Sai Haneesh Allu

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Research Interests

My research focuses on robot learning for mobile manipulation tasks in unstructured real-world environments. I develop frameworks for learning human skills from videos and transferring them via optimization. I also work on semantic scene representations for long-horizon planning to enable robots to navigate and perform complex tasks autonomously. My work intersects robot learning, mobile manipulation and semantic exploration.

Education

The University of Texas at Dallas — Texas, USA
Ph.D. in Computer Science — Aug 2022 – Present

Indian Institute of Technology (IIT) Delhi — Delhi, India
Masters in Control and Automation — July 2018 – May 2020

National Institute of Technology (NIT) Warangal — Warangal, India
Bachelors in Electrical and Electronics Engineering — July 2012 – May 2016

Research Experience

- **Intelligent Robotics and Vision Lab** - UT Dallas — Texas, USA
  Research Assistant, Advised by ***Prof. Yu Xiang*** — Aug 2022 – Present
  - Developed a **One-Shot Human-to-Robot Trajectory Transfer** system that learns manipulation skills from human demonstration videos, leveraging Vision Language models for **Video Understanding** and trajectory optimization of robot base and arm for complex physical interactions in unstructured real-world.
  - Engineered a greedy and modular **Autonomous Exploration** algorithm for large environments, with a hierarchical semantic-geometric data structure for **Semantic Mapping** and efficient environment updates.
  - Formulated a point-cloud-based **Trajectory Optimization** framework for simultaneous grasp selection and motion planning, achieving $\sim 66\%$ faster performance compared to conventional OMPL based approach.
  - Proposed a marker-free scene alignment technique for **Benchmarking** real-world robot manipulation, evaluated across 11 existing perception, planning and control pipelines executing over 2000 grasping trials.
- **Swarm Intelligence Lab** - IIT Delhi — Delhi, India
  Graduate Student Researcher, Advised by ***Prof. Shubhendu Bhasin*** — May 2019 – May 2020
  - Setup and calibrated a 12 camera **OptiTrack Motion Capture** test bed by optimizing coverage, creating a reliable 6DoF pose estimation and wireless data transfer for multi-robot consensus experiments.
  - Researched and implemented **Distributed Formation Control** algorithms on real-world quadcopter swarm and developed a target capture mechanism using a graph-based leader-follower consensus approach.

Industry Experience

- **VECROS Technologies** — Delhi, India
  Co-Founder and CTO — Jan 2020 – Nov 2021
  - Developed an edge-processed **Visual Inertial Odometry** system and a mapless reactive planner, to operate in **GPS-denied** environments, ensuring safe navigation using Intel T261, D430 modules.
  - Led the team in building a web-based **Beyond Visual Line of Sight** (BVLOS) control platform using AWS IoT, for remote aerial surveillance to detect and report construction activities and road anomalies.
  - Contributed to raising $**100K** seed fund, scaling up the operations and product development.

- **Sterlite Tech** Maharashtra, India
  Operations Engineer June 2016 – Aug 2017
  - Investigated the optical fiber spooling process and implemented a **Grounding Mechanism** to dissipate charge built through virtual capacitance, reducing spool changeover failures by $\sim 67\%$ in a 3 month period.
  - Co-authored comprehensive equipment **Maintenance Documentation** for troubleshooting and root-cause analysis of fiber winding machine breakdowns, resulting in reduced downtime.

Publications

1. **HRT1: One-Shot Human-to-Robot Trajectory Transfer for Mobile Manipulation**
   Sai Haneesh Allu*, Jishnu Jaykumar P*, Ninad Khargonkar, Tyler summers, Jian Yao, Yu Xiang
   arXiv preprint, Under submission, IEEE Robotics and Automation Letters (RA-L).
2. **A Modular Robotic System for Autonomous Exploration and Semantic Updating in Large-Scale Indoor Environments**
   Sai Haneesh Allu, Itay Kadosh, Tyler Summers, Yu Xiang
   Under review, International Conference on Robotics and Automation (ICRA) 2026.
3. **Grasping Trajectory Optimization with Point Clouds**
   Yu Xiang, **Sai Haneesh Allu**, Rohith Peddi, Tyler Summers, Vibhav Gogate
   In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024.
4. **SceneReplica: Benchmarking Real-World Robot Manipulation by Creating Replicable Scenes**
   Ninad Khargonkar*, **Sai Haneesh Allu***, Yangxiao Lu, Jishnu Jaykumar P, Balakrishnan Prabhakaran, Yu Xiang
   In International Conference on Robotics and Automation (ICRA), 2024.

   ** denotes equal contribution*

Skills

Languages: Python, C++, C.

Frameworks & Tools: ROS1, ROS2, PyTorch, OpenCV, OpTaS, CasADi, Gazebo, Simulink.

Leadership & Service

- **Peer Reviewer:** IROS'24, ICRA'25,'26.
- **Workshop Organizer:** Co-organizer for the **Neural Representation Learning for Robot Manipulation** workshop at CoRL 2023.
- **Teaching Assistant:**
  - **UT Dallas**: Computer Graphics, Human-Computer Interaction, Programming language paradigms.
  - **IIT Delhi**: Stochastic filtering and system identification, Multi-agent control, Advanced Control Lab.

Awards and Recognitions

- **Prof. A.K. Sinha Award** IIT Delhi
  Received for achieving the highest GPA (9.8/10) among 141 graduate students. 2020
- **Best Teaching Assistant Award** IIT Delhi
  Recognized for outstanding teaching support and student mentorship, voted by over 70% students. 2019
- **Special Award** Sterlite Tech
  Awarded for quick learning and independently handling shift as a new trainee engineer. 2017
- **Sport Performance award** Sterlite Tech
  Earned for reducing fiber draw startup time by installing variable-speed capstan in legacy towers. 2016