

# Mohammad Ibrahim Memon

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## PROFESSIONAL SUMMARY

Robotics engineer specializing in ROS/ROS2-based autonomous systems, with strong experience in fault diagnosis, simulation, and embedded robotics. Proven track record in international robotics competitions, applied research, and hardware and software co-design.

## EXPERIENCE

### Research Assistant | Garrulus (Bonn, Germany)

05/2025 – 12/2025

- Designed and validated PCB protection circuits for 3.3V, 5V, and 24V rails, implementing solenoid drivers and eFuse-based power distribution.
- Developed power sequencing, inrush-current limiting, and reverse-polarity protection for field-deployed robots.
- Collaborated with hardware and firmware teams to integrate robust electronics into autonomous tree-seeding robots.

### Research Assistant | Kelo Robotics (Stuttgart, Germany)

05/2024 – 08/2024

- Set up Isaac Sim and Gazebo environments for robotic simulation tasks.
- Researched and compared simulation frameworks for multi-agent navigation and control.

### Robotics System Engineer | Unbox Robotics Pvt. Ltd (Pune, India)

06/2022 – 07/2023

- Built and automated testing frameworks for feature validation, bug fixes, and development debugging, generating detailed reports.
- Conducted root cause analysis (RCA), executed DFMEA, and tested control boards using oscilloscopes for reliable system integration.
- Served as Scrum Master, managing integration challenges, robot deployments, and customer demonstrations.

### Embedded System Engineer | DashDot Robotics Pvt. Ltd (Ahmedabad, India)

03/2021 – 02/2022

- Designed and prototyped hardware systems from scratch, ensuring optimal functionality and performance.
- Conducted circuit troubleshooting and root-cause analysis to resolve technical issues effectively.
- Developed firmware at the integration level, incorporating and calibrating various sensors.

## PUBLICATION

Patent Publication: "An Inventory Management, Tracking and Consumption Predicting System using Intelligent Container Box and Central Server", Patent Publication No: IN 202021029069 A (2020)

## SKILLS

**Programming :** Python, C++, C, Embedded C, MATLAB

**Robotics Middleware :** ROS2, ROS, MoveIt!, tf2, RViz, Gazebo, Isaac Sim

**Multimodal Perception :** Vision-based state detection, LiDAR–IMU fusion, EKF/UKF, SLAM, sensor calibration

**Machine Learning :** PyTorch, TensorFlow, CNNs, contrastive learning, model training and evaluation

**Vision & Language Integration :** Vision-to-action pipelines, structured action schemas, embedding-based retrieval, OpenCV

**Robot Learning :** Simulation-driven evaluation, policy benchmarking, data-driven perception pipelines, robustness analysis

**Simulation & RL :** Isaac Sim, Gazebo, Gym-style experimentation, domain randomization basics

**Embedded Systems :** Bare-metal firmware, GPIO/ADC/I2C/SPI/UART, sensor interfacing, hardware bring-up

**System Engineering :** Root cause analysis, DFMEA, structured debugging, integration testing, Git, CI pipelines

# PROJECTS

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- Robothon 2025 (Grand Challenge)** | *ROS, Python, C++, MoveIt, Kinova Gen3* Munich, Germany
- Achieved a **Top 5 ranking** in an international competition by automating complex manipulation tasks under strict time limits.
  - Engineered a vision-guided manipulation pipeline with MoveIt and OpenCV to detect task states, press buttons, and grasp a stylus for trajectory drawing.
  - Implemented a maze-solving algorithm using a magnetic end-effector and continuous visual feedback.
- Cross-Modal Action Retrieval for Robotic Manipulation** | *PyTorch, Vision-Text Embeddings, ROS2*
- Built a lightweight cross-modal embedding model that aligns images with text instructions to predict manipulation action labels such as push, slide, and rotate.
  - Trained a dual-encoder pipeline in PyTorch using contrastive learning and evaluated retrieval quality using Top-1 and Top-5 accuracy.
  - Integrated inference into a ROS2 node that outputs the predicted action label as a decision signal for downstream manipulation logic.
- ILP-Based Fault Detection and Diagnosis for Mobile and Multi-Robot Systems** | *ROS, Python, Prolog, ILP*
- Developed an interpretable fault detection and diagnosis framework for ROS-based mobile robots using Inductive Logic Programming.
  - Modeled and diagnosed faults such as wheel slip, sensor noise, delay, and communication inconsistencies using symbolic rules.
  - Extended the approach to multi-robot systems to study fault propagation, coordination robustness, and scalability.
  - Evaluated detection accuracy, interpretability, and system behavior in simulation and real robot experiments.
- Explainable Robot Task Allocation using Inductive Logic Programming** | *ROS2, Python, Prolog, Multi-Robot Systems*
- Designed a symbolic task allocation framework for multi-robot systems using Inductive Logic Programming.
  - Learned interpretable allocation rules based on robot states, capabilities, and task constraints.
  - Analyzed decision logic to explain why tasks were assigned to specific robots under different conditions.
  - Validated allocation behavior in ROS2 simulation with multiple robots and dynamic task scenarios.
- Multi-Robot Task Distribution** | *ROS2, Python, Gazebo, GitHub Actions, SLAM, Linux*
- Developed scalable task allocation for multiple robots in Gazebo simulation.
  - Enabled coordinated parcel collection and delivery to a central depot.
  - Implemented CI pipelines using GitHub Actions and static analysis with Codacy.
- Autonomous Mobile Robot (AMR)** | *ROS, Python, SLAM, LiDAR, A\**
- Built an AMR that navigates unknown spaces using assigned coordinate goals.
  - Led the end-to-end design including circuit layout, power system, and full software stack integration.

# EDUCATION

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Hochschule Bonn-Rhein-Sieg	<b>Master of Science in Autonomous Systems</b> – Bonn, Germany	<i>On going</i>
<i>Expected Graduation: 2026</i>		
U V Patel College of Engineering	<b>Bachelor of Technology in Mechatronics</b> – India	<i>June 2018 – May 2022</i>

# LANGUAGES

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**English** – C1

**German** – A1 (*active learner*)