

Sajitha Madugalle

Biomedical Engineering Undergraduate, University of Moratuwa, Sri Lanka

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Professional Summary

Dedicated Biomedical Engineering undergraduate with strong skills in electronic circuit design and analysis, Printed Circuit Board (PCB) design, 3D modeling and 3D printing, and VLSI/ASIC design. Experienced in developing healthcare-focused solutions, and embedded systems. Proficient in electronic instrumentation and biosignal acquisition techniques.

Interest Areas

My interests focus on electronic device design and manufacturing, PCB design, embedded system design, and VLSI. I am also interested in biosignal processing and human-computer interaction, with the aim of developing innovative solutions that connect technology and healthcare.

Professional Experience

Visiting Research Intern - The University of Sydney, NSW, Australia

Dec 2024 - June 2025

Human-Computer Interaction

- Collaborating on HCI research projects focusing on electrotactile feedback on fingertips
- Computational design and 3D printing techniques for deployable structures

Instructor – Skillsurf

May 2025 – Sep 2025

Instructor for the “Analog CMOS IC Design and Simulation Course 2025,” delivering outcome-oriented education with strong theoretical foundations and hands-on, iterative learning.

Founding Member – Aura Digital Labs

Dec 2024 – Present

Co-founded a technology startup specializing in AI solutions, embedded systems and IoT, robotics, cloud applications, and DevOps.

auradigitalabs.com

Education

University of Moratuwa, Sri Lanka

Mar 2021 – Dec 2026 (Expected)

BSc Engineering (Hons), Biomedical Engineering

GPA: 3.75 / 4.00

- **Honors:** Dean’s List (Semesters 1, 2, 4, 6)
- **Relevant Coursework:** Analog Electronics, Digital Electronics, Signals and Systems, Device design and development, Engineering Mathematics

Government Science College, Matale, Sri Lanka

2020

G.C.E. Advanced Level: 3 A’s (Z-score: 2.1243), Physical Science Stream

Projects

Electrooculography (EOG)-Based Drowsiness Detection System for Early Alerts

2024

The project “Steer Safe” is an electrooculography-based drowsiness detection system that identifies fatigue patterns in EOG signals and alerts drivers to prevent road accidents.

(Winners – IEEE Sri Lanka Section Challenge Sphere, Circuit Challenge)

github.com/orgs/PulseX-Solutions/repositories

Real-Time Electromyography (EMG) Monitoring System and EMG-Controlled Flappy Bird Game (Human-Computer Interaction)

2025

A complete electromyography (EMG) acquisition and monitoring system incorporating custom hardware design, analog signal conditioning, embedded microcontroller firmware, and real-time signal visualization. Human-Computer Interaction (HCI) is demonstrated through an EMG-controlled Flappy Bird game driven by user muscle activity.

github.com/Sajitha-Madugalle/EMG-Capture-and-Visualization

SPI Master–Slave RTL Design and Synthesis

2025

A fully synthesizable SPI master–slave full-duplex communication module implemented in Verilog HDL. The project covers the complete RTL-to-GDSII design flow using Cadence EDA tools, including RTL design, functional verification, logic synthesis, place-and-route, and static timing analysis.

github.com/Sajitha-Madugalle/spi-fdx-master-slave-rtl-to-gds

32-bit Floating-Point Arithmetic Logic Unit Design and FPGA Implementation (DE2-115)

2024

Design and implementation of a 32-bit IEEE-754 single-precision floating-point Arithmetic Logic Unit (ALU) supporting addition, subtraction, multiplication, and division. The design was verified through simulation and deployed on the DE2-115 FPGA platform.

github.com/Sajitha-Madugalle/32-bit-Floating-Point-Arithmetic-Unit

Analysis and Tape-Out Design of a CMOS Inverter IC Using Sky130 PDK

2024

A detailed analysis and tape-out-ready design of a CMOS inverter using open-source EDA tools including ngspice, Magic VLSI, and xschem. The design was implemented using the Sky130 Process Design Kit (PDK), demonstrating a complete open-source ASIC design workflow.

github.com/Sajitha-Madugalle/cmos_inverter_sky130

100 KSPS 8-bit Fully Differential SAR Analog-to-Digital Converter (ADC) for Low-Power Applications

2024

A CMOS SAR ADC layout design developed using open-source tools as part of the IEEE UNIC-CASS program, targeting low-power and moderate-speed data acquisition applications.

github.com/Sajitha-Madugalle/8bit-100KSPS-Fully-differential-SAR-ADC-design

Portable Analog Electrocardiogram (ECG) Monitor

2023

A portable ECG monitoring device constructed primarily using analog components, integrating biosignal acquisition and on-board filtering on a custom PCB. Digital components were incorporated to display ECG waveforms for real-time visualization of cardiac electrical activity.

github.com/Sajitha-Madugalle/Analog_Heart_Rate_Monitor

Heart Sound Classification Using CNN with 1D-LBP and 1D-LTP Features

2025

Implementation of the research paper “Heart Sounds Classification Using a CNN with 1D-Local Binary and Ternary Patterns,” including signal preprocessing, feature extraction using 1D-Local Binary Patterns (1D-LBP) and 1D-Local Ternary Patterns (1D-LTP), and classification using a Convolutional Neural Network (CNN) for phonocardiogram (PCG) signals.

github.com/Sajitha-Madugalle/heartsound-lbp-ltp-cnn

Vibration Analysis and Damping Factor Estimation of Mechanical Systems

2024

A vibration analysis system for robotic arms using MATLAB and a dedicated data acquisition device. The system evaluates natural vibration characteristics and estimates damping factors using FFT and power spectral density (PSD) analysis.

github.com/Vibration-Analysis/Vibration-Analysing-system-for-Robot-arms

Window Capture and Content Browsing Tool Using Gemini API

2024

A real-time window capture and content reading tool developed using OpenCV and Tesseract OCR. Integration with the Gemini API enables intelligent browsing shortcuts, improving efficiency when navigating and consuming digital content.

github.com/Sajitha-Madugalle/Reading_Companion_OpenCV

Volunteering Experience

IEEE Engineering in Medicine and Biology Society (EMBS) Student Branch Chapter at the University of Moratuwa

Oct 2024 – Present

- *Chairperson for the term 2025–2026*
- *Vice Chairperson for the term 2024–2025*
- *Event Co-Chair – Brainstorm 2024*

Brainstorm is Sri Lanka’s premier healthcare innovation challenge organized by the IEEE EMBS Student

- *Treasurer for the term 2025–2026*

Technical Skills

- **Hardware Design (Advanced):** Altium Designer, LTspice, ngspice, PSIM, Intel Quartus Prime, SolidWorks.
- **Programming (Proficient):** Python, Verilog, SPICE, MATLAB.
- **VLSI / ASIC (Intermediate):** xschem, Magic VLSI, Verilog HDL.
- **Tools & Frameworks:** TensorFlow, OpenCV, Git/GitHub, LaTeX.

Honors and Awards

Dean's List Honors, Faculty of Engineering, University of Moratuwa <i>Semester 1 , Semester 2 , Semester 4 and Semester 6</i>	<i>2021 - 2025</i>
Circuit Challenge - IEEE Sri Lanka Section Challenge Sphere Event Series <i>Champions</i>	<i>2024</i>
National Microelectronics Olympiad - Sri Lanka Chips Challenge IEEE <i>Top 10</i>	<i>2024</i>
Silicon Pulse, a 24-hour Analog Circuit Design Competition <i>Champions</i>	<i>2024</i>
School Colours for Chess - Sri Chandananda Buddhist College, Kandy	<i>2012</i>
Gold Medalist - Kandy District Youth Chess Championship - U14	<i>2014</i>
Brainstorm '22 Semifinalists	<i>2022</i>
Machine Learning Specialization by DeepLearning.AI	

Extra-Curricular Activities

IEEE Engineering in Medicine and Biology Society (EMBS) Student Branch Chapter

- **Invited Speaker, Research Day 2025 – Faculty of Medicine:** Delivered a technical talk titled “Advancements in Medical Technology through Collaboration.”
- **Workshop Presenter:** Conducted a workshop on “Advanced Biomedical Electronics and Computational Technologies”.

Mathematical Society, University of Moratuwa

Jan 2024 - Apr 2024

- **Academic Pillar - Organizing Committee Member, Enigma 2024:** Developed advanced mathematical coding challenges for the national-level hackathon.
- **Resource Person, MTutor:** Conducted educational sessions and created content for school students as part of the society's outreach program.

Electronic Club, University of Moratuwa

2023 - Present

- **Workshop Presenter, Sri Lanka Robotics Challenge (SLRC):** Delivered technical workshops on robotics and electronics for school-level participants.
- Participated in **Abhina 2023 and 2025.**

Government Science College, Matale : Senior Prefect

2018 – 2020

Sri Chandananda Buddhist College, Kandy : School Chess Team Captain

2012

Languages

English: Proficient **Sinhala:** Native

References

Chamira U. S. Edussooriya
BSc Eng (Moratuwa), MSc (UVic), PhD (UVic), MIEEE
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