Sharath Nataraj

SUMMARY: Research Engineer at Fraunhofer IPA focused on **robotics safety, autonomy, and intelligent human–robot collaboration**. Experienced in **AI-based perception, simulation, and control systems** for collaborative, industrial, and humanoid robots. Skilled in **ROS/ROS2, machine learning, and safety technologies** enabling predictive and context-aware robotic behavior.

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sharathbhushan.github.io

Skills

Robotics Frameworks & Middleware:
ROS / ROS 2 (Humble, Foxy), UR RTDE, KUKA Karel, ABB RAPID, Denso SDK, Unitree SDK 2, Visual Components, NVIDIA Omniverse, Gazebo, Rviz

AI, Perception & Simulation:
Deep Learning (PyTorch, TensorFlow, TensorRT), Computer Vision (OpenCV, OpenPose, OpenNI), Human Skeleton Tracking, Activity Recognition, 3D Geometry, Sensor Fusion, Sim2Real Transfer, NVIDIA CUDA / RAPIDS

Safety & Risk Assessment Systems:
Collaborative Robot Risk Modeling (ISO 10218-2, ISO/TS 15066), Context-Aware Real-Time Risk Assessment, Safety PLCs (SICK, Pilz, Omron), Emergency Stop / Safe Stop / Speed & Separation Monitoring (SSM), Force & Pressure Measurement for Cobots, Computer-Aided Risk Assessment (CARA)

Tools & Data Infrastructure
Git, Docker, CI/CD, Linux (Ubuntu), HTML/CSS/JavaScript, Data Analytics, Power BI, Raspberry Pi, 3D Sensors (LiDAR, Radar, RealSense, ZED), Vicon Motion Capture

PROFESSIONAL EXPERIENCE

Research Engineer, Robot Safety and Cobots
June 2023–Present | Fraunhofer IPA, Stuttgart

- **Developer** for *Computer-Aided Risk Assessment (CARA)* — a Fraunhofer flagship software for the safety evaluation of collaborative robot applications, enabling quantitative risk visualization and compliance with **ISO 10218-2 and ISO/TS 15066** standards: https://www.ipa.fraunhofer.de/en/current-research/robot-and-assistive-systems/50_years_robotics/cara_en.html
- **Principal architect** of *Robo-Dashcam*, a post-deployment safety optimization platform combining multi-sensor data (3D cameras, force sensors, radar, LiDAR) and **AI-driven** monitoring in industrial robot cells: https://www.youtube.com/watch?v=sHSu70lZKHA
- **Designed and implemented** a **physical safety test pipeline for humanoid robots**, integrating real-time measurement, Vicon-based motion tracking, calculating stability parameters.
- **Core contributor to the RoSA (RoboSafety Assist)** initiative — an innovation project selected for Fraunhofer's *AHEAD* startup incubator program, focused on commercializing predictive safety solutions for collaborative and humanoid robots.

EDUCATION

MSc - Electrical Engineering
Specialized in Smart Systems
University of Stuttgart
10.2020 – 02.2023

BEng - Electronics and Communication Engineering
Dr Ambedkar Institute of Technology
07.2016 - 08.2020

Conference and Seminars

ERF Stuttgart 2023
Fraunhofer IPA, Stuttgart

Automatica 2023
Munich

Motek 2024
Stuttgart

Safe HRC Workshop – Speaker 2024
Fraunhofer IPA, Stuttgart

Automatica 2025
Stuttgart

National Conference on Recent Trends in Science, Engineering

- **Pioneering research** in **context-aware and real-time risk assessment** frameworks for human-robot collaboration (HRC), focusing on predictive modeling using multimodal perception and AI inference.
- **Integrated multi-vendor robotic systems (UR, KUKA, FANUC, ABB, Denso, Unitree G1)** through unified control interfaces leveraging **ROS 1/2, RTDE, Karel**, and **safety PLC** environments.
- Developed simulation and validation pipelines using Visual Components, **NVIDIA Omniverse**, and **TensorRT** for **sim-to-real testing of robot safety concepts.**

Research Assistant, Robotic System Integration and Software Development

July 2022–June 2023 | Fraunhofer IPA, Stuttgart

- Responsible for deploying Human-Robot Collaboration using an Intel D435i Camera with advanced pose recognition software such as OpenPose and OpenNI.
- Mapping and localization of swarm robots (TurtleBot).
- Development of observers to calculate and plot error in swarm bot navigation - https://github.com/swarmBots-ipa
- **Skills Acquired: ROS and ROS2, Gazebo, Rviz, Point cloud, SLAM, Lidars, Image processing, Python, C++, Linux**
- Department Page - Software Engineering and Systems Integration - Fraunhofer IPA
- GitHub: https://github.com/SHARATHbhushan

Part time Internship on Robotics, Research and Development

September 2021– September 2022 | BEC Gmbh, Reutlingen

- Research and Development of a vision system for AGV using multiple Intel Realsense D435i cameras and its Pointcloud.
- Responsible for dynamic object detection and tracking using YOLO accelerated using intel's openvino drivers.
- Development of Control loop and calibration for LED's on AGV to accurately depict the motion of the AGV.
- Project Page: https://www.b-e-c.de/de/industrie
- Reference: mailto:o.benfarah@b-e-c.de

Working Student IOT Developer

July 2021–October 2021 | n-fuse Gmbh Stuttgart

- Responsible for Development of entire backend for media control system for kids' playhouse.
- Effective calibration of raspberry Pi as Server and client configuration to Control projectors and speakers over the Wi-Fi
- Responsible for Hardware configuration and setup.
- **Skills Acquired: Raspberry pi, Ultrasonic sensors, projectors, typescript, JavaScript, python, wireless communication, MQTT.**

and Management- Presented a paper on Self- Learning AI Robotic Tank
Dr. Ambedkar Institute of Technology
JUN 2019

Hands on Training on JAVA and Web Designing
Dr. Ambedkar Institute of Technology
APR 2017

Workshop on machine learning
Indian Institute of Technology Roorkee
MAR 2019

Publication

Use of Ground Penetrating radars in Planetary Rovers – 2019
https://www.ijresm.com/volume-1-issue-10-october-2019

Multipurpose Defense Robot 2020
https://www.irjet.net/volume7-issue7

Personal Projects

MK2 Robotic ARM
March 2022 - Present
Integration of Inverse kinematics on open source EEZYBOT ARM mk2 3D Printed Robotic Arm, using MOVEIT and ROS Environment

Line Following with Obstacle avoidance Robot
November 2015 – February 2016
Skills Acquired: Infrared sensor, Ultrasonic Sensor, C, Arduino programming.

Languages

English - C1 Expert
German – A1 Beginner

PROJECTS

Master Thesis on "An Online Fault Injection Framework For 7 Piece Puzzle Demonstrator Based on ROS-Gazebo Simulation"

October 2022–February 2023 | IAS Uni-Stuttgart

- Development and testing of ROS-based "Fault Injection Tool" to inject different and stochastic faults and errors into a 7DOF Panda Robot
- **Skills Acquired: ROS, Gazebo, Rviz, URDF, 3D modelling**

Research Project on Speech module for Autonomous control of Robot

March 2022–October 2022 | IAAS Uni Stuttgart

- Implementation of wake word detection, speech-to-text, natural language processing, text to speech, on a Telepresence robot to perform smart automation tasks and control the robot as well as have a meaningful conversation.
- Connection of various implementations to a frontend where the user can choose to interact with the robot either by voice or by using text input.
- Successfully implemented an Appointment scheduling system to contact and set a meeting with anyone in the department database by interacting with the robot.
- Link: https://github.com/SHARATHbhushan/speech_module_client
- **Skills Acquired: Google cloud integration, C, C++, Python, Flask, MQTT, Natural Language Understanding**

Multipurpose Defense Robot

January 2020-July2020 | Bengaluru

- Development of a prototype of a defence robot with advanced technologies like metal detection, fire extinguisher, ultrasonic radar.
- Responsible for the Design and Development of the Communication system
- **Skills Acquired: Autodesk (CAD), Temperature and Humidity Sensors, Ultrasonic Distance Measurement (HC-SR04), RF communication Module (HC12), Object detection, Face Recognition using Python**