

RUTURAJ BENDKHALE

Embedded Systems Engineering (Student) & Hardware Engineer

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📍 Bremen, Germany (Ready to relocate)

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EXPERIENCE

Avionics Team Lead & Hardware Engineer

ASTRA E.V. (Bremen)

Aug 2024 - Present

- Fusion 1.0: STM32-based Flight Computer** - **Hardware Design:** Designed and implemented STM32F7-based flight controller PCB with 4-layer stackup. Integrated IMU, GPS, barometer sensors via I2C/SPI. **Software:** FreeRTOS real-time scheduling, Extended Kalman Filter sensor fusion, STM32CubeIDE + HAL. Validated EKF vs. Madgwick in MATLAB.
- TEENSY Flight Computer - Hardware:** Teensy 4.x microcontroller integration with custom breakout board. **Software:** FreeRTOS multi-tasking, ARM CMSIS-DSP fixed-point operations; reduced CPU load and improved real-time loop latency.
- Custom Communication System - Hardware:** SX1276 LoRaWAN module integration with custom antenna design. **Software:** Implemented LoRaWAN protocol stack, tuned ADR/data rate and payload framing for improved link reliability in field tests.
- Flexitronics - Wireless Sensor Network** - **Hardware:** Designed 4-layer PCB in Altium with ESP32C6, optimized for low-power operation. **Software:** ESP-IDF + ESP-NOW; profiled task timings and optimized memory allocation for burst traffic handling.
- Real-time Telemetry Dashboard** - Built Unreal Engine C++ dashboard with WebSockets and Protocol Buffers. Implemented quaternion pipeline for attitude visualization.

Simulation Engineer Intern

Deutsche Bahn (DB) (Germany)

Oct 2023 - Jun 2024

- Developed automated freight train HMI using MATLAB App Designer + Automotive Toolbox; standardized UI controls improved operator workflow consistency.
- Prototyped ERJU-ETCS dashboard in MATLAB App Designer; modeled state logic in Stateflow to clarify mode transitions and reduce UI edge-case errors.
- Automated JFrog Artifactory nightly jobs with Bash; reduced manual interventions and stabilized artifact availability during morning QA.
- Built Capella→Simulink converter with Systems Engineering Toolbox; cut repetitive modeling steps and aligned naming across tools for easier handover.

Summer Intern

TOPAS Industrial Mathematics Innovation GmbH (Bremen) May 2022

- Researched and benchmarked EV technologies from 70 manufacturers, identified strategic partnership opportunities through feature mapping analyses.

HARDWARE PROJECTS

Real-time Motor Fault Detection System

- Hardware:** Designed STM32F4-based vibration monitoring PCB with accelerometer sensor integration. **Software:** ARM CMSIS-DSP FFT processing, TensorFlow ML model deployment via STM32Cube.AI. Achieved real-time fault detection with 95% accuracy.

Magnetic Levitation Control System

- Hardware:** Artix-7 FPGA-based control system with custom sensor interface board. **Software:** Fixed-point VHDL PID controller, MATLAB simulation and tuning. Maintained stable levitation under parameter variations. Built App Designer GUI for live parameter tuning.

SUMMARY

Hardware Engineer with expertise in PCB design, FPGA development, and embedded systems. Proven track record in avionics hardware, real-time control systems, and microcontroller programming. Strong background in Altium PCB design, VHDL/Verilog, and hardware-software integration.

EDUCATION

M.Sc. Embedded Systems Design

Bremerhaven University of Applied Sciences
CGPA: 1.86 | Apr 2022 - Present

B.E. Electrical Engineering

KKWIEER Nashik
CGPA: 2.10 | Aug 2016 - Jun 2020

LANGUAGES

English	C1	<div><div style="width: 100%;"></div></div>
German	C1	<div><div style="width: 100%;"></div></div>
Spanish	A2	<div><div style="width: 50%;"></div></div>

CERTIFICATIONS

DO160C Compliance

COTS Devices in Model-Based Systems - Comprehensive seminar on DO160C environmental testing standards using MATLAB/Simulink.

- Coursera - Development of Secure Embedded Systems Specialization (EIT Digital)
- Coursera - Real-Time Embedded Systems Specialization (University of Colorado Boulder)
- Coursera - Spacecraft Dynamics and Control Specialization (University of Colorado Boulder)

SKILLS

Hardware Design

Altium KiCad EASYEDA PCB Design Multi-layer

MCUs/Processors

STM32/ARM Xilinx 7000 ESP32 Teensy Nucleo-144

FPGA Tools

Vivado Vitis Quartus VHDL Verilog

Communication Protocols

SPI I2C CAN LoRa UART RS485

Programming

C C++ VHDL Assembly Python

Modeling/Simulation

MATLAB Simulink Stateflow LTspice

ML Skills

PyTorch TensorFlow Scikit-learn Pandas Numpy

FPGA & EMBEDDED HARDWARE PROJECTS

High-Performance CORDIC Algorithm (FPGA)

- **Hardware:** Xilinx FPGA implementation with custom VHDL architecture. **Performance:** Optimized trigonometric calculations achieving 20µs execution time through parallelization. 30x acceleration over MATLAB floating-point implementation.

Embedded PI Controller (Microcontroller)

- **Hardware:** 8-bit Microblaze soft processor on FPGA. **Software:** Assembly-optimized fixed-point PI controller implementation. Achieved 1kHz control loop frequency with real-time performance.

FPGA-based DSP System

- **Hardware:** Xilinx FPGA with custom DSP architecture. **Implementation:** 8th order bandpass filter using Direct Form-II architecture. Parallel processing enabled real-time filtering of 16 channels at 100kHz sampling rate.

HACKATHONS & COMPETITIONS

Braunschweig City Hackathon (Rank 1)

- Built RAG chatbot using Langchain/PyPDF, reducing PDF form completion time from 20 mins to under 3 mins.

SAIL Hackathon (Rank 2)

- Engineered ML model using TensorFlow to optimize engine exhaust channels, achieving $R^2=0.98$ and covering 92.5% of test points.

Mental Health Hackathon

- Built a RAG-based chatbot to assist students with multiple patient profiles in training mental health professionals. Utilized tools like Langchain, RAG, and Dialogflow for implementation.

Bremen City Hackathon

- Developed a web tool using BeautifulSoup and Flask to scrape and structure information on electrical products, enabling manufacturers to create environmentally friendly products and shoppers to make informed choices.

VOLUNTEER EXPERIENCE

EASYEDA Student Ambassador

University of Bremen

2023 – Present

- Promoting PCB design tools and component selection expertise among students. Conducted workshops and provided technical support for EASYEDA platform adoption.

Data Analyst

Statistics Without Borders

2022 – 2023

- Volunteered as data analyst for non-profit organization, providing statistical analysis and data visualization support for humanitarian projects.

PUBLICATIONS

A Detailed Comparative Analysis of Different Multipulse and Multilevel Topologies for STATCOM [↗](#)

- Published in IEEE International Conference on Power Electronics, Smart Grid and Renewable Energy (ICPSGRE 2020). Conducted comprehensive comparative analysis of five power inverter topologies for STATCOM implementation: three multilevel (5-level, 7-level, 9-level) and two multipulse (6-pulse, 12-pulse) configurations.