Deebul Nair

Wacholderweg 9, Sankt Augustin, Germany, 53757
(+49) 015218672925 • deebuls@gmail.com

Work Experience

Senior Robotics Software Developer – ST Engineering Applied Solutions 2022 – present
Singapore Technologies, Frankfurt

- Developed and Integrated custom navigation stack for construction robots on top of ROS architecture.
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- Deployed robot control software on ARM based embedded systems.
- Developed and deployed computer vision algorithms for water spray detection for construction robot.
- Demonstrated expertise in C/C++/Python programming, particularly in an embedded environment, to ensure efficient and high-performance code execution.
- Temporal sensor fusion in DNN with different probabilistic methods Kalman Filter, Particle Filter.
- Ported robot software from ROS1 to ROS2.
- Integrated the software with various ROS/ROS2 modules, ensuring seamless communication and compatibility with existing systems.
- Wrote detailed documentation, including design specifications, user manuals, and technical guides, to facilitate seamless knowledge transfer and maintain system integrity.
- Expertly leveraged computer vision frameworks and libraries such as Torch, PyTorch, Tensorflow, Tflite, ONNX, and OpenCV to develop and deploy robust applications.
- Collaborated effectively with a team of engineers, fostering an environment of innovation and teamwork, while also being capable of independently driving projects forward.

Senior Research Assistant – Sesame Project 2018 – 2022
Bonn-Rhein-Sieg University of Applied Sciences

- Defined and architected a software system for implementing deep learning and computer vision algorithms on embedded systems(Yolov8 / FOMO/ Resnet8).
- Implemented the system, including architecture modifications and quantization, to ensure efficient processing and execution on embedded platforms(Coral, Movidius, Raspberry Pi, OAK-D).
- Trained and deployed deterministic uncertainty estimation for Deep Neural Networks(DNN) to improve robustness and dependability attributes.
- Integrated the software with various ROS/ROS2 modules, ensuring seamless communication and compatibility with existing systems.
- Open source contribution for probabilistic programming languages.
- Experiment Design and statistic test using Bayesian analysis for experiment reporting.

Robotics Team Leader – b-it-bots Team 2017 – 2022
Bonn-Rhein-Sieg University of Applied Sciences

- Managing a team of software developers and roboticist.
- Architecture Design, Software development(c++, python), Testing, CI, H/W Integration.
- Integration of deep learning algorithms with ROS/ROS2 architecture.
- Deep learning networks on embedded boards (movidius/OAK-D).
- Maintainer for university open-source projects <https://github.com/b-it-bots>.
- Maintenance of multiple embedded robots like Youbot, Robile, Toyota HSR, Kinova arm.
- Navigation stack (ros_navigation, nav2) deployment on multiple robots.
- State machine development using SMACH and Behaviour Tree
- Custom localization algorithm development and integration on robots with 3D lidar.

Research Assistant – DigiKlausur 2016 – 2017
Prof. Paul Plöger, Bonn-Rhein-Sieg University of Applied Sciences

- Docker, Kubernetes cluster deployment for the Jupyter notebook based electronic examination.
- Deployed jupyterhub server on google cloud and OpenStack.
- Explainable AI methods for the *Decision Tree* machine learning algorithm.
- Developed tool to visualize decision tree output developed using scikit-sklearn python package.
- `https://github.com/deebuls/decision_tree_visualize`

Senior Embedded Software Engineer – IMO Project 2010 – 2014
Rockwell Collins, Inc

- Software development of the smart router for AIRBUS A350.
- Responsible for implementation of communication manager which co-ordinated availability of different communication medium(LAN, WLAN, GSM, SATCOM) and provided the user with uninterrupted service.
- Involved in complete life cycle of software development from requirement writing(IBM Rational DOORS), designing(UML), development(C++), testing and software integration.
- Implemented the proposed ARINC specification 822 - Air/ground Wireless Communication (Gatelink).
- Software development in C++ for communicating with the WLAN controllers and access point.

- Developed and maintained Linux device driver for custom FPGA chip on PowerPC MPC8572.
- Developed and integrated Linux device driver for I2C protocol chip PCA555.
- Developed board support package for a Windriver Linux based customized x86 board.
- Boot loader selection and customizing to the board.

Technical Skills

- Programming Languages: C, C++, Python
- Platforms & Frameworks: Robot Operating Systems(ROS), Tensorflow, PyTorch, Scikit
- Tools & Libraries: Git, Vim, Github actions, Docker, Travis, Lxc container
- Operating Systems: Ubuntu, Debian, Linux, VxWorks, Windriver Linux
- Standards: DO-178B, ISO 26262, FMEA, AIRINC 429
- Software Development: Scrum, Jira, Git, Github
- Computer Vision Libraries: OpenCV, PCL, Kornia
- Build Systems: Autotools, Make, CMake

Open Source Contributions

b-it-bots – `https://github.com/b-it-bots/mas_industrial_robotics`

- ROS based software architecture for youBot industrial mobile robot.
- contributor and administrator
- code base for youBot robot used in international competitions

sa_tool_python – `https://github.com/deebuls/sa_tool_python`

- python based tool for fault diagnosis in robots.
- contributor and maintainer
- used as a teaching tool in the course "Fault detection and diagnosis"

BayesPy – `https://github.com/bayespy/bayespy/`

- tools for Bayesian inference with Python
- contributor

Publications

- **D. Nair**, N. Hochgeschwender, M. Olivares-Mendez, "**Maximum Likelihood Uncertainty Estimation: Robustness to Outliers**", in proceedings of the Workshop on Artificial Intelligence Safety 2022 (SafeAI 2022) co-located with the Thirty-Sixth AAAI Conference on Artificial Intelligence (AAAI 2022)
- A. Padalkar, M. Wasil, S. Mahajan, R. Kumar, D. Bakaraniya, R. Shirodkar, H. Andradi, D. Padmanabhan, C. Wiesse, A. Abdelrahman, S. Chavan, N. Gurulingan, **D. Nair**, S. Thoduka, I. Awaad, S. Schneider, P. G. Plöger, and G. K. Kraetzschmar, "**b-it-bots: Our Approach for Autonomous Robotics in Industrial Environments**", in Proceedings of the 23rd RoboCup International Symposium, Sydney, Australia, 2019.
- K. Jeeveswaran, M. Muthuraja, **D. Nair**, and P. G. Plöger, "**Using Active Learning for Assisted Short Answer Grading**" in ICML Workshop on Real World Experiment Design and Active Learning, , 2020.

Education

University of Luxembourg • Luxembourg city, Luxembourg — Present
Doctoral Candidate • SpaceR Lab

Bonn-Rhein-Sieg University Applied Sciences • Sankt Augustin, Germany — 2017
Master of Science • Autonomous Systems

Centre for Development of Advanced Computing • Hyderabad, India — 2010
Post Graduate Diploma • Embedded Systems Design

Xavier's Institute of Technology (Mumbai University) • Mumbai, India — 2009
Bachelor of Technology • Electronics and Communication Engineering

Achievements

- 1st place in Robocup@work: RoboCup 2019, Sydney, Australia
- 1st place in Robocup@work: German Open 2019, Magdeburg, Germany

Areas of Interest

• Robotics design & integration • Deep learning & Architectures • Embedded system design