Aditya Bidwai

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Education

University of Minnesota Twin Cities — *Minneapolis, MN*
Master of Science, Robotics — *Sept '24 – May '26 (expected)*

Birla Institute of Technology and Science, Pilani (BITS-Pilani) — *Goa, India*
Bachelor of Engineering, Electronics and Communication — *Aug '18 – May '22*

Experience

Komatsu Mining Corp — *Milwaukee, WI*
Automation Engineering Intern — *June '25 – Aug '25*
- Built a proximity sensor-based startup calibration routine for a prototype robotic shovel, eliminating human intervention
- Developed a robust human–machine control interface enabling intuitive teleoperation of a client demo prototype robotic truck

OptimalX Group, University of Minnesota Twin Cities — *Minneapolis, MN*
Graduate Research Assistant — *Jan '25 – May '25*
- Led the design and setup of a motion-capture robotics lab in the aerospace dept. for heterogeneous multi-robot experiments

MARMot Lab — *Singapore*
Robotics Engineer — *Dec '22 – Aug '24*
- Developed active perception algorithms for autonomous exploration (and efficient SLAM) in GPS-denied, resource-constrained environments, focusing on omnidirectional legged robots for single-pass inspection settings **(paper)**
- Contributed to a solution of Multi-Robot Task Allocation problem by dynamic coalition formations using reinforcement learning, yielding 100x faster solutions than exact solvers. Published at **ICRA '24 (paper)**

Robotics Intern — *Jan '22 – Sept '22*
- Designed and conducted real-robot experiments for stable online real-time gait transitions using a keyframe-based central pattern generator (CPG) algorithm for legged mobile manipulation. Published at **CDC '22 (video)**
- Implemented bio-inspired workspace-CPG locomotion controller on a hexapod resulting in stable and directed vision **(video)**
- Conducted an in-depth review analysis on object manipulation techniques by legged robots. Published in **Frontiers (paper)**

Publications

- Dai, W., **Bidwai, A.**, & Sartoretti, G. (2024). *Dynamic Coalition Formation and Routing for Multirobot Task Allocation via Reinforcement Learning*. Published at **IEEE ICRA 2024**. **(paper)**
- Gong, Y., Sun, G., Nair, A., **Bidwai, A.**, Cs, R., Grezmak, J., … Daltorio, K. A. (2023). *Legged robots for object manipulation: A review*. Published in **Frontiers in Mechanical Engineering**. **(paper)**
- Dhongdi, S., Tahiliani, M., Mehta, O., Dharmadhikari, M., Agrawal, V., & **Bidwai, A.** (2022). *FANS: flying ad-hoc network simulator*. Published at **2022 ACM LANC** (Latin America Networking Conference). **(paper)**

Technical Skills

Programming	C, C++, Python, MATLAB, Bash
Tools & Frameworks	Git, Docker, **Deep Learning** (PyTorch, OpenCV, Open3D), **Robotics** (ROS, ROS2, MoveIt!, PX4)
Simulators	NVIDIA Isaac Sim, Gazebo, PyBullet, Gym, Softgym, PyFlex, Simulink
Relevant Coursework	Trajectory Optimization, Optimal Estimation, Computer Vision, Deep Learning for Robot Perception

Selected Projects

Cooperative UAV-UGV localization using Extended Kalman Filter (EKF) — *Sept '25 – Dec '25*
- Developed a nonlinear UAV-UGV localization system in MATLAB using an EKF and simulation-based validation
- Evaluated estimator consistency using Monte Carlo testing with NEES/NIS analysis on simulated and real data

Optimization-based Motion Planning for 3D Enviornments — *Sept '25 – Dec '25*
- Formulated a minimum control-energy trajectory optimization problem for obstacle-free motion planning in 3D environments
- Modeled cuboidal and cylindrical obstacles as convex sets using superellipse-based formulations for tractable optimization

Dynamic Visual SLAM for Crowded Indoor Environments — *Jan '25 – May '25*
- Integrated ORB-SLAM3 pipeline with Nvidia SegFormer to detect and reject moving objects in crowded environments
- Evaluated in real university environments, achieving 0.077 m ATE and 0.073 m / 1.33° RPE, showing robust localization

Clothbot - Cloth Manipulation using Self Supervised Value Network (poster, web) — *Sept '24 – Dec '24*
- Developed a self-supervised value network policy using spatial action maps for dynamic cloth unfolding on a dual UR5
- Achieved 95% coverage on rectangular cloths and 87.68% on unseen garments (T-shirts) with zero-shot sim-to-real transfer

Flying Ad-hoc Network Simulator for multi-UAV exploration (code) — *Aug '20 – Aug '22*
- Developed a co-simulation platform integrating NS3 and Gazebo through ROS for testing multi-UAV swarm tasks
- Implemented UAV swarm motion planning and analyzed network metrics like PDR, hop-by-hop, and end-to-end delay
- Simulated a wildfire rescue UAV swarm (PX4 SITL and ROS) for surveillance application. Published in **ACM LANC '22**

Mars Rover for University Rover Challenge (Controls Team Lead) — *Aug '19 – Apr '21*
- Designed trajectory generation and path tracking (PID) controllers for the manipulation and locomotion systems
- Developed ROS-based drivers and software interfaces to integrate sensors and motor drivers with Nvidia Jetson