SURYA TEJA JAKKA

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OBJECTIVE

Accomplished embedded systems engineer specializing in **end-to-end IoT product development**, with a track record of taking systems from concept and breadboard prototypes to robust, field-deployable hardware and firmware. Experienced in architecting **low-power wireless sensor networks**, designing custom dual-PCB dataloggers, and implementing reliable LoRa-based mesh communication for long-range, intermittent-connectivity environments. Adept at integrating heterogeneous sensors, building resilient data acquisition pipelines that process **50,000+ time-series measurements daily**, and enforcing stringent calibration and validation standards derived from precision metrology practices.

Brings **deep hands-on expertise with ESP32 and microcontroller-based systems**, including real-time data acquisition, power budgeting, ADC optimization, and persistent storage management on SD and similar media. Combines hardware design and embedded C/C++ firmware development with **edge ML capabilities**, having deployed TensorFlow Lite models on microcontrollers to deliver **sub-50ms anomaly detection** with production-grade precision and recall on environmental sensor data. Demonstrated ability to operate across the full IoT stack: PCB design, embedded software, wireless communication, sensor fusion, and data pipelines consuming hundreds of thousands of sensor records per week.

Excels in **cross-functional, research-driven environments**, collaborating with ecologists, climate scientists, and engineers to translate domain constraints into practical, maintainable IoT solutions for long-term field deployments. Known for an optimization mindset—achieving **<50mA average current draw** and **3+ months autonomous solar-powered operation**—and for building systems with measurable reliability targets such as **95%+ packet delivery** and **99.5%+ data consistency** across power cycles. Seeking a full-time **IoT / Embedded Systems Engineer** role where this combination of hardware-software integration, low-power wireless design, and edge intelligence can drive real-world, production-grade connected devices at scale.

CORE COMPETENCIES

Hardware & Embedded Systems

- **Microcontroller Platforms:** ESP32, ATmega328P, Arduino, Raspberry Pi (hands-on production experience)
- **Communication Protocols:** LoRa mesh networking, WiFi, Bluetooth, UART, SPI, I²C, RS-485
- **PCB & Circuit Design:** Schematic design, PCB layout, prototyping, hardware-software integration, EDA tools
- **Sensor Integration:** Dendrometers, micro tensiometers, soil moisture sensors, environmental monitoring, IMU sensors
- **Power Management:** Battery optimization, solar power integration, ultra-low-power design (<50mA), RTC integration, power budgeting
- **Measurement & Testing:** Handheld CMM (±0.001mm precision), oscilloscopes, multimeters, protocol analyzers, bench tools

Embedded Software Development

- **Languages:** C/C++ (primary for embedded), Python, MATLAB
- **Real-Time Systems:** FreeRTOS, real-time data acquisition, interrupt-driven programming, task scheduling, context switching

- **Edge ML Deployment:** TensorFlow Lite, PyTorch Mobile, on-device inference optimization, model compression
- **Firmware Development:** Bootloaders, OTA updates, persistent storage management, SD card integration, EEPROM operations
- **Version Control & Collaboration:** Git/GitHub for embedded team development, documentation practices

IoT Architecture & Protocols

- **Wireless Mesh Networking:** LoRa implementation, multi-hop topologies, routing algorithms, mesh network design
- **Data Telemetry:** Real-time sensor data streaming, cloud integration patterns, edge-to-cloud architecture
- **System Design:** Distributed architecture, node synchronization, time-series data buffering, fault tolerance
- **Data Management:** SQL (PostgreSQL, MySQL), time-series database optimization, query performance tuning

Data Processing & Analytics

- **Time-Series Analysis:** Sensor data preprocessing, anomaly detection algorithms, trend analysis, pattern recognition
- **Machine Learning:** Lightweight ML models for embedded platforms, edge inference, model optimization for low-power devices
- **Data Visualization:** MATLAB, Matplotlib, Seaborn, Plotly for real-time sensor monitoring and analysis
- **Signal Processing:** ADC optimization, noise filtering, calibration protocols, sensor fusion

WORK EXPERIENCE

Northern Arizona University, Flagstaff, AZ, USA
Research Associate – Datalogger Development (ECOSAIL Lab) *(August 2024 – Present)*

KEY ACHIEVEMENT: Designed and engineered production-ready dual-PCB IoT datalogger system for environmental monitoring with 95%+ network reliability and 3+ month autonomous field operation.

IoT Hardware & System Architecture:

- Designed custom dual-PCB datalogger architecture for precision environmental monitoring, with an ESP32-based acquisition front-end (12-bit ADC, 5+ sensor types) and a dedicated aggregation and storage board with SD card and RTC.
- Implemented a LoRa RF mesh network achieving 2km+ line-of-sight range across 6 distributed nodes with 95%+ packet delivery rate in remote field conditions.
- Optimized power consumption to <50mA average current draw, enabling 3+ months of autonomous solar-battery-powered operation in remote deployments.
- Built a sensor validation pipeline using metrology principles to ensure ±1% accuracy across dendrometers, micro tensiometers, and soil moisture sensors.

Data Acquisition & Management:

- Architected the system to process 50,000+ data points daily at 1-minute intervals from heterogeneous environmental sensors.
- Designed a data pipeline handling 500MB+ weekly sensor data with automated quality checks, preprocessing, and time-series validation before storage.
- Implemented robust state management achieving 99.5%+ data consistency across power cycles, network interruptions, and restarts.

Interdisciplinary Collaboration:

- Collaborated with a team of 5 researchers (ecologists, climate scientists, engineers) to translate monitoring requirements into embedded system specifications.
- Established standardized protocols for data acquisition and validation to support long-term climate change monitoring.
- Coordinated with MRTL Lab to align sensor calibration and validation standards for the datalogger platform.

Status: System in advanced PCB testing phase, preparing for multi-site deployment across 6 remote monitoring locations.

Northern Arizona University, Flagstaff, AZ, USA

Research Associate (MRTL Lab) *(August 2024 – Present)*

- Achieved ±0.001mm precision measurements using handheld CMM across 50+ samples, establishing quality assurance protocols for advanced materials research.
- Improved measurement accuracy by 15% via systematic calibration procedures for surface profilers and elemental analyzers.
- Processed 200+ precision measurements weekly for research validation, ensuring consistency and reliability of metrology data.
- Developed metrology standards that support ECOSAIL datalogger sensor validation, linking materials characterization with sensor network reliability.
- Led cross-lab efforts to standardize sensor validation and calibration workflows for embedded IoT systems.

TATA Consultancy Services, Hyderabad, India

Assistant System Engineer – Trainee *(July 2021 – August 2022)*

- Automated 15+ manual reporting processes using SQL Server, reducing report generation time from 4 hours to 15 minutes (94% efficiency gain).
- Designed normalized schemas for 10,000+ borrower records and 50,000+ transaction entries with strong integrity constraints.
- Replaced 25+ Excel-based workflows with SQL-based reports, improving data accessibility for 50+ business users.
- Improved query performance by 60% through index tuning and query optimization techniques.

ACADEMIC PROJECTS

Embedded Machine Learning for Real-Time Sensor Anomaly Detection | (2024, ECOSAIL Datalogger Support)

- Trained lightweight TensorFlow Lite models (50KB–200KB) for anomaly detection on environmental sensor data, optimized for ESP32 deployment.
- Achieved 92% precision and 94% recall on edge anomaly detection using 500,000+ labeled sensor datapoints.
- Implemented edge inference with <50ms latency, enabling fully on-device anomaly detection with no cloud dependency.
- Reduced false positives by 78% via adaptive thresholding based on historical patterns and environmental context.
- Integrated as an analysis and alerting layer for the ECOSAIL datalogger pipeline.

Smart Home IoT Control System with Multi-Protocol Communication | (Bachelor's Capstone, 2020)

- Built an end-to-end IoT control system using Arduino with a MATLAB-based GUI for real-time device management and monitoring.
- Implemented WiFi and Bluetooth-based mesh communication to control 5+ smart devices (lights, thermostats, sensors) with ~50ms response time.
- Exported the MATLAB UI as a standalone application (<5MB footprint) suitable for lightweight deployments.
- Implemented persistent state management achieving 99.5% data consistency across restarts and power cycles.
- Demonstrated integration of heterogeneous IoT devices and human-machine interface design fundamentals.

Intelligent Web Scraping & Automation Pipeline for Job Optimization | (2024)

- Developed a distributed scraping framework in Python using Selenium and BeautifulSoup to process 50,000+ job postings daily from 20+ sources.
- Achieved 3× speedup (4 hours → 1.5 hours) via 8 concurrent worker threads.
- Implemented an 85%-accurate job matching algorithm using 50+ criteria.
- Built dashboards for tracking applications, responses, and interviews, reducing time-to-hire by 60%.

EDUCATION

Northern Arizona University, Flagstaff, AZ, USA — May 2024
Master of Science, Computer Science — GPA: 3.55/4.0

GITAM Deemed to be University, Hyderabad, Telangana, India — June 2021
Bachelor of Technology, Electrical Electronics and Communication Engineering — GPA:8.76/10.0