MARIO DE SILVA

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RESEARCH INTERESTS

I am broadly interested in **Signal Processing, Implicit Neural Representations, Spectral Imaging** and **Stochastic Processes**, with a focus on building models that bridge theory and real-world measurement.

EDUCATION

BSc. (Hons.) in Electrical and Electronic Engineering June 2021 - August 2025
(First Class Honours) **GPA: 3.85/4.00**
University of Peradeniya, Sri Lanka

G.C.E. Advanced Level Examination 2019
Physics (A), Chemistry (A), Pure & Applied Mathematics (B) Ranked 43rd in the district

BCS Certificate and Diploma in IT 2017
BCS (The Chartered Institute for IT)
Completed Certificate and Diploma levels, awarded the **World Prize** at Diploma level

PUBLICATIONS

J – JOURNALS, C – CONFERENCES

J 1 **AVSim – Realistic Simulation Framework for Airborne and Vector Borne Disease Dynamics**
Pre-print
in *IEEE Transactions on Systems, Man and Cybernetics: Systems* [Under review]
P. Thennakoon, **M. De Silva**, M. Viduranga, M. Liyanage, S. Godaliyadda, M. P. Ekanayake, V. Herath, A. Rathnayake, G. Thilakarathne, J. Ekanayake, S. Dharmarathne.

C 2 **COSMO-INR: Complex Sinusoidal Modulation for Implicit Neural Representations**
Pre-print
in *International Conference on Learning Representations 2026 (ICLR 2026)* [Under review]
P. Thennakoon, A. Ranasinghe, **M. De Silva**, B. Epakanda, R. Godaliyadda, M. P. Ekanayake, V. Herath.

C 3 **Real World Data-Driven Agent Based Modeling for Health Policy Insights During Epidemics**
DOI | Presentation
in *International Conference on Advancements in Computing 2024 (ICAC 2024)*
Outstanding Paper Award in ICAC
S. Liyanage, M. Viduranga, **M. De Silva**, R. Godaliyadda, M. Ekanayake, V. Herath, J. Ekanayake.

C 4 **Deep Learning for Soil Moisture Content Estimation via Reflectance Multispectral Imaging**
DOI | Presentation
in *9th International Conference on Advancements in Technology and Computing 2024 (ICATC 2024)*
S. Ranasinghe, S. Jayakody, **M. De Silva**, V. Herath, R. Godaliyadda, P. Ekanayake, S. Navaratnarajah, F. Kizei, G. Thilakarathne.

C 5 **From Samples to Functions: Implicit Neural Representations for Continuous Modeling**
in *19th International Conference on Industrial and Information Systems 2025 (ICIIS 2025)* [Accepted and to be published]
B. Epakanda, **M. De Silva**, A. Ranasinghe, P. Thennakoon, R. Godaliyadda, M. P. Ekanayake, V. Herath.

HIGHLIGHTED ACHIEVEMENTS

- Awarded **second runners up** in the **Best Undergraduate Project in Sri Lanka - Manamperi Award 2025** for the Final Year Project on "Multispectral Imaging"
- Awarded the **Silver Award** in the Engineering field at **Sahasak Nimawum Inventions and Innovations Competition 2024** for for the Final Year Project on "Multispectral Imaging"
- **Outstanding Paper Award** at **ICAC 2024** for the paper titled "Real World DataDriven Agent-Based Modeling for Health Policy Insights During Epidemics".
- **Finalists** at the Inter-University Hackathon **"RealHack" 2024,** organized by the University of Kelaniya (team "Croods").
- **Second runners up** in the Productivity category at **ACES Hackathon 2023** (team "Croods"), organized by the Association of Computer Engineering Students, University of Peradeniya.

EXPERIENCE

Research & Development Engineer November 2025 – Present
Farbe Technologies
Working on AI-based customer solutions in industrial, agricultural, healthcare and information domains.

Volunteer Researcher May 2023 – November 2025
Multidisciplinary AI Research Center, University of Peradeniya
Served as a voluntary researcher from undergraduate years across multiple AI research groups at MARC, contributing to the following foundational and applied machine learning and deep learning projects.

- Implicit Neural Representations (INRs)
- Agent-Based Modelling of Human Mobility
- Multispectral Imaging for Agricultural and Environmental Monitoring
- Entropy Based Hallucination Detection in Large Language Models

Trainee Research & Development Engineer July 2023 – October 2023
SLT Digital Lab, Sri Lanka Telecom
Supported applied machine learning projects using TensorFlow and Python deployed on AWS-based pipelines. Assisted in data preparation, model training and evaluation for telecommunication-related analytics and automation tasks.

PROJECTS

HeritageAI | 2025 – Present
Under Nvidia Academic Grant Program

Focused on developing a unified restoration pipeline for degraded Sri Lankan historical images using implicit neural representations (INRs) and diffusion models, with current work focused on INR based modules for both denoising and upscaling.
Concepts: Implicit Neural Representations (INRs), Diffusion Models, Image Restoration.

Implicit Neural Representations (INRs) | 2024 – Present

Investigated INRs as compact continuous function models for vision and signal processing. Developed and analyzed novel activation functions with improved spectral behavior, achieving gains across image representation and inverse problems including denoising, inpainting, 3D occupancy modeling and neural radiance fields (NeRF).
Concepts: Deep Learning, Fourier Analysis, Conditional Neural Networks with Prior Knowledge, Chebyshev Polynomials, Neural Tangent Kernels (NTKs), Wirtinger Derivatives.

Entropy Based Hallucination Detection in Large Language Models | 2025 – Present

Developing an entropy driven method for identifying hallucinations by clustering LLM responses with spectral clustering and analyzing response mode distributions.
Concepts: Entropy Measures, Unsupervised Clustering, Responsible AI.

Agent-Based Modelling of Human Mobility | 2023 – 2025
Under AI4COVID Grant

Modeling human behavior for epidemiological analysis by utilizing GPS data along with mathematical models and advanced machine learning algorithms within Agent-based Models (ABMs)
Concepts: Agent-Based Modeling (ABM), DBSCAN & Spectral Clustering, Mathematical & Statistical Models, Markov Decision Process, Data Structures.

Multispectral Imaging for Agricultural and Environmental Monitoring | 2023 – 2025

Conducted multispectral sensing research for environmental and industrial analysis, developing machine learning models for soil characterization, algal bloom detection and adulterant identification.
Key studies.

- **Soil Moisture Content Estimation (2023–2024):** Built regression models to estimate moisture levels from spectral features.
- **Soil Classification and Composition Prediction (2024–2025):** Developed models to classify soil texture and predict composition.
- **Microcystis Cell Count and Toxicity Estimation (2025):** Designed regression models to detect harmful algal blooms.
- **Palm Oil Adulteration Detection in Milk (2025):** Applied reflectance and transmittance based multispectral imaging to identify non-dairy adulterants.

Concepts: Multispectral Sensing, Feature Extraction, Regression and Classification Models, Random Forests, CNNs.

Project CamBlocks 2024
Modular CCTV System on ESP32

Designed and developed a fully modular CCTV camera platform on ESP32 with separable units for the base camera, two axis rotatable mount, power backup and IR lighting for night vision, with integration of cloud services for remote access and storage.
Concepts: Embedded Systems, IoT Architectures, Microcontroller Programming, Cloud Computing.

SKILLS AND INTERESTS

Programming	Python, C, C++, JavaScript
Machine Learning	Scikit-learn, PyTorch, TensorFlow, Keras, cv2
Simulation and Tools	Latex, git, Proteus, Multisim, PSCAD (power system simulation), AutoCAD
Core Interests	Signal Processing, Machine Learning, Artificial Intelligence, Data Analytics, Implicit Neural Representations, Agent-based Modelling, Applied Statistics
Professional Skills	Analytical thinking, problem solving, teamwork, communication

TEST SCORES

IELTS 10th November 2025
Overall Band Score: 9.0
Reading: 9.0 Listening: 9.0 Speaking: 9.0 Writing: 8.0

EXTRA CURRICULAR ACTIVITIES

- Vice President, Ceylon University Dramatic Society, University of Peradeniya (2023 - 2024).
- Member, Newmann Society, University of Peradeniya (2021 - Present).

OUTREACH

- Volunteered at the session **"AI for All: Transforming the Future Across Fields"**, held at Trinity College Kandy (2025), to teach foundational concepts of AI to students in grades 9-13, and to encourage responsible use of modern AI techniques.
- Participated in an outreach program in Vavuniya (2025) to share knowledge on Implicit Neural Representations with A-Level and university students, encouraging regional engagement in advanced AI research and applications.
- Volunteered at the **"Frontiers in AI and Sharing Experiences"** session, part of iPURSE 2024 at the University of Peradeniya, to engage over 500 local students in foundational and emerging concepts in AI.

REFEREES

Prof. Roshan Godaliyadda
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