJoCo tasks showed, similar running times for reaching reward thresholds but needs only around 70% as much data. [link]
 - **Hardware to Simulation Sync**: Compiled framework for syncing data with Simulation for analyzing the current state of the robot, and deployment of various policies on the fly. This enabled automated training on hardware.
 - **Technologies**: Torch, OROCOS, ROS, Isaac gym, MPC, QPOases, C++, Offpolicy Reinforcement Learning
- **Bosch Global Software Technologies, AIShield Department** Bangalore, India
Data Scientist Intern Mar 2022 - May 2022
 - **Vulnerability Analysis for Video Classification Model against Black Box Extraction**: Integrated Multiple Black Box Model Extractions algorithms with existing Pipeline, such that We could analysis different form of vulnerability for video classification models and report possible prevention. My work extended the baseline with 213% times the prior extraction accuracy
 - **Technologies**: Torch, Video Generative networks, Kubernetes, Azure, Adversarial Learning
- **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 in Scala based back-end to enable deployment of edge computation framework
 - **Technologies**: Torch, Scala, PySyft, Edge Computing, Meta Learning, Federated Learning

- Indian Institute of Science** Bangalore, India
Summer Research Internship Under Dr. Shishir N Kolathaya, IISc. *April 2021 - Jan 2022*
 - ROS Developement and Optimal Control:** Developed the Stochlite (Quadruped Robot) ROS Package and Integrated a Model Predictive Control for the quadruped, that contributed to robust locomotion in irregular and unknown terrains.
 - Reinforcement Learning:** Worked on the Linear Policy based Controller Designed for the platform [\[link\]](#). While working on Model based Learning methods for challenging irregular terrains. Contributed in training the policies on Isaac gym based environment. **The project currently is currently submitted/drafted to 2 publications at top tier conference**
 - Technologies:** Torch, OROCOS, ROS, Isaac gym, Pybullet, MPC, QPOases, C++, Reinforcement Learning
- 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 to achieve a recognition accuracy of 96.37% on the reconstructed frames
 - Technologies:** Tensorflow, Graph Algorithms, Time Constrained Kmean Clustering, Representation Learning

PROJECTS

- Black Box Model Extraction Attacks for Video Classification** Model Extraction Attacks
Attacking Teacher models to distill into student without Any Data. [\[link\]](#)
- Graph Neural Network based communication in Multi Agent Reinforcement learning** MARL
Graph Neural Network based communication in MARL based on different heuristics. [\[link\]](#)
- RL aided Model Predictive Control for micro aerial vehicles**
Reinforcement Learning based acceleration of MPC for computationally limited quad-rotors. [\[link\]](#)

RELEVANT COURSE'S TAKEN

- MA-101** Engineering Mathematics-I (Real analysis)
 - Linear Algebra** by MIT OpenCourseWare [\[Unofficial\]](#).
- 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 [\[Unofficial\]](#).
 - CSO302** Ubiquitous Computing and Federated Learning

ACHIEVEMENTS

- 2nd 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 and ranked **2** in **Inter-IIT 2022 Bosch's Model Extraction Attack For Video Classification** Challenge by developing black-box model extraction solution using generative models [\[More Details\]](#)
- Secured a rank of **1433** in **Google KickStart'21** Round D.
- Stood **65** th rank out of 2000+ teams in **Amazon MI Challenge'21**.
- Memberships and Leadership:**
 - Joint Secretary** of the Club of Programmers, IIT (BHU)[\[link\]](#).
 - Tech lead** at RoBoReG [\[link\]](#), A student research based group in the domain of Intelligent Robotics.
 - 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.