Aditya Bidwai

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EDUCATION

University of Minnesota Twin Cities	*Minneapolis, MN, USA*
Master of Science (M.S.), Robotics	*Sept '24 – May '26*
Birla Institute of Technology and Science, Pilani (BITS-Pilani)	*Goa, India*
Bachelor of Engineering (B.E.), Electronics and Communication	*Aug '18 – May '22*

TECHNICAL SKILLS

Programming	C, C++ (C++17), Python, MATLAB (YALMIP/MOSEK, Gurobi, SCIP), Bash
Tools & Frameworks	Git, Docker, CMake, Bazel, **ML** (PyTorch, OpenCV, Open3D), **Robotics** (ROS, ROS2, MoveIt!, PX4)
Simulators	NVIDIA Isaac Sim, Gazebo, PyBullet, Gym, Softgym, PyFlex, Simulink, CARLA
Research Interests	Trajectory Optimization, Motion Planning, Optimal Control, State Estimation, Perception-Aware Planning

EXPERIENCE

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

OptimalX Research Group — *Minneapolis, MN*
Research Assistant | *P.I.: Prof. Dr. Yue Yu* — *Jan '25 – Present*
- Designed motion-capture lab infra, built PX4 drones and ROS ground robots for experiments accessible to ∼500 students
- Developing optimization algorithms for energy- and sensing-aware trajectory generation for UAV-UGV teams using MINLP

MARMot Lab, National University of Singapore — *Singapore*
Research Engineer | *P.I.: Prof. Dr. Guillaume Sartoretti* — *Dec '22 – Aug '24*
- Built and evaluated an autonomous exploration pipeline using ROS/Gazebo, RTAB-Map SLAM, and RealSense (T265, D435), integrating perception-aware motion planning and heading optimization for environment inspection tasks **(paper)**
- Contributed to a solution of Multi-Robot Task Allocation problem by dynamic coalition formations using reinforcement learning (PyTorch), yielding 100x faster solutions than exact solvers. Published at **ICRA '24 (paper)**

Research Intern — *Jan '22 – Sept '22*
- Developed tests for legged-robot gait-transition algorithm to adapt walking on changing terrain (concrete → grass)**(video)**
- Implemented a CPG-based omnidirectional walking controller for hexapod locomotion using ROS and Python **(video)**
- Conducted an in-depth review analysis on object manipulation techniques by legged robots. Published in **Frontiers (paper)**

SELECTED PROJECTS

Cooperative UAV-UGV localization using Extended Kalman Filter (EKF) (code) — *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 Environments (code) — *Sept '25 – Dec '25*
- Built a convex optimization–based collision-free trajectory generation framework in MATLAB using YALMIP/MOSEK
- 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/C++ for testing multi-UAV swarm tasks
- Implemented UAV swarm motion planning (C++) 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 path planning and tracking (PID, Stanley, Pure Pursuit) controllers for the manipulation and locomotion systems
- Developed ROS/C++ -based drivers and software interfaces to integrate sensors and motor drivers with Nvidia Jetson

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)**

Teaching Experience

- **Graduate Teaching Assistant** - AEM 3103 Computer Methods in Aerospace Engineering
- **Undergraduate Teaching Assistant** - CS G523 Software for Embedded Systems **(graduate level)**
- **Course Instructor** - Introduction to Robot Operating System (ROS)

Volunteering and Positions of Responsibility

- **Student Volunteer** - IEEE Conference on Decision and Control (CDC) 2023 - Singapore
- **Student Volunteer** - IEEE International Conference on Robotics & Automation (ICRA) 2025 - Atlanta, GA, USA
- **Subsystem Lead - Mobility and Manipulation** - Project Kratos [Link]
- **Senior Core Member** - Electronics and Robotics Club, BITS-Pilani [Link]
- **Student Committee Member** - Sandbox Innovation Labs, BITS-Pilani [Link]

Awards and Honours

- Secured global rank 10 in International Rover Challenge (Project Kratos) [Link]
- Secured a place among top 20 teams of the country in the Flipkart GRID Robotics Challenge [Link]