

Education

University at Buffalo, The State University of New York

Ph.D. Computer Science & Engineering

Jan. 2024 – Current

Buffalo, New York

University at Buffalo, The State University of New York

M.S. in Robotics

Aug. 2022 – Dec. 2023

Buffalo, New York

Technical Skills

Specializations: Robot Motion Planning and Control, End-to-End Robot Learning

Languages: Python (opencv, numpy, PyTorch, TensorFlow), C/C++

Technologies/Frameworks: ROS, ROS 2, Gazebo, Nvidia Omniverse, Pytorch, Linux, MacOS, Windows

Developer Tools: VS Code, Docker, Version Control (git)

Experience

DRONES Lab, University at Buffalo

Research Assistant/ PhD Research

Aug 2022 - Current

Buffalo, New York

- Led UB's F1Tenth team at the 2023 IROS Grand Prix achieving a top 10 finish.
- Developed a novel control algorithm based on differential flatness for F1Tenth Autonomous Racing that performs 15% better than the SOTA Model Predictive Control Algorithm while reducing the required compute by more than 50% (*published at IROS 2023*). This controller was deployed on the F1Tenth team's racing stack.
- Supervised the development of a time optimal path generation algorithm (*under review at RAL 2024*) and currently extending this research by incorporating the differential flatness of a kinematic bicycle model.
- Leading a team of 6 under the EARTH (Excavation Autonomy with Resilient Traversability and Handling) project. This three-year project, funded by MOOG and undertaken in collaboration with the Center for Embodied Autonomy and Robotics (CEAR), is a groundbreaking framework for autonomous excavators and earth-movers that integrates several novel perception, planning, and hydraulic control components that work in synergy to enable autonomous operation.

University at Buffalo

Teaching Fellow/ Instructor

Aug 2024 - Current

Buffalo, New York

- Instructor for CSE568 Robotics Algorithms a graduate level course at UB taken by 50+ students. Designed a comprehensive syllabus to provide hands on experience with first principles of perception, estimation, planning and control.

Intelligent Autonomous System (IAS), TU Darmstadt

Visting Researcher under Prof. Jan Peters

May 2024 - Aug. 2024

Darmstadt, Germany

- Developed a novel approach to extend visual planning methods into 3D spaces using Gaussian Splatting, driving collaboration between CEAR, UB, and IAS, TUD to advance research in end-to-end robot learning.
- Devised and prototyped a 2 step pipeline that "imagines" a motion plan in 3D visual space and executes it on a real robot with the aim of explicitly using 3D information as well as increasing the interpretability of learning based methods.

SLB

Digital Technology Intern

Jun. 2023 - Aug. 2023

Menlo Park, California

- Played a vital role in the identification of critical tasks in oil and gas operations for automation with robots, reducing safety risks and operational hazards.
- Implemented state-of-the-art learning based motion planning algorithms, selecting the best methods through comprehensive research.
- Successfully fine-tuned and deployed the chosen methods to obtain the best performer which demonstrated more than 90% success rates on 5 different robotic tasks.
- Evaluated 3 simulators: Omniverse Isaac, Gazebo & CoppeliaSim on various fronts for developing digital twins of oil and gas plants thus accelerating the design decisions of development team.

Bernhard Schulte (Singapore) Holdings Pte. Ltd.

Robotics Intern

Aug. 2021 - Jun. 2022

Singapore (Remote)

- Made a 3D physics enabled simulation using ROS and Gazebo from scratch to test the localisation algorithms on an underwater autonomous rov. Added the capacity to simulate sensor noise to narrow down the sim-to-real gap and eliminate need for domain adaptation.
- Designed the visualization tools for the ground control station and developed a communication interface between the ground station and a ROS based robot enabling live testing and onsite qualitative evaluations.
- Optimized the Extended Kalman filter for localization to give less than 2 percent error, which was crucial for the performance the control algorithms.

Selected Publications

S. Rajguru, **Y. Dighe**, Y. Turkar, C. Aluckal, N. Kale, and K. Dantu, "Saga-flt: Surface-adaptive grip-aware trajectory generation for fltenth autonomous racing,(under review ral 2024)," 2024.

Y. Dighe, Y. Kim, S. Rajguru, Y. Turkar, T. Singh, and K. Dantu, "Kinematics-only differential flatness based trajectory tracking for autonomous racing," in *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, IEEE, 2023, pp. 1629–1636.

Y. Turkar, C. Aluckal, **Y. Dighe**, S. Deshpande, and Y. Agarwadkar, "Conceptualization of uav based waypoint generation for precision horticulture," in *2020 IEEE India Geoscience and Remote Sensing Symposium (InGARSS)*, 2020, pp. 150–153. DOI: 10.1109/InGARSS48198.2020.9358973.

Y. Dighe, Y. Turkar, C. Aluckal, and Y. Agarwadkar, "Dynamic path planning system for uav remote sensing in urban environments.," in *National Symposium on Innovations in Geospatial Technology for sustainable Development with special emphasis on NER, ISG, ISRS.*, 2019.