

Ashish Sukumar

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Professional Summary

Robotics Engineering M.S. student at WPI (GPA 3.83, May 2027) with hands-on expertise in **motion planning, visual-inertial odometry, and autonomous system design**. Proficient in **C++, Python, ROS2, and OMPL**, with demonstrated ability to implement sampling-based planners, kinodynamic systems, and full TAMP pipelines from scratch. Published researcher (ICIoT 2025) with industry experience at e-Yantra, IIT Bombay. Seeking Summer 2026 US robotics internship with potential to convert to full-time.

Education

Worcester Polytechnic Institute

M.S. Robotics Engineering

GPA: 3.83/4.00 Expected Graduation: May 2027

Relevant Coursework: Motion Planning, Foundations of Robotics, Robot Dynamics, Deep Learning for Perception, Computer Vision (RBE 549)

SRM Institute of Science and Technology

B.Tech Computer Science & Engineering

CGPA: 9.54/10 Excellence Award for Outstanding Student & Best Class Representative

Worcester, MA

2025–Present

Chennai, India

2021–2025

Technical Skills

Languages: C++ (primary), Python, C, Bash

Motion Planning: RRT, RRT*, PRM, PRM*, RRTConnect, AO-RRT, EST, SST, KPIECE1, TAMP / PDDL

Frameworks & Tools: OMPL, MoveIt, ROS2, ROS, Gazebo, Webots, Genesis Simulator, RViz

Trajectory & Control: Kinodynamic Planning, Trajectory Optimization, Feedback Control, Dynamic Systems Modeling

Estimation & Sensing: Visual-Inertial Odometry (S-MSCKF, EKF), Kalman Filtering, IMU Fusion, Stereo Vision, SLAM

Deep Learning: PyTorch, TensorFlow, CNNs, Bi-LSTM with Attention, Multi-scale Encoders

3D Vision: NeRF, SfM, COLMAP, Camera Calibration, Pose Estimation, Bundle Adjustment, Point Clouds

Hardware: Arduino, Raspberry Pi, ESP32, IMU, Ultrasonic, IR, Proximity, Gas Sensors

Build & Systems: CMake, Docker, Git, Linux

Design Tools: Fusion 360, AutoCAD, TinkerCAD

Experience

e-Yantra, IIT Bombay

Junior Project Technical Assistant

- Designed and implemented **autonomous task pipelines** and simulation environments in **Webots** for the national eYSRC competition, integrating **perception, decision-making, and embedded control** end-to-end.
- Built **image processing** and sensor-based modules (camera, IR, proximity) enabling real-world autonomous robot interaction and navigation.
- Performed **hardware-software debugging** across sensor, actuation, and control layers; produced technical documentation deployed nationally via mdBook.
- Formally recognised by **Prof. Kavi Arya (PI, e-Yantra, IIT Bombay)** for technical proficiency; conducted two workshops on Embedded Systems and Robotics for school students nationwide.

Chennai, India

Jun 2024–Feb 2025

Robocare Lab, WPI

Voluntary Research Assistant

- Contributed to **behavior design and perception pipelines** for the SoftBank **Pepper Robot**, integrating speech, gesture, and visual feedback via **ROS2**.
- Configured and tested onboard camera, microphone, and joint actuator systems; resolved behavioral failure modes through iterative lab testing.

Worcester, MA

Oct–Dec 2025

WPI Small Business Digitization Initiative (SBDI)

Digital Consultant

- Independently scoped, designed, and delivered end-to-end digital solutions for small business clients, managing full project lifecycle with minimal supervision.

Worcester, MA

Oct–Dec 2025

Key Projects

Deep VIO: Implemented full **S-MCKF** pipeline (EKF, IMU propagation via RK4, stereo measurement updates, sliding-window camera states), achieving **RMSE ATE 0.12 m** on the EuRoC MAV benchmark after SE(3) alignment. Designed and trained three **deep learning** models (vision-only, IMU-only, visual-inertial gated fusion) using multi-scale CNN encoders and **bi-directional LSTM with temporal attention**. Built a synthetic **Blender VIO** dataset (20 scenes, 10K poses each, 100 Hz); applied **pose graph optimization** with loop-closure and smoothness constraints, reducing test ATE from 1.94 m to **1.18 m (39% improvement)**.

TAMP 7-DOF: Designed a full **TAMP pipeline** integrating **PDDL symbolic planning** with **OMPL motion planning**, enabling a 7-DOF robot arm to execute collision-aware motion primitives end-to-end. Implemented predicate extraction (ON, CLEAR, HOLDING, HANDEEMPTY) and **closed-loop re-planning** for fault recovery.

RTP Planner: Implemented a complete **RTP (Random Tree Planner)** from scratch in C++ using OMPL, supporting point and SE(2) square robots with custom collision checkers. Separately implemented **PRM, PRM*, and RRTConnect** in **7-DOF joint space** with a self-collision checker; solved narrow-passage problems with targeted sampling. Benchmarked against EST and RRT on path optimality, computation time, and sampled states.

Kinodynamic: Implemented **AO-RRT** for dynamically constrained models including **car-like robots** (curvature limits, velocity bounds) and pendulum systems. Benchmarked **KPIECE1, EST, and SST** for convergence speed and path quality across varying system dynamics.

NeRF: Built a complete **NeRF** pipeline from scratch in **PyTorch**: positional encoding, hierarchical coarse-fine sampling, and volume rendering. Achieved **27.42 dB PSNR / 0.9084 SSIM** (Lego) and 25.75 dB / 0.799 (Ship). Extended to custom real-world datasets using **COLMAP**-based SfM for camera pose extraction.

Fire Smart-Bot: Deployed an autonomous navigation system on custom embedded hardware with real-time sensor fusion (IR, gas, proximity), shortest-path planning, obstacle avoidance, BLE-based mobile control, and live video streaming. Validated in real-world deployment. **Published at ICIoT 2025.**

Publications

Ashish S., Jeya R., Rithish R., Donipart R., & Ganesh K. (2025). *Fire Detection and Risk Prediction for Smart Safety: A Neural Network-Driven IoT Approach*. IJERCSE.

Ashish S., Jeya R., Rithish R., Donipart R., & Ganesh K. (2025). *Fire Aware Smart-Bot with AI Responsive System*. ICIoT 2025.

Certifications & Achievements

- Red Hat Certified System Administrator (RHCSA)
- Oracle Cloud Infrastructure (OCI) Certified
- 2nd Place – Project Expo, SRMIST