Maanasa Rajeshwer

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RESEARCH INTERESTS

Embodied AI, Multimodal Perception, Robot Learning, Dexterous Manipulation, Human-Robot Interaction, Physical AI

EDUCATION

University of Pennsylvania, School of Engineering and Applied Science (SEAS), Philadelphia, PA — *Dec 2026*
Master of Science in Engineering, Robotics — *GPA*: 3.60/4.0
Concentration: Perception

University of North Carolina of Chapel Hill, Chapel Hill, NC — *May 2022*
Double Major: Bachelor of Science in Computer Science — *GPA*: 3.50/4.0
Bachelor of Science in Statistics and Analytics with a minor in Health and Society

Dean's List 2018, 2019, 2022 (4/5 semesters), Honors Carolina Laureate

Affiliations: *President* Carolina Irish Dance Association (CIDA) • *Fellow* Rewriting the Code • Women in ML • Women Who Code

TECHNICAL SKILLS

Robotics: ROS, Gazebo, Isaac Sim, Franka Emika Panda (sim & hardware), Kinematics (FK/IK), Motion Planning, AprilTags
Vision & Perception: OpenCV, NumPy, SciPy, Optical Flow(RAFT), Video Segmentation, Multi-Object Tracking, Camera Calibration
Machine Learning: PyTorch, Robosuite, Robomimic, CNNs, VAEs, Multimodal & Imitation Learning, Sensor Fusion, Repr. Learning
Software & Systems: Python, C++, Java, R, SQL, Git, Linux/Bash, LaTeX, Azure, Databricks, Jenkins, Spring Boot, REST, YAML/JSON
Visualization & Interfaces: Typescript, React, Streamlit, Matplotlib, Taipy, Plotly, Seaborn

SELECTED ROBOTICS AND PERCEPTION PROJECTS

Spatially-Aware Re-Identification for Identity-Preserving Video Segmentation — *Dec 2025*

- Investigated identity fragmentation in foundation video segmentation models (SAM2/SAM3) under object transformations, occlusions, and multi-view camera changes.
- Designed a training-free spatial re-identification pipeline combining SAM masklets, RAFT optical flow, and tracklet-based temporal reasoning to preserve object identity through physical transformations.
- Conducted failure-mode analysis on challenging videos involving identical objects, object splitting, and viewpoint changes, demonstrating improved identity continuity over prompt-only baselines.

Reformulating Multi-Camera Tracking via BEV for Identical Objects — *Dec 2025*

- Reformulated multi-camera multi-object tracking for identical forklifts by introducing a BEV-based early-fusion detection architecture, eliminating reliance on appearance-based re-identification.
- Built a synthetic multi-camera warehouse dataset in Isaac Sim with full nuScenes-format conversion for controlled eval.
- Designed a BEV detection network with multi-view feature projection, learned attention-based camera fusion, and transformer decoding, achieving 98% AP and improved cross-camera spatial consistency over 2D baselines.

VAE-Augmented Imitation Learning with LLM-Based Goal Generation — *May 2025*

- Built an imitation learning pipeline for simulated pick/place using behavioral cloning, VAEs, and LLM-based spatial goals
- Learned compact latent trajectory representations from proprioceptive and object-centric state, integrating natural language goal parsing to generate constraint-compliant 3D placement targets to reduce reliance on visual inputs

Vision-Based Manipulation with Franka Panda — *Dec 2024*

- Developed a perception-to-control manipulation system for static and dynamic block stacking using inverse kinematics.
- Implemented AprilTag-based estimation and real-time motion prediction for grasping blocks on a rotating platform.
- Addressed sim-to-real discrepancies through camera calibration, frame alignment, and end-effector offset correction.

Policy Learning for Continuous Robot Control — *May 2025*

- Implemented PPO in PyTorch for continuous control of a bipedal walker in MuJoCo; trained stochastic policies for 1M+ timesteps and analyzed learning stability, failure modes, and recovery behavior in closed-loop control

IN-PROGRESS ROBOTICS PROJECTS

Garment Keypoint Detection and Folding Pipeline for Deformable Garments *In Progress*

- Developing a vision-based pipeline for cloth segmentation, keypoint detection, and fold-line reasoning

Mini SLAM Project *In Progress*

- Evaluating SLAM systems on public datasets with focus on trajectory estimation and mapping consistency

WORK HISTORY

Gap Inc, Remote

Data Engineer- Customer Data Engineering Team *Feb 2024 – June 2025*

- Led large-scale customer data unification pipelines across Amperity and C-360, supporting downstream analytics and ML use cases across marketing, personalization, experimentation, and internal decision systems.
- Designed and implemented PII masking and encryption workflows to improve data security, regulatory compliance, and cloud cost efficiency while managing sensitive customer data across 300+ customer data tables in production.
- Produced system architecture diagrams and pipeline documentation, standardizing coding practices and improving long-term maintainability, onboarding efficiency, and cross-team knowledge transfer.

Data Engineer- Supply Chain Data Engineering Team *Aug 2023 – Feb 2024*

- Built and maintained Python-based data transformation and validation pipelines; documented schemas, metadata, and data relationships for analytics and forecasting consumers across supply chain systems.
- Automated CI/CD workflows using Jenkins shared libraries and Databricks notebooks, while developing Streamlit and Taipy proof-of-concept dashboards to improve deployment reliability and dataset accessibility for internal stakeholders.

Back End Engineer- Allocation Team *Feb 2023 – Aug 2023*

- Migrated legacy HBase pipelines to Azure SQL by refactoring Hadoop workflows into Python, supporting real-time inventory and in-season customer choice systems while reducing operational cost by $18k annually.
- Improved backend reliability by increasing test coverage and integrating robust error handling in Spring Boot services supporting live allocation, demand planning, and decision-critical workflows.

Front End Engineer- Shopping Bag UI Team *Aug 2022 – Feb 2023*

- Implemented production-scale frontend features using React and TypeScript, collaborating closely with design and backend teams within a large, distributed, multi-brand e-commerce platform.

Scope IT Consulting, Remote

Appian Business Process Management Consultant *Dec 2020 – Sep 2021*

- Engineered Appian BPM workflows for state-level systems (Georgia Dept. of Driver Services, Kansas Dept. of Transportation), orchestrating regular client demos for feedback integration.
- Designed ERDs and SQL-based data models to support structured data management, querying, and reporting.

Renaissance Computing Institute at UNC (RENCI), Chapel Hill, NC

Research Assistant *Jan 2020 – May 2020*

- Overcame challenges in the application of different, freely available biomedical data sets using R to drive innovations in clinical care and drug discovery, collaborating with a team to perform statistical, qualitative, and quantitative analyses.
- Supported development of a semi-automated annotation and crowdsourcing platform for training data generation.

COMMUNITY AND TEACHING EXPERIENCE

FIFE Academy, *Robotics Instructor & LEGO Robotics Aide (Grades 2-8)* *Oct 2025 – Current*

- Design and lead hands-on robotics programming using Scratch/Python, teaching core concepts in sensing, motion, and problem-solving through LEGO platforms while developing adaptable curricula to support diverse learning levels

RELEVANT COURSEWORK

Advanced Machine Perception • Deep Learning • Learning in Robotics • Autonomous Racing (F1TENTH) • Advanced Robotics • Optimization • MEMS and NEMS • Computational Photography • Algorithms & Analysis • Stochastic Modeling • Program Synth