Munjal Nayak

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Professional Summary

Hardware and embedded systems engineer with **3+ years' experience** in **SIL4 railway signalling**, **IoT products**, and **power electronics**. Strong foundation in **PCB and hardware design**, **embedded firmware** (ESP32/STM32, Embedded C, Python), and system-level integration and testing. Demonstrated ownership of onboard train control modules and industrial IoT solutions from concept through prototyping and validation, with growing focus on product definition, requirements, and stakeholder coordination.

Skills

Core Hardware	PCB and schematic design, component derating and selection, PCB manufacturing processes and DFM/DFT considerations, soldering and SMD rework, oscilloscope and mixed-signal debug, signal integrity awareness, power electronics (multilevel inverters, motor drives, DC–DC conversion), rapid prototyping (3D printing, breadboarding), hardware bring-up and reverse engineering.
Embedded	Embedded C for bare-metal and MCU environments, ESP32 (ESP-IDF), STM32, Python for scripting and test harnesses, UART/SPI/I^2C peripheral integration, GPIO and timer configuration, MQTT/MQTTS and HTTP/Web APIs, basic RTOS concepts (tasks, scheduling, synchronization), debugging with logic analyzers and serial consoles, firmware over-the-air (basic exposure).
Systems & Networking	OPNsense, pfSense, WireGuard, Wireshark, AdGuard, EJBCA, Proxmox VE, Docker, TrueNAS, PostgreSQL, MariaDB, Ubuntu Server 24.04, Rocky Linux, Windows Server 2022/2024, Active Directory (AD), AD CS, Azure Active Directory, Azure IAM, basic PKI and certificate management, network segmentation and secure remote access.
Safety, Quality & Standards	Working knowledge of SIL4 safety concepts in railway signalling, configuration management, traceability, version control with Git/GitHub, test planning and documentation, basic understanding of EMC/ESD concerns and environmental testing constraints.
Product & Project	Requirements elicitation and clarification, translating customer and operator needs into technical specifications, writing and reviewing technical documentation, coordinating with cross-functional and multi-disciplinary teams, basic project planning and effort estimation, stakeholder communication and expectation management.
Licences	Car and motorcycle licences, Heavy Rigid (learner), Forklift and Order Picker licences, First Aid & CPR, White Card.
Soft Skills	Clear written and verbal communication, structured problem solving, ownership mindset, ability to work independently or within cross-functional teams.
Languages	IELTS overall band 7 (English).

Experience

ETCS Application Engineer (Onboard Systems) *Alstom* 2023 – 2025

SIL4 | Railway Signalling | Onboard Systems | Data Configuration

- Developed proficiency in European Vital Computer (EVC) systems, including EVC 3, EVC 2 Plus, and EVC 2, for SIL4 onboard train control and signalling.
- Took ownership of onboard data system configuration and validation for MRTS trains in the NCRTC Delhi project, acting as a key engineering contact between design teams and operations.
- Prepared and validated configuration data for EVC modules, ensuring data integrity, compliance with SIL4 safety requirements, and correct integration with train subsystems.
- Participated in system integration testing, structured fault investigation, and root-cause analysis for onboard signalling hardware and software interfaces.

- Contributed to documentation and knowledge transfer, supporting future maintenance and scalability of the onboard ETCS solution.

IoT Developer Intern (Hardware & Firmware) *Eleics Design* 2023

ESP32 | Firmware | IoT Product Development

- Designed and developed embedded software for ESP32-based systems using the official ESP-IDF environment, targeting both new products and upgrades to existing hardware.
- Contributed to the "WiDrive" product, providing input on PCB design, implementing firmware, debugging issues, and supporting end-to-end system integration.
- Implemented and validated industrial communication protocols including SPI, UART, MQTT, HTTP-based web requests, and USB for IIoT applications, with attention to reliability and latency.
- Collaborated with senior engineers in design reviews, test planning, and incremental improvements to product reliability and usability.

Education

Master of Electrical Engineering *University of New South Wales (UNSW)* 2025 – Present

Expected 2027 | Embedded Systems

- Specializing in embedded systems and hardware design.

B.Tech in Electrical Engineering *Pandit Deendayal Energy University (PDEU)* 2023

- Scored **10/10** in final-year project.
- CGPA: **8.71/10**.
- Authored **2 research papers** on machine learning and co-authored 1 additional paper.

Certifications

- IBM – Introduction to Cloud Computing
- Microsoft – Create Machine Learning Models in Microsoft Azure
- Red Hat – Fundamentals of Red Hat Enterprise Linux
- MathWorks – Power Electronics Simulation Onramp
- IBM – Getting Started with Git and GitHub
- Keysight Technologies – Essential RF Power Measurements
- IIT Bombay – Understanding Incubation and Entrepreneurship
- UC Irvine – The Raspberry Pi Platform and Python Programming
- Coursera – Docker for Beginners

Projects

NCRTC MRTS (Delhi) – EVC3 Onboard Engineer

Onboard ETCS | Data Engineering

- Led onboard EVC3 engineering for MRTS trains, responsible for configuration data preparation, validation, and coordination with cross-functional teams to meet safety and schedule requirements.

MADRID – EVC2/EVC2P Data Preparation

ETCS | Configuration Management

- Supported multiple ETCS projects by preparing and validating configuration data for EVC2 and EVC2P systems, improving consistency and reducing rework during integration.

IoT Smart Panel (Industrial Motor Control)

ESP32 | VFD | Industrial IoT

- Designed an ESP32-based IoT controller to manage a three-phase squirrel cage induction motor via VFD.
- Implemented cloud connectivity for data logging and predictive analysis, enabling remote monitoring and control of motor performance.

IoT Smart Irrigation System

ESP32 | Home Assistant | Embedded Sensors

- Developed an ESP32 + Home Assistant-based smart irrigation solution for soil moisture and temperature monitoring.
- Enabled per-plant automated watering based on sensor feedback, improving water efficiency and reducing manual intervention.

Low Power Multilevel Inverter

Power Electronics | STM32

- Implemented a 5-level H-bridge inverter (+24, +12, 0, -12, -24) using 5 MOSFETs and an I-type power supply, controlled by an STM32 microcontroller.
- Focused on switching strategy, efficiency, and safe operation under low-power conditions.

Publications

- ELSEVIER – *Engineering Applications of Artificial Intelligence*: "An explainable artificial intelligence based approach for the prediction of key performance indicators for a 1 megawatt solar plant under local steppe climate conditions."
- International Conference on Sustainable Energy and Clean Technologies 2022 – "Using machine learning techniques to predict the effect of different parameters on inverter efficiency."

Final-year Project

Electrical Efficiency Optimization in the Industrial Sector: An Embedded Systems Approach to Real-time Asset Monitoring and Predictive Control

- Designed and implemented an embedded system for real-time monitoring of industrial assets, enabling data-driven efficiency improvements and predictive maintenance.