Bhaswanth Ayapilla

bayapill@andrew.cmu.edu | (412) 224-0713 | **Portfolio** | **Github** | **LinkedIn** | **Pittsburgh, PA**

EDUCATION

Carnegie Mellon University — Pittsburgh, USA
Master of Science in Robotic Systems Development | GPA 3.96/4.0 — *2024 – Exp. 2026*

Relevant Coursework ↗ - Deep Reinforcement Learning, Multi-Modal Machine Learning, Visual Learning & Recognition, Learning for 3D Vision, Deep Learning, Computer Vision, Planning & Decision Making, Systems Engineering

Birla Institute of Technology and Science Pilani — Hyderabad, India
B.E. in Electronics and Communication Engineering | GPA 8.62/10.0 — *2020 – 2024*

Relevant Coursework ↗ - Digital Image Processing, Reinforcement Learning, Machine Learning, Computer Programming

TECHNICAL SKILLS

Languages: C++, Python, MATLAB/Simulink **Libraries:** PyTorch, TensorFlow, Keras, scikit-learn, OpenCV, PCL
Frameworks: ROS/ROS2, Gazebo, Isaac Sim/Lab, MuJoCo, MoveIt2, Solidworks, SUMO, Git, Docker, AWS

EXPERIENCE

Research Assistant, Bot Intelligence Group (BIG) — *January 2026 – Present*
Supervisor: Dr. Jean Oh — *Carnegie Mellon University, Pittsburgh*

- Collected large-scale teleoperated demonstrations (50–80Hz) across single-arm and bimanual embodiments, executing real-world manipulation tasks (pick-and-place, cloth folding, bowl scrubbing) using Spacemouse and leader–follower interfaces
- Evaluated real-world deployment of state-of-the-art VLA models ($\pi_{0.5}$, GR00T), analyzing task success rates and rollouts
- Contributed to the published framework "RIO: Flexible Real-Time Robot I/O for Cross-Embodiment Robot Learning"
- Currently contributing to system improvements and integration of additional robot embodiments

Research Assistant, DRiverless Intelligent VEhicle (DRIVE) Lab — *August 2025 – December 2025*
Supervisor: Dr. John M. Dolan — *Carnegie Mellon University, Pittsburgh*

- Developing locomotion stack for CMU's first wheeled-biped robot in Isaac Sim/MuJoCo, coupling exteroceptive perception with proprioceptive information through student–teacher privileged learning for adaptive gait switching
- Trained PPO-based standing and walking policies over diverse terrains with domain randomization for improved stability and sim-to-real robustness

Robotics Engineering Intern, Milwaukee Tool — *May 2025 – August 2025*

- Spearheaded the development of autonomy stack for wheeled mobile-manipulator, integrating localization, custom LiDAR-feature extraction, and deploying Pure-Pursuit and MPC controllers for reliable operation in unstructured environments
- Designed a perception-driven manipulation framework integrating visual-servoing with depth-informed segmentation and geometric feature extraction to enable adaptive task execution

RELEVANT PROJECTS

Humanoid Whole-Body Manipulation — *Jan 2025 – Present*

- Developing a unified locomotion–manipulation framework for a 61-DoF Unitree G1 humanoid (dual Shadow Hands) in MuJoCo MJX, targeting coordinated tool-use and contact-rich whole-body control tasks from HumanoidBench
- Exploring PPO-based reinforcement learning and likelihood-free flow-matching objectives for expressive, multimodal gait generation, enabling adaptive walking, recovery behaviors, and smooth locomotion–manipulation transitions
- Benchmarking FastTD3 (distributional critic, high UTD ratios) against PPO with value-shaped reward shaping on manipulation tasks, analyzing hyperparameter sensitivity and reward design to improve contact stability and sample efficiency

Language-Conditioned BEV Perception for Autonomous Driving ↗ — *Aug 2025 – Dec 2025*

- Extended BEVFormer-Tiny to study language-conditioned spatial reasoning by injecting 256-dim text embeddings into the BEV query set without modifying sensors, supervision signals, or detection heads
- Implemented and benchmarked multiple fusion strategies (BEV-grid bias, object-query bias, FiLM conditioning, lightweight cross-attention) using CLIP-based sentence embeddings with projection MLP alignment
- Evaluated on nuScenes-mini with nuScenes-Text annotations, showing improved behavior-related metrics (orientation, velocity, attributes) and measurable shifts in transformer attention despite unchanged raw 3D detection accuracy

Lunar ROADSTER ↗ — *Dr. William "Red" Whittaker | Sept 2024 – Dec 2025*

- Spearheaded end-to-end autonomy for an autonomous lunar-grading rover, integrating depth-based perception, Sky-Cam and multi-sensor EKF localization (Total Station + IMU + wheel odometry)
- Implemented a Lattice A* global planner with curvature-aware cost functions and a Pure Pursuit controller for Ackermann-constrained tracking, achieving 22.89% global path deviation ($\leq$ 25% req.) and 7.01% mean tracking error ($\leq$ 10% req.)
- Engineered a perception-to-manipulation pipeline using a custom-trained YOLOv8 model and depth-based crater geometry extraction to generate source/sink grading poses for autonomous excavation and backblading