Vignesh Balaji

+31 613963192 **Netherlands**
vbalaji707@gmail.com
Linkedin GitHub

Summary of Expertise

Proactive Robotics Engineer with expertise in advanced control algorithms, system modeling & robotic manipulation. Skilled in rapid prototyping and deploying algorithms from simulation (MATLAB/Simulink, ROS, PyBullet) to embedded hardware (C++, microcontrollers, Raspberry Pi). An adaptable and cheerful team player, collaborating effectively with multidisciplinary teams to achieve technical objectives. Currently exploring robot learning with transformers (eg:- ACT, VQ-BeT) and diffusion policies on Hugging Face's LeRobot.

Company Experience

Quatt B.V. Amsterdam, Netherlands
Controls & Embedded Engineer, Full time November, 2024 – June 2025

- Worked on Model Predictive Control of Heat pump (Null-space MPC).
- Designed Control Algorithms and state estimators for 2 products - All Electric and Hybrid Heatpumps.
- Implemented Heat pump software stack on MATLAB/Simulink & C++ and deployed in Hardware.

Pentas Moulding B.V. Almelo, Netherlands
Robotics Engineer, Part time December, 2022 – July, 2024

- Developed & tuned control programs for multi-axis welding robot manipulators in C++.
- Developed dashboards for rotor molding machines and applied machine learning (scikit-learn) to sensor data for predictive maintenance. Trained YOLOv8 on a custom dataset for real-time defect detection.

Ather Energy Pvt Ltd Bangalore, India
Controls Algorithm & Embedded Engineer, Full time August, 2015 – August, 2019

- Implemented safety-critical motor and battery control (C++), including charging algorithm, SoC/SoH estimation, and torque-mode profiles for different modes in electric scooter.
- Followed best software practices - Unit testing, Git, CI runners, Built hardware in loop to test before deployment.
- Adopted model-based design (Simulink state machines) for the application layer, streamlining integration of auto-generated code with device drivers and enabling SIL validation with battery and motor models.

Education

University of Twente August, 2024
Master of Systems and Controls, Specialized in Robotics and Mechatronics
Relevant Coursework: Control Systems for Mechatronics, Control for UAVs, Robust Control, Non-linear Control, System Identification, Computer Vision & Image processing, Machine Learning
Thesis: Autonomous Control of Multiple Quadrotors (Drones) to Carry Objects with a Net

Anna University June, 2015
Bachelor of Electrical and Electronics Engineering
Thesis: Sewage Cleaning Robot

Technical Skills

- **Controls & Estimation:** Cascaded PID, NMPC, LQR, Feedforward, Impedance Control; Kalman Filter, Particle Filter, Moving Horizon Estimation, H-Infinity.
- **Programming Languages:** C, C++, Python, Rust, ROS 1 & 2.
- **Tools/Technologies:** MATLAB, Simulink, Gazebo Ignition, Pybullet, MuJoCo.
- **Computer Vision:** OpenCV, YOLOv5/v8, Detectron2, TensorFlow, PyTorch, SLAM
- **Machine Learning:** scikit-learn, Stable-Baselines3, OpenAI Gym, imitation learning.

- **Hardware:** Jetson Nano, Arduino, Raspberry Pi, microcontrollers – STM32F4, ESP8266, LPC1768, KEA128.
- **Development Methodologies:** Agile, Scrum, V-Model, Unit tests, CI/CD, HIL, test driven development.
- **Way of Working Tools**: VS code + Docker, Git, Linear/Jira, Confluence/Slite, Obsidian/Notion, Miro, Latex.

Intership

LAAS-CNRS Toulouse, France
Autonomous Robot Navigation Engineer, Full time February, 2022 – August, 2022
- Used human-aware navigation planner algorithms for UAV (Parrot) & mobile robot (TIAGo) in ROS C++.
- Conducted Experimentation via User study and evaluated human-aware robot navigation with metrics.

Projects

Telerobotics with robot arms University of Twente
Interaction Robotics (iBotics) Lab January, 2022
- Developed human-in-loop teleoperation system with MPC framework.
- Developed passivity framework to ensure safety & stability under communication time delay.

Autonomous Control of Multiple Quadrotors (Drones) University of Twente
Aerial Robotics Lab September, 2023
- Modeled a multi-quadrotor (four) system carrying a payload with a net in Gazebo.
- Generated a feasible trajectory for the system & controlled it.

Personal Projects

SO-101 Robot Arm (Hugging Face LeRobot) (in progress)
- Applied state-of-the-art **robot learning methods** (ACT, PUS-T, Diffusion Policies) for manipulation tasks (pick-and-place, pushing, stacking).
- Built demonstration datasets and trained policies via **imitation learning** for training manipulation policies.

Vacuum Cleaner Robot (in progress)
- Built a mobile robot platform based on the **Linaro ROS 2 repo**, with a 3D-printed chassis and onboard sensors.
- Currently implementing **ROS 2 Control** & **Nav2 stack** for autonomous mapping, localization & planning.
- Aiming to demonstrate an autonomous mobile robot testbed, with vacuum cleaning functionality as an add-on.

Awards & Certifications

- Patent: Electric scooter reverse mode implementation.
- Best Science Communicator Award (2020) – FameLab (British Council), Netherlands.
- Top 25 Social Impact Projects – National Science Congress, India (Sewage cleaning robot).
- Founding Member – Ather Energy Pvt. Ltd. (Now valued at $2 billion).

Extra Curricular Activity

RoboTeam Twente Enschede, Netherlands
Controls Engineer September, 2020
- Worked on traction control and dribbler control systems & Implemented Kalman filter.

IEEE-RAS Young Reviewers Program Enschede, Netherlands
Reviewer February, 2022
- Reviewed multiple ICRA and IROS papers for the last 3 years.

Design Lab Enschede, Netherlands
Technical Team Member September, 2020
- Guided students with projects in programming, 3D printing etc.
- Co-delivered workshops - Arduino, Electronics, MATLAB.

Languages & Hobbies

- **Languages:** English (C2), French (B1), Dutch (A2)
- **Hobbies:** Salsa, Badminton, Running, Football