Somnath Sendhil Kumar
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Education

- **Indian Institute of Technology (BHU), Varanasi** — Varanasi, India
  Bachelors of Technology in Electrical Engineering; GPA: 8.59 / 10.0 — *Jul. 2019 – May 2023*

Publication

- **Somnath Sendhil Kumar**, Pavan Kulkarni, Yuvaraj Govindarajulu, Manojkumar Parmar "**VidModEx: Interpretable and Efficient Black Box Model Extraction for High-Dimensional Spaces**", *Submitted at AAAI'25 Main Conference.*
- **Somnath Kumar***, Yash Gadia*, Akshay Nambi, Tanuja Ganu "**MMCTAgent: Multi-modal Critical Thinking Agent Framework for Complex Visual Reasoning**", *Accepted at NeurIPS'24: Open World Agent Workshop.*
- **Somnath Kumar**, Vaibhav Balloli, Mercy Ranjit, Kabir Ahuja, Tanuja Ganu, Sunayana Sitaram, Kalika Bali, Akshay Nambi "**Bridging the Gap: Dynamic Learning Strategies for Improving Multilingual Performance in LLMs**".
- **Somnath Sendhil Kumar**, Dhruv Jain, Eshaan Agarwal, Raunak Pandey "**SwissNYF: Tool Grounded LLM Agents for Black Box Setting**", *Accepted at ICLR'24: Workshop on LLM Agents.*
- **Somnath Sendhil Kumar**, Qin Lin, John M. Dolan, "**LatentCBF: Control Barrier Definition on Latent Space**"
- Aditya Shirwatkar, **Somnath Kumar**, Shishir Kolathaya, Bharadwaj Amrutur, Shalabh Bhatnagar, Shamrao Garur, Vinod Kumar, "**Realizing Linear Controllers for Quadruped Robots on Planetary Terrains**", *Published at Advances In Robotics '23 Conference*
- **Somnath Sendhil Kumar**, Pratik Chattopadhyay, Lipo Wang, "**BGaitR-Net: Occluded Gait Sequence reconstruction with temporally constrained model for gait recognition**", *Published at Expert Systems with Application '23 Journal*

Experience

- **Scaled Foundations** — Kirkland, WA
  Research Engineer under Jonathan Huang & Ashish Kapoor — *Aug 2024 - Present*
  - **Data Generation**: Pipelines for generating data for navigation and robotics tasks, integrating automated procedural generation to enhance scalability across diverse indoor and outdoor environments.
  - **Sim integration**: Integration of multiple simulators as a micro-service with unified schemas, enabling users to develop target tasks within a simulator-agnostic framework, leveraging the strengths of any simulator seamlessly.
  - **Technologies**: Airflow, ManiSkill, Gstreamer, WebRTC, Procedural generation
- **Microsoft Research India** — Bangalore, India
  Research Fellow — *July 2023 - July 2024*
  - **Copilot for Training and Education**: Worked on integration of LLMs and ML pipelines for building Co-pilot. I was responsible for building various use cases of LLM from assessments to Bring your own data. [link]. Also assisted integrating the copilot into Microsoft Community Traning with 10.4+ M users. The project has been launched in collaboration with the Government of Karnataka to enhance education in government schools across the state.[link]
  - **Model Optimization**: Finetuning new models based on user feedback from the deployed copilot. Mainly focusing on increasing inference throughput and scalability.
  - **Visual Reasoning**: Currently working on Improving the Visual Reasoning capability of the Foundational Vision-Language Model, coupled with an external LLM for better reasoning and analyzing models. Investigating the use of Hierarchical RL as a dialogue-level optimization for such interactions.
  - **Technologies**: Deepspeed, vLLM, RLHF, Hierarchical RL, MultiModal Reasoning

- **Carnegie Mellon University** Pittsburgh, Pennsylvania
  Research Assistant Under Dr. John Dolan *Mar 2022 - Mar 2023*
  - **Control Barrier Definition on Latent Space**: Learning Control Barrier functions for a non linear latent space, aimed to guide the learning to converge to a robust safety critical Policies.[link]
  - **lipschitz Generative Adversarial Networks**: Evaluated lipschitz Conditional GAN for learning representation using bjorck Conv2D for learning a lipschitz representation a constrain for a CBF.
  - **Technologies**: CVXOPT, Torch, QPOases, GAN, Bjorck Conv2D, Reinforcement Learning
- **Indian Institute of Science** Bangalore, India
  Summer Research Internship Under Dr. Shishir N Kolathaya, IISc. *April 2021 - 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). Demonstrated efficiency on MuJoCo tasks, achieving reward thresholds with about 70% less data in comparable running times.[link]
  - **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 [link]. Compiled framework for Hardware in the Loop for deployment and analysis of various policies on the fly. This enabled automated training on hardware.
  - **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.
  - **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**: Successfully integrated various Black Box Model Extraction algorithms into the existing pipeline, enabling comprehensive analysis of vulnerabilities in video classification models and the formulation of potential prevention strategies. Significantly enhanced the baseline, achieving an extraction accuracy that surpassed previous benchmarks by 213%.
  - **Technologies**: Torch, Video Generative networks, Kubernetes, Azure, Adversarial Learning

Relevant Course's Taken

- **MA-101** Engineering Mathematics - Real analysis, **MA-202** Probability and Statistics, **Linear Algebra** by MIT OpenCourseWare [Unofficial] & **MA5895** Numerical Optimization by IIT Madras [Unofficial].
- Deep learning foundations: **CS229** and **CS230** by Andrew NG on Coursera, **CS224n** Natural Language Processing by Stanford [Unofficial].
- **Reinforcement Learning Specialization** by Univ. of Alberta on Coursera, **Hierarchical RL** by Balaraman Ravindran, IIT Madras on NPTEL, **CSE322** Ubiquitous Computing and Federated Learning

Achievements

- Awarded the prestigious **Institute Color,** ***highest recognition for contributions towards the Institute***, emblematic of notable achievements and exemplary leadership exhibited within Science & Technology Council.
- **2nd** place in **All Indian Institute of Technology Robotics Association 2021** Challenge for Maximum coverage of warehouse using Multiple Agents, and stood second against all prestigious institutions in India.
- Led 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 [Link]
- Won the Microsoft Hackathon 2023 in both National and International Regions for our project Shiksha.
- **Leadership**:
  - Served as **Deputy Contingent Leader** at Inter IIT Tech Meet 2023 representing my institute.
  - **Joint Secretary** of the Club of Programmers, IIT (BHU)[link].
  - **Tech lead** at RoBoReG [link], A student research based group in the domain of Robot Learning.
  - **Founding Member** of COPS IG group[link], A student-based research group in the field of machine learning focusing majorly on NLP and RL at IIT(BHU), Varanasi.