

Saurabh Sawant

Address: Hamburg, Germany | **Email:** saurabhsawant1599@gmail.com

LinkedIn: linkedin.com/in/saurabh-sawant-0b6252204

Portfolio: saurabh1599.github.io

GitHub: github.com/Saurabh1599 | **Phone:** +49 176 86965862



EDUCATION

Technische Universität Hamburg (TUHH) Hamburg, Germany M.Sc. in Mechatronics (Intelligent systems and robotics)	10/2022 – 08/2026
K.J. Somaiya College of Engineering Mumbai, India B.Tech. in Mechanical Engineering (CGPA: 8.69)	09/2017 – 05/2021

SKILLS

Programming Languages: Python, Java, C++, SQL, PLC

Robotics & Automation: ROS, ROS2, RViz, Gazebo, Nav2, MoveIt2, BT.cpp, Twincat3

Software & AI: OpenCV, PyTorch, Point Cloud Library(PCL), PyQt5

Tools & Platforms: Git, Gitlab, Linux, MATLAB, Simulink, LaTeX, CVAT, SolidWorks

Domains: Mobile robotics, Motion & Task Planning, Multi-Robot Systems, Machine/Deep/Reinforcement Learning, Automation

EXPERIENCE

Student Tutor | *Institute of Digital and Autonomous Construction, TUHH, Germany* 11/2025 – 02/2026

- Assisted in teaching the *Bauinformatik Datenbanken* seminar, introducing students to fundamental DBMS concepts.
- Guided students through the database design process, including conceptual and logical design as well as ER modeling.
- Conducted practical hands-on sessions with MS Access and LibreOffice Base, demonstrating table structuring, data-type definition, and primary-key setup.
- Taught SQL fundamentals and supported students in formulating queries to filter and extract data effectively.

Student Research Assistant | *Institute of Digital and Autonomous Construction, TUHH, Germany* 08/2025 – 10/2025

- Integrated a Raspberry Pi with the Duet board for low-level control of an earth printer.
- Developed a PyQt5 graphical user interface for the earth printer.
- Set up a simulation environment for the Husky robot and UR5e arm.
- Conducted research on Behavior Trees for multi-robot task assignment and fault-recovery mechanisms.

Student Research Assistant | *Institut für Flugzeug-Produktionstechnik, TUHH, Germany* 10/2023 – 09/2025

- Integrated Beckhoff IPCs into a robotic platform; developed TwinCAT3 and Python (*pyads*) interfaces to read position/force via Modbus TCP/IP from a Suhner EFC device.
- Developed Python scripts for KUKA robot motion to precise end-effector measurement poses; implemented robot and spindle speed control using *pyads* and TwinCAT3.
- Built a PyQt5 GUI for a wear-generation setup; ran wear tests and recorded datasets in CSV format for model training.
- Trained a neural network to predict material removal & surface roughness from force, spindle speed, and material-removal data.
- Conceptualized a setup for recording flap-wheel images before and after wear tests.
- Developed a convolutional autoencoder for anomaly detection in flap wheels using PyTorch.

Graduate Engineer Trainee (Weld - PE) | *Suzuki Motor Gujarat Pvt. Ltd., India* 09/2021 – 04/2022

- Regularly updated weld shop layouts in AutoCAD.
- Performed weld spot verification, marking, and checking based on standard drawings.
- Collaborated with a team to carry out pre-production trials for new car models.
- Supervised vendors during robot teaching operations.
- Communicated with vendors to ensure smooth coordination and project progress.

PROJECTS

Articulated motion planning for dual-body nonholonomic mobile robots (Master Thesis) 15/02/2026 – 17/08/2026

- Adapting the ROS 2 Nav2 framework to support dual-body articulated rovers by integrating custom motion models and hinge-aware collision checking.
- Configuring existing Nav2 planners and controllers to manage the complex nonholonomic constraints of the custom dual differential-drive system, modifying their underlying kinematic representations as needed.
- Integrating Multi-Robot Graph SLAM with the planning pipeline, ensuring seamless communication between high-level autonomous navigation and low-level physical hardware controllers.

Non-visual perception system for an existing robot platform (UGV, Raspberry Pi) 04/2025 – 07/2025

- Built a non-visual perception stack on a Raspberry Pi-equipped UGV using ultrasonic, force, and IMU sensing—no cameras/LiDAR.
- Enabled environment understanding: distinguish hard vs. soft obstacles with recovery behaviors; infer terrain (smooth/rough) and estimate slope via a terrain probe.
- Achieved real-time motion adaptation from tactile & inertial feedback; developed end-to-end with a V-model workflow (requirements → black-box → functional decomposition → concept selection → prototyping → testing).

Task Planning for Mobile Robots in Multi-Robot Systems (Unitree A1 robots, ros_bt_py) 10/2024 – 04/2025

- Developed a dynamic, modular Behavior-Tree framework for autonomous inspection with multiple robots: parallel skill execution, GUI-based task assignment, and isolated per-robot control via ROS namespaces.
- Implemented reusable BT subtrees as robot skills—navigation to target locations and visual inspection (e.g., socket detection with onboard cameras)—to enable plug-and-play task composition.
- Integrated multi-robot localization via Cartographer gRPC; built with ROS, Python, and PyQt5; validated indoors on quadruped robots to demonstrate scalability and robustness.

Maze Solving Challenge (Java, OOP) – LEGO Mindstorms 11/2023 – 01/2024

- Worked on a LEGO Mindstorms robot for autonomous maze navigation in simulation and hardware testing.
- Implemented the control software in Java using object-oriented programming (OOP) principles for modular and reusable behavior design.
- Developed maze-solving logic with obstacle avoidance, color detection, and low-pass filtering to improve navigation stability.

Image-Guided Robotic Needle Placement (Franka Panda, ROS) 04/2023 – 07/2023

- Worked on trajectory planning for precise needle insertion using a robotic arm.
- Implemented trajectory planning using a quintic polynomial approach in a ROS node with Python.
- Collaborated with the team to implement path planning, forward and inverse kinematics.

PUBLICATIONS

Tandon, A.; Stührenberg, J.; Sawant, S. (2025). “Kopplung von Building Information Modeling mit Behavior Trees als Grundlage für automatisierte Bauwerksinspektionen.” In: *Proceedings of the 36. Forum Bauinformatik*, Aachen, Germany.

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WORKSHOPS & SUMMER SCHOOLS

ACM SIGSOFT Summer School for Software Engineering in Robotics Brussels, Belgium

- Explored advanced robotic architectures, focusing on automated task planning (PDDL) and execution using PlanSys2 and Behavior Trees.
- Learned about Behavior Trees and their applications in robotics.
- Learned software engineering, continuous integration, and deployment practices for robotic systems using ROS2.

LANGUAGES

English — C2 **German** — A2 **Hindi** — C1 **Marathi** — C2