

MANTU KUMAR

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Professional Summary

Results-driven Hardware & Embedded Engineer with 1 year of industrial experience in end-to-end IoT, GPS/Cellular tracking, and compact wearable product development. Proficient in multi-layer PCB layout architecture utilizing Altium Designer, circuit debugging, and firmware engineering. Specialized in bare-metal programming, real-time operating systems (RTOS), low-power optimization, and hardware-software validation using lab diagnostic tools.

PROFESSIONAL EXPERIENCE

Hardware & Embedded Engineer – I

Trakbond (IoT & Smart Wearables Manufacturer)

June 2025 – Present
Noida, Uttar Pradesh, India

- **Multi-layer PCB Engineering:** Designed complex 4-layer high-density PCB architectures for high-precision consumer GPS trackers and smartwatches using Altium Designer, ensuring clean signal integrity within dense wearable form factors.
- **Hardware Validation & Bring-up:** Executed complete board bring-up protocols on new product revisions, utilized high-bandwidth oscilloscopes and logic analyzers to trace signal noise and eliminate critical layout routing bottlenecks.
- **Bare-Metal & RTOS Firmware:** Developed low-level driver abstractions in Embedded C to interface Quectel MC60 (GPS/GSM combo modules) and BLE peripherals, delivering highly reliable cellular-to-cloud data packaging over UART, SPI, and I2C.
- **Power Optimization:** Conducted deep-dive system power profiling using the Nordic PPK2 Power Profiler, engineered firmware-level low-power sleep state routines that significantly minimized idle draw and informed structural LiPo cell hardware upgrades.
- **Supply Chain Management:** Headed component sourcing strategies, formulated production-ready Bill of Materials (BOM), and drafted vendor-facing Request for Quote (RFQ) documentation to safeguard product timelines.

TECHNICAL AND SOFTWARE SKILLS

- **Hardware Design:** Altium Designer, Multi-layer Layout (Compact Wearables), Schematic Capture, Library & Footprint Design (SMD), Component Sourcing, BOM Management, RFQ Documentation
- **Firmware & RTOS:** Embedded C, Python, Bare-Metal Development, Real-Time Operating Systems (RTOS), Task Scheduling, Mutexes, Semaphores, Queues, State Machines.
- **Microcontrollers & Stacks:** Quectel MC60 (GPS/GSM), Quectel EC600, STM32, ESP32/ESP8266, AVR, PIC, Raspberry Pi.
- **Protocols & Peripherals:** I2C, SPI, UART, USART, Accelerometers, Power Profilers, Watchdog Timers, Displays (LCD/7Segment), Relays.
- **Connectivity:** GPS, GSM, BLE, Wi-Fi.
- **Lab Tools & IDEs:** Nordic PPK2 Power Profiler, Digital Oscilloscopes, Logic Analyzers, Multimeters, STM32CubeIDE, Microchip Studio, MPLAB X-IDE, VS Code, Cursor, Git & Gitflow.

Technical Projects & Research

Autonomous Cotton-Picking Robotic Arm

Implemented real-time cotton boll detection using a custom-trained YOLOv8 computer vision model. Engineered inverse kinematics code coupled with ArUco Marker pose estimation algorithms to control a multi-axis robotic manipulator arm for automated agricultural harvesting. April 2025

IIT Mandi Technical Research Internships

Undergraduate Timeline

- **Acoustic Manipulation:** Engineered an ultrasonic acoustic wave levitation system capable of suspending blood and water droplets mid-air for touchless micro-fluidic lab environments.
- **Artificial Skin Sensors:** Developed flexible matrix sensor elements optimized to translate changes in multi-point physical pressure, ambient temperature, and relative humidity.

EDUCATION

Central University of Karnataka

B.Tech in Electronics and Communication Engineering, CGPA: 8.69/10

Nov 2021 – May 2025

Kalaburagi, Karnataka

LANGUAGES & CREDENTIALS

- **English:** Full Professional Proficiency.
- **Hindi:** Native Language.
- **Certifications:** NPTEL Verilog System Design (FPGA/IIT-Guwahati).