

Nikhil Singhal

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SKILLS

Programming Languages: C++ (3+ years), Python (3+ years), Rust (1+ years), JavaScript/TypeScript (4+ years)

Robotics: ROS1/ROS2, MoveIt2, Nav2, Gazebo, Pybullet, OpenSCENARIO2, SLAM, Motion Planning, MuJoCo, Robot Perception, PDDL, Behavior Trees

Computer Vision/AI: OpenCV, PyTorch, TensorFlow, Image Processing, Neural Networks, Object Detection, OpenAI Gym, Reinforcement Learning

Cloud and Edge Computing: Edge Computing, AWS, Docker, Kubernetes, Helm, Microservices Architecture

Development Tools and Practices: Git/GitHub, Jira, QT, QML, CI/CD Pipelines, Ansible, Automated Testing

Language Proficiency: English (Native), German (Fluent), Hindi (Native)

EXPERIENCE

Robotics Software Developer and Researcher - Internship and Master Thesis

Intel Labs

January 2024 - January 2025, Karlsruhe, Germany

- Contributed to developing and enhancing the open-source library [Scenario Execution](#), based on OpenSCENARIO DSL standards and Behavior Trees, enabling reproducible experiments, which streamlined robotics testing processes and reduced manual efforts.
- Developed and implemented CI/CD pipelines using GitHub Actions and automated unit testing for robotics software, increasing deployment efficiency and enabling faster delivery of critical updates.
- Implemented Kubernetes-based cloud and edge deployments for ROS2 applications (e.g., MoveIt2, Nav2), offloading processing workloads from robots to cloud infrastructure, thereby reducing onboard resource usage by 80%.
- Designed and implemented a Kubernetes-based failure mitigation framework as part of the master thesis, incorporating stateful handover and fallback mechanisms. This system improved fault tolerance and reduced downtime in edge computing environments.
- Simulated and validated recovery strategies in Gazebo and with physical robots, analyzing performance metrics to refine failure recovery approaches and ensure reliability in live robotic applications.

Robotics Software Developer and Researcher – Student Research Assistant

Institute of Mobile Machines and Commercial Vehicles

March 2023 - December 2023, Braunschweig, Germany

- Developed robotics software in Python and C++ using object-oriented principles, enhancing system functionality and improving operational efficiency.
- Built data transfer mechanisms with ROS2 over 5G networks, enabling large dataset exchanges between robots and edge/cloud systems, increasing data speed and reducing latency.
- Integrated real-time GPS data into the robotic system using ROS2, providing precise positioning information for effective field operations.

Full Stack Developer - Working Student

Lower Saxony State Office for Monument Preservation

February 2022 - February 2023, Hannover, Germany

- Built a web-based platform with React, Nodejs, TypeScript, and Tailwind CSS for historical data management, enhancing data retrieval and usability for architectural research.
- Enhanced system efficiency through advanced PostgreSQL techniques such as indexing and partitioning, leading to faster data retrieval.
- Integrated the platform with Potree, an open-source point cloud visualization tool, enabling interactive 3D visualization of building data.

PROJECT

Development of Realistic Failure Scenarios of Navigation Sensors for an Underwater Simulation Environment

Institute of Flight Guidance • July 2023 - December 2023

- Analyzed and documented common fault and failure modes of Inertial Measurement Units (IMUs) in underwater environments.
- Simulated realistic failure scenarios using ROS and Gazebo, enhancing simulation accuracy, observing and analyzing the behavior of the vehicle under fault conditions to assess and improve navigation system resilience.
- Implemented a containerized solution using Docker to enable seamless communication between ROS1 and ROS2 environments, enabling seamless platform transition and interoperability.

EDUCATION

M.Sc. Computational Sciences in Engineering

Technical University of Braunschweig • Braunschweig, Germany • 2025

- Relevant Courses:** Robot Control and Optimization, Pattern Recognition, Advanced Programming, Robotics Lab, Computer Vision and Machine Learning.

PUBLICATIONS

IEEE International Conference on Robotics & Automation

- Mirus F, Pasch F, **Singhal N**, Scholl K-U, A generic approach for reactive stateful mitigation of application failures in distributed robotics systems deployed with Kubernetes, In: Computing Research Repository, (CoRR) 2024 [\[URL\]](#)