HARSH KUMAR

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SUMMARY

Software and Embedded Systems Developer with strong hands-on experience in designing end-to-end intelligent systems spanning custom PCBs, firmware development,cloud backends, and Flutter-based mobile applications. Proven ability to integrate biomedical, environmental, and RF systems with AI-driven analytics.Experienced in hackathons, client-facing projects, and rapid prototyping of production ready solutions.

TECHNICAL SKILLS

- Programming Languages: Python, Dart, C, C++, SQL
- Frameworks/Libraries: TensorFlow, NumPy, Flask, FastAPI
- Mobile & Backend: Flutter, Firebase Realtime Database, FastAPI
- Tools & Platforms: Linux, Git, Github, Arduino IDE, Firebase, VS Code, PyCharm, Postman
- Core Competencies: Data Structures, Computer Networking, Machine Learning, IoT Systems

PROFESSIONAL EXPERIENCE

Freelance Software & Embedded Systems Developer.

- Designed and delivered IoT-based monitoring and automation solutions, improving real-time visibility and remote decision-making.
- Developed Flutter mobile applications for real-time visualization of sensor data.
- Integrated embedded hardware, cloud backends, and AI-based logic into complete systems.
- Collaborated with clients to gather requirements, iterate on features, and deploy solutions.

PROJECTS

[MAY 2025 - JUL 2025]

Portable Air Quality Monitoring Station
Multi-Sensor IoT Environmental Analytics
Tech Stack: Arduino Nano RP2040 | MQ Series | SD Card Logging | Flutter | Custom PCB | 3D Printing [Sep 2025 - Nov 2025]

Developed a portable air quality monitoring system featuring a custom PCB–based 7-sensor array for measuring dust particulate matter, CO, CH_4, CO_2-equivalent gases, SOx/NOx, environmental noise, and temperature–humidity. Implemented a Wi-Fi Access Point server to stream real-time sensor data in JSON format via a /data endpoint, with SD card logging for offline analysis. Designed a 3D-printed lattice enclosure optimized for sensor airflow and built a Flutter mobile application with live dashboards, pollutant trend visualization, and AQI calculations.

[FEB 2025 - APR 2025]

Attendance Management System
AI-Powered Facial Recognition & Analytics Platform.
Tech Stack: Flask|DeepFace| Firebase Realtime Database| OpenCV| Pandas| Plotly| HTML/CSS/JavaScript

Built a comprehensive web-based attendance system using Flask and DeepFace for real-time facial recognition via webcam capture and verification against student/lecturer databases. Implemented role-based authentication (admin, lecturer, student) with Firebase Realtime Database for secure CRUD operations on user profiles (UID, name, branch, semester, DOB). Developed interactive dashboards with Plotly visualizations (pie charts, bar graphs, sunbursts) for attendance analytics, gender distributions, and enrollment trends.

[AUG 2025 - OCT 2025]

Health Monitoring Wearable System
Multi-Sensor Physiological Data Platform
Tech Stack: Arduino Nano RP2040 | MicroPython | MQTT | Flutter | Custom PCB | 3D Printing

Designed and prototyped a wearable health monitor capturing ECG, EEG, GSR, and temperature via custom PCB with Arduino Nano RP2040. Developed MicroPython firmware for real-time sensor fusion and MQTT telemetry to cloud. Built Flutter mobile app with live waveforms, heart rate variability analysis, and data trend visualization in 3D-printed ergonomic enclosure.

[SEP 2024 - NOV 2024]

Drone Frequency Hopping Communication System
NRF24L01 GPS Telemetry with Dynamic Channel Adaptation.
Tech Stach: Raspberry Pi | CircuitPython | NRF24L01 | PyNMEA2 | RPi.GPIO | Serial Communication

Developed bidirectional NRF24L01 communication system between Raspberry Pi sender/receiver nodes for real-time GPS drone telemetry. Implemented dynamic frequency hopping (1-50 channels) triggered by GPIO signal, enabling anti-jamming operation with sub-millisecond transmission latency. Parsed NMEA GGA sentences for precise lat/long coordinates via UART GPS module, achieving robust data transmission in contested RF environments.

[NOV 2025 - DEC 2025]

Smart Gardening Companion
AI-Powered IoT Plant Health Platform
Tech Stack: ESP32 | Python ML | Flutter | Firebase | Railway | WeatherAPI | OpenStreetMap

Built ESP32-based IoT system with soil moisture, humidity, and NPK sensors for intelligent irrigation using WeatherAPI forecasts. Developed Python ML crop recommendation engine with OpenStreetMap geolocation integration. Created Flutter mobile app for live sensor dashboards and LLM-powered chatbot queries. Deployed Railway REST backend with Firebase for seamless device-cloud synchronization.

[DEC 2024 - JAN 2025]

Smart Waste Management System
IoT-Enabled Municipal Waste Analytics
Tech Stack: Raspberry Pi | Ultrasonic/Load Sensors | AWS IoT | SageMaker ML | Silverlight

Built Raspberry Pi-based smart bins with ultrasonic/load sensors for real-time capacity monitoring and municipal notifications. Deployed AWS IoT data pipeline with SageMaker ML models for waste pattern analysis, trend forecasting, and anomaly detection. Created Silverlight dashboard for live fill-level tracking, predictive maintenance alerts, and optimized collection route planning.

EDUCATION BACKGROUND

- B.Tech in Computer Science | Sarala Birla University | Expected Graduation: June 2026 |
- Senior Secondary (Class XII) | International Public School | CBSE | 2021
- Secondary (Class X) |Cambridge School | CBSE | 2018

BACHELOR ACHIEVEMENTS & CERTIFICATIONS

- Certifications : Udemy Deep Reinforcement Learning using python 2025 , Infosys Intro to Pytorch
- Finalist – Smart India Hackathon (SIH) 2024 & 2025
  – Ranked among the top teams out of 300+ participating teams nationwide
- Led technical teams in college hackathons and project competitions
- Organized and managed robotics and technical events

ADDITIONAL INFORMATION

- Languages: English, Hindi
- Soft Skills : Problem Solving, Teamwork, Communication, Time Management

TECHNICAL INTERESTS

- Artificial Intelligence & Machine Learning
- Internet of Things (IoT) Systems
- Embedded Systems Design
- Edge AI & Smart Devices