Madhav Murali

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github.com/madhav-murali

Skills

Languages: Python, C++, C, Java, R, Go, Lua, SQL, JavaScript, Rust

Frameworks & Libraries: Node.js, Next.js, TensorFlow, PyTorch, Langchain, Supabase, Locust, Tauri
Protocols: TCP/UDP, MQTT, REST APIs, Wi-Fi, Bluetooth, LoRaWAN

IoT & Embedded Systems: ESP32, ESP8266, Arduino, Raspberry Pi, DHT22, HC-SR04, MPU6050, SG90 Servo, L298N Motor Driver

DevOps & Tools: Docker, Git, Jenkins, Postman, Prometheus, Grafana, Node-RED, n8n

Databases: MongoDB, TimescaleDB, PostgreSQL, SQL

Education

Indian Institute of Information Technology Kottayam , BTech in Computer Science and Engineering — Nov 2022 – Nov 2026

- GPA: 8.15 / 10.0

Experience

CPP Intern, Hewlett Packard Enterprise — March 2025 – July 2025

- Engineered a secure chat application prototype featuring end-to-end encryption by implementing PQC algorithms (**Kyber** and **ML-Kem**) in **Python from scratch**.
- Authored over **4,000 lines** of Python code, building the full cryptographic library and the chat application backend, completing the core modules **2 weeks ahead of schedule**.
- Optimized the Python implementation of Kyber's key generation, reducing execution time by **40%** through algorithmic enhancements and efficient NumPy array manipulations.
- Achieved **100% successful key encapsulation and signature verification** across **5,000+ simulated chat sessions**, validating the robustness of the from-scratch PQC implementation.
- Designed and demonstrated a hybrid security model for the chat app, combining PQC for quantum resistance with traditional AES-256 for symmetric encryption.

Projects

Dravidian Language Sentiment Analysis- NAACL Conference Paper — Open Review Page

- Developed a sentiment analysis model using XLM-RoBERTa for Dravidian languages and secured 3rd place in a Codalab competition hosted by NACL with an f1-score of 71
- Documented all experiments and results, leading to a paper acceptance at the NACL Conference. Submitted the Camera Ready version and are awaiting further processes.

Chatting App in Rust — Github

- Developed a **scalable WebSocket-based chat server** in Rust using **warp** and **tokio**, enabling real-time messaging with multi-user support and efficient message broadcasting.
- Implemented a **health check API endpoint** and leveraged **asynchronous processing** for high-performance, non-blocking communication.

Shuukan - Habit Tracker — Github

- **Built a habit-tracking web application**, featuring a GitHub-style contribution graph for visualizing habit streaks and progress.
- **Integrated Supabase, PostgreSQL, and Next.js**, enabling secure authentication, real-time database updates, and a seamless user experience.

Smart Environment Monitor (ESP32 + Sensors) Github

- Developed an **IoT-based monitoring system** using ESP32, DHT22, and HC-SR04 to collect and stream environmental data.
- Used the **MQTT protocol** to publish sensor data to a Node-RED backend, and visualized real-time readings on a Grafana dashboard.
- Deployed services using **Docker containers** and secured data transmission with **TLS and authentication**.

Remote-Controlled Bluetooth Vehicle (ESP32) Github

- Built a **remote-controlled vehicle** using ESP32, L298N motor driver, SG90 servo, and HC-05 Bluetooth module.
- Programmed PWM-based motor control and **obstacle avoidance** with an ultrasonic sensor.
- Powered the system using a **3.7V 18650 Li-Ion battery** with TP4056-based safe charging.

Certifications

Data Science For Engineers | NPTEL September 2023

- Gained a foundational understanding of Data Science concepts tailored for engineers
- Acquired proficiency in the R programming language for data analysis and visualization.

Artificial Intelligence: Search Methods For Problem Solving | NPTEL September 2023

- Developed a strong grasp of search algorithms used in AI problem-solving.
- Learned various search techniques, including BFS, DFS, A* search, and heuristic search.

Linux Command Line Basics | Coursera January 2025

- Covered core Linux terminal operations including file handling, permissions, piping, and scripting.
- Applied Linux commands in Dockerized and embedded system environments.

Introduction to Embedded Systems | NPTEL August 2025

- Will cover fundamentals of embedded system design, microcontrollers, and sensor interfacing.
- Includes practical lab-based implementation with ESP32 and embedded C programming.