AMAL MADHU

M.Tech Scholar | Neuromorphic VLSI Researcher

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RESEARCH STATEMENT

I am an electronics engineer driven by a specific fascination: **Bio-inspired Hardware**. My academic journey is focused on bridging the gap between biological neural efficiency and silicon-based architecture. With a strong DIY background, I approach engineering through reverse-engineering and prototyping. I am currently researching **Neuromorphic VLSI**, aiming to design circuits that mimic synaptic plasticity and neuronal spiking behavior. As a fresher with no prior corporate conditioning, I bring a clean, innovative perspective to mixed-signal design and AI hardware integration.

EDUCATION

M.Tech in Electronics Engineering (VLSI Specialization) **June 2025 – Present**
Digital University Kerala, School of Electronics & Automation (SoESA)

- **Specialization:** AI Integration in Hardware, Mixed-Signal Design.
- **Key Academic Focus:** Designing hardware accelerators for AI; Studying Quantum Physics applications in modern electronics.
- **Status:** First Year (Early 2nd Semester).

B.Tech in Electronics & Communication Engineering **2020 – 2024**
College of Engineering & Management, Punnapra

- **CGPA:** 6.66
- **Core Coursework:** Digital Signal Processing, Embedded Systems, Analog Circuits, Microcontrollers.

Secondary Education

- **Higher Secondary (12th):** CGPA 7.4 (Physics, Chemistry, Maths, Computer Science).
- **SSLC (10th):** CGPA 8.9.

DETAILED PROJECTS & RESEARCH

UNet for Underwater Image Analysis *Current Research (SIH)*
Role: AI Researcher & Model Architect

- **Objective:** To solve the visibility issues in maritime security cameras caused by underwater haze and turbidity.
- **Methodology:** Implementing a U-Net convolutional network using **PyTorch**. Currently experimenting with "Attention U-Net" variants to focus model learning on specific image features rather than background noise.
- **Innovation:** Utilizing a custom dataset and training pipeline rather than pre-trained "black box" solutions to understand the mathematical underpinnings of the weights.
- **Outcome:** Prototype demonstrated at Bengaluru Nagarrojuna College; currently optimizing for edge-deployment.

Accident Detection & Alerting System *B.Tech Capstone*
Role: System Integrator (DIY Implementation)

- **Objective:** To reduce emergency response time in vehicular accidents.
- **Implementation:** Designed a hardware module integrating vibration sensors and GPS modules with a microcontroller.
- **DIY Approach:** Hand-soldered components and wrote raw Embedded C code to handle interrupt signals from the sensor, ensuring immediate SMS triggering via GSM.

Water Quality Monitoring System *B.Tech Project*
Role: Hardware Designer

- Developed a low-cost, portable system to measure pH and turbidity. Focused on sensor calibration and analog-to-digital signal conversion accuracy.

TECHNICAL EXPERTISE

- **Hardware Description:** Verilog, SystemVerilog (Focus on Register Transfer Level design).
- **VLSI & EDA:** Cadence, Synopsys (Academic exposure to flow), Circuit Simulation.
- **Neuromorphic Concepts:** Spiking Neural Networks (SNNs), Memristive Systems, Synaptic Modeling.
- **Programming:** Python (Advanced libraries: PyTorch, NumPy), C/C++, Bash Scripting.
- **Documentation & Tools:** LaTeX (Scientific writing), VSCode, Git Version Control.

CERTIFICATIONS CONTINUOUS LEARNING

- **NPTEL:** Introduction to Cybersecurity.
- **Udemy (Angela Yu):** 100 Days of Code - Python Pro Bootcamp (Full Stack focus).
- **Udemy (Imran Afzal):** Linux for IT and DevOps.
- **Self-Study:** Consistently reading research papers on Quantum Electronics and Neural Engineering.

AWARDS & ACTIVITIES

Sports Athletics

- **1st Place:** 1500m Race (Inter-School Competition).
- **3rd Place:** 1500m Race & Shotput (Intra-School, 11th & 12th Grade).
- Active practitioner of Martial Arts, Badminton, and Table Tennis.

Leadership

- **Maths Club Leader (10th Std):** Organized peer-tutoring sessions and logic puzzle competitions.

PERSONAL INTERESTS

- **DIY Prototyping:** Passionate about taking things apart to understand their internal logic and building small electronic utilities.
- **Neuromorphic Research:** deeply interested in the physics of computation—how to make a silicon chip "think" like a biological brain.
- **Hobbies:** Drawing, Reading Scientific Literature, Cycling, Chess.