ABHIK KUMAR

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Education

University of Pennsylvania	August 2024

Master's of Science in Electrical Engineering – 3.91 / 4 CGPA — *Philadelphia, U.S.*
Courses: *Embedded Systems, Digital Integrated Circuits & VLSI, SOC Architecture, Chips Design & Measurement, Mixed Signal*

Delhi Technological University	August 2019

Bachelor of Technology in Electrical Engineering – 8.73 / 10 CGPA — *Delhi, India*
Minor in Computer Science Engineering
Courses: *Deep Learning, AI, Microprocessors & Microcontrollers, Digital Circuits System, Power Electronics, Operating Systems*

Skills

Programming Languages: Embedded C, C++, Python, CLI, Bash, Matlab, FreeRTOS, Cmake, NodeJs, Docker
Protocols Technologies: XBee, SPI, I2C, RS485, UART, Bluetooth Low Energy, MQTT, Robot Operating System
Hardware:WINC1500, ATMega, Digital Multimeter, Oscilloscope, Logic Analyzer, ULtra96
Software/Tools: Altium, Microchip Studio, MPLabX, Linux, Visual Studio Code, GitHub, JIRA, Confluence

Professional Experience

MUNCH Industries, Inc.	June 2025

Lead Embedded & Electrical Systems Engineer Intern — *Philadelphia, PA, USA*

- Led the design and development of the electrical and embedded control systems, managing firmware architecture, PCB integration, power distribution, and CAN-based communication between microcontrollers and Backend support.
- Developed modular Zephyr firmware using devicetrees, interrupts, and work queues for real-time control.
- Built comprehensive test infrastructure including **hardware-in-the-loop** validation, **end-to-end RTOS testing**, and unit tests using **Zephyr's ztest** framework with mocked drivers to verify subsystem behavior pre-deployment.
- Automated CI builds/tests with Docker git, cut bugs by **30%**, speed up iterations by **40%**; ensured HW integration.

Cogoport	January 2023

Software Development Engineer (Full Stack Developer) — *Gurgaon / Mumbai, India*

- Developed a platform to streamline onboarding, cutting time by **50%** and user errors by **30%** with checkpoint features.
- Automated data population, reducing manual effort by **70%** and tripling platform engagement. Ensured data consistency across **Indonesia, Vietnam, Thailand, Singapore, and China**.
- Built a real-time cargo tracking map using Leaflet and a **partner growth visualization** CRM tool with an org tree, 2X user interaction, accelerating data updates by **20%**, and improving reporting accuracy by **40%** for 2,000+ daily users.
- Automated agent allocation, increasing retention by **60%** and revenue by **30%** through improved shipment forecasting.

Research & Project work

Real-Time Data Compression on Zynq SoC with ARM–FPGA Co-Design	December 2025

- Built a real-time ARM–FPGA compression pipeline on Ultra96 (SHA-256, dedup, chunking on ARM/NEON) and offloaded LZW to FPGA using Vitis HLS, integrated via AXI DMA + XRT.
- Achieved 4× speedup (200 Mb/s) over CPU-only baseline using LZW kernel and pipelined host–device flow.
- Validated system with RTL-HLS testbenches, Ethernet stress tests, and end-to-end diff checks across multiple file types

Smart Plant Survival System	May 2025

- Designed and developed a 4-layer PCB using **Altium** with **SAMD21** microcontroller and **WINC1500** Wi-Fi module, fabricated by **PCBWAY** for automated plant monitoring and irrigation.
- Sensor Fusion with motor and pump over I2C; on **FreeRTOS** and WiFi alerts, boosting water efficiency by **40%**.
- Built a **Node-RED** dashboard for remote control and alerts, optimizing irrigation and cutting water use by **25%**.

DJ Gloves: Interactive Music Control System	December 2024

- Built a wearable that mapped hand gestures and motion to MIDI control using IMU, LCDs, and sensor fusion.
- Utilized ADXL335 accelerometers, Neopixel LED rings, Zigbee (XBee S2C) radios, ATMega32PB MCUs, and custom Python-based MIDI bridge for wireless data transmission and gesture mapping.
- Enabled low-latency gesture-to-MIDI control with interrupt-driven sampling and SPI/LCD feedback.

Publication & Achievements

Reinforcement Learning in Simultaneous Localization and Mapping	Springer Nature, April 2025

- Book chapter in *Recent Developments in Control, Automation and Power Engineering* (ISBN: **978-981-96-0047-2**).
- Developed model-free path planning strategies using reinforcement learning for reconfigurable robotic systems.
- Implemented and compared value iteration, policy iteration, and modified A* algorithm within SLAM frameworks.

Leadership & Sportsmanship

- Deputy Director of Compliance at **GAPSA** Finance Team, managing fiscal funds for university clubs and events.
- Featured **RAKT** project in the **top 100 out of 10,000+** entries at the United Nations Academic Impact.
- Won **silver** in 5km and 4×400m relay; led organization of Arena sports festival.