Praveen Sumanasekara

dmu.praveen@gmail.com +94719600222 Portfolio Website Praveen Sumanasekara
github.com/DMUPraveen ResearchGate Youtube

Profile Summary

I am a researcher driven by self-directed exploration across multiple scientific domains, which has given me a cross-disciplinary perspective and a strong preference for theory-driven understanding. I approach problems from first principles, examining underlying assumptions and drawing on insights from different areas of science to guide my intuition. Exploration for me is both analytical and practical: I use simulations, experiments, and implementation to probe how ideas behave in reality, and refine those observations through careful mathematical reasoning. This continual interplay between fundamental analysis and practical, implementation-driven exploration is central to how I understand problems and develop principled solutions.

Highlights

- **National Rank 2** (out of 30,000+ candidates) in the 2019 G.C.E. Advanced Level University Entrance Examination.
- **World Rank 5** (National Rank 1) in IEEEXtreme 19.0 programming competition, 2025 out of 8,000+ teams from 75 countries (Credentials – Team Insomniacs).
- **First in Engineering** (1/480) with a perfect GPA of 4.0/4.0 at the University of Peradeniya.
- **4+ peer-reviewed publications**, including **Q1 Elsevier journals** and **IEEE conferences**.
- **Multiple International Olympiad Medals**, including IMSO Gold Medal and the Award for Best Theory Performance (2013), and Bronze Medal at the **International Chemistry Olympiad** (2020).

Education

B.Sc. Engineering (Hons.) in Electrical and Electronic Engineering *2021 - 2025*
University of Peradeniya

- **GPA: 4.0/4.0**
- **Top of the class** in Engineering (1/480 - Based on Tentative Grades)
- Degree program is accredited by **Washington Accord**

G.C.E. Advanced Level (National University Entrance Examination) *2011 - 2019*
Badulla Central College

- **Country Rank: 2** (Out of total 30000+ students)
- Z score: 3.1840
- Combined Mathematics (A), Physics (A), Chemistry (A) (Maximum grade : A) View Credentials

Publications

Peer-reviewed Journals

Hyperspectral Unmixing with Spatial Context and Endmember Ensemble Learning with Attention Mechanism January 2025
ISPRS Open Journal of Photogrammetry and Remote Sensing
R.M.K.L. Ratnayake, *D.M.U.P. Sumanasekara*, H.M.K.D. Wickramathilaka, G.M.R.I. Godaliyadda, H.M.V.R. Herath, M.P.B. Ekanayake
10.1016/j.ophoto.2025.100086

Preprocessing Algorithm Leveraging Geometric Modeling for Scale Correction in Hyperspectral Images for Improved Unmixing Performance — Under Review

IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing

Praveen Sumanasekara, Athulya Ratnayake, Buddhi Wijenayake, Keshawa Ratnayake, Roshan Godaliyadda, Parakrama Ekanayake, Vijitha Herath

arxiv.org/abs/2508.08431

Mamba-FCS: Joint Spatio- Frequency Feature Fusion, Change-Guided Attention, and SeK Loss for Enhanced Semantic Change Detection in Remote Sensing — In Revision – Recommended for Publication

IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing

Buddhi Wijenayake, Athulya Ratnayake, *Praveen Sumanasekara*, Roshan Godaliyadda, Parakrama Ekanayake, Vijitha Herath, Nichula Wasalathilaka

arxiv.org/abs/2508.08232

A low-cost, activated carbon-coated, stainless-steel counter electrode for dye-sensitized solar cells — February 2024

Ceylon Journal of Science

M. A. K. L. Dissanayakea, T. S. M. Liyanage, J. M. K. W. Kumari, *D. M. U. P. Sumanasekera*, T. Jaseetharan, W. I. Sandamali, G. K. R. Senadeera

10.4038/cjs.v53i1.8237

International Conference Publications

Enhanced SCanNet with CBAM and Dice Loss for Semantic Change Detection — November 2025

2025 Moratuwa Engineering Research Conference (MERCon)

R.M.A.M.B. Ratnayake, W.M.B.S.K. Wijenayake, *D.M.U.P. Sumanasekara*, G.M.R.I. Godaliyadda, H.M.V.R. Herath, M.P.B. Ekanayake

10.1109/MERCon67903.2025.11217111

Comparison of Appliance Signature Classification Methods for Non-Intrusive Load Monitoring — January 2025

International Conference on Electrical Engineering (EECon)

Keshawa Ratnayake, Mahela Pandukabhaya, *Praveen Sumanasekara*, Uthpala Ratnayake, Roshan Godaliyadda, Janaka Ekanayake

10.1109/EECon64470.2024.10841878

A Detailed Analysis of Datasets Used in HSI in the Context of Mixture Models for Unmixing — August 2024

Moratuwa Engineering Research Conference (MERCon)

D. M. U. P. Sumanasekara, R. M. K. L. Ratnayake, H. M. K. D. Wickramathilaka, G. M. R. I. Godaliyadda, M. P. B. Ekanayake, H. M. V. R. Herath

10.1109/MERCon63886.2024.10689093

Endmember Abundance Prediction in Hyperspectral Unmixing: The Impact of Endmember Extraction Algorithms and Self-Attention in Autoencoders — August 2023

International Conference on Industrial and Information Systems, ICIIS

H. M. K. D. Wickramathilaka, R. M. K. L. Ratnayake, *D. M. U. P. Sumanasekara*, G. M. R. I. Godaliyadda, M. P. B. Ekanayake, H. M. V. R. Herath

10.1109/ICIIS58898.2023.10253564

Precision Spatio-Temporal Feature Fusion for Robust Remote Sensing Change Detection — Accepted

International Conference on Industrial and Information Systems (ICIIS) 2025

Buddhi Wijenayake, Athulya Ratnayake, *Praveen Sumanasekara*, Nichula Wasalathilaka, Mathivathanan Piratheepan, Roshan Godaliyadda, Mervyn Ekanayake, Vijitha Herath

https://arxiv.org/abs/2508.08431

Awards and Achievements

International Awards

- Top 100 International Ranks in IEEEXtreme programming competition
  - 2025 **World Rank 5** and National Rank 1 (out of 8000+ teams from 75 countries) View Credentials
  - 2024 **World Rank 66** and National Rank 1 (out of 7000+ teams from 75 countries) View Credentials
  - 2023 **World Rank 65** and National Rank 1 (out of 7000+ teams from 69 countries) View Credentials

- **Bronze Medal** in the International Chemistry Olympiad 2020 (Hosted by Turkey) (over 80 participating countries worldwide) View Credentials

- 2013 **Bronze Medal** International Junior Science Olympiad - India (over 70 participating countries worldwide) View Credentials
- International Mathematics and Science Olympiad (IMSO) (over 50 participating countries)
  - 2013 **Gold Medal** View Credentials and **Award for Best Performance**- Philippines View Credentials
  - 2012 **Gold Medal**- India View Credentials
  - 2011 **Silver Medal** -Philippines View Credentials

- Participant of Huawei Seeds for the Future Workshop and Competition 2024 Shenzhen, Guangdong, China View Credentials

- **Top 1000** ranker out of 16,000 international Participants in Google Kickstart competitions (Highest Rank 289th globally) 2019

Academic Awards

- **National 2nd** in 2019 G.C.E Advanced Level Physical Science Stream

- **Professor E. F. Bartholomeusz Prize for Best Performance** in Engineering Mathematics in the second year, 2023 View Credentials

- **Professor E. F. Bartholomeusz Prize for Best Performance** in Engineering Mathematics in the first year, 2022 View Credentials

- **Dr. Tilak Peiris Award for Best Performance** in General Programme in Engineering 2022 in University of Peradeniya View Credentials

- **Peradeniya University Alumni Association of New South Wales (PUAAN) Scholarship for Best Performance** at First Examination, Faculty of Engineering in University of Peradeniya 2022 View Credentials

National Awards

- **First Runner-up** in the Group Category of the prestigious Manamperi Award 2025, organized by Sri Lanka Association for the Advancement of Science View Credentials

- **1st place** in ACES Coders 2024 and 2022 National Programming Competition (100+ top unviersity teams) View Credentials for 2024 View Credentials for 2022

- **1st place** (out of over 450 participating teams) in MoraExtreme 2023, 2022 and 2021 coding competition organized by the University Of Moratuwa View Credentials

- **2nd Runner-up** in RealHack 5.0 Hackathon Competition, University of Kelaniya 2024 View Credentials

- **1st Runner-up** in the IESL ROBOGAMES National Robotic Competition 2022 View Credentials

- **1st place** in the Robot Simulation Competition Pbots 2019 organized by the University of Peradeniya (Team 404) View Credentials

Test Scores

IELTS - 8.5 Overall, Listening - 9.0, Reading - 9.0, Speaking - 8.5, Writing - 7.5

Experience

Research Assistant *2025*
Multidisciplinary AI Research Centre

- Conducting Research in Remote Sensing, Computational Methods for Satellite Images, and Signal Processing for Smart Grid Systems

Voluntary Research Assistant *2023-2024*
Multidisciplinary AI Research Centre

- Conducting Research in Remote Sensing, specifically focusing on the development of Hyperspectral Unmixing Algorithms and Change Detection

Huawei Seeds for the Future Workshop and Competition *2024*
Huawei, Shenzhen, Guangdong, China

- Participated in the workshop on 5G, Renewable Energy, Smart Grid Technology, Artificial Intelligence, and Cloud Computing organized by Huawei and held in Shenzhen, China.
- Participated in the Huawei Seeds for the Future entrepreneur competition.

Research and Development Engineering Intern *2023, 2024*
Orise Pvt. Ltd.

- Worked as a developer of Embedded Software and Statistical Modelling, Inference and Machine Learning Engineer

Casual Instructor *2024*
Department of Computer Engineering, University of Peradeniya

- Worked as a Casual Instructor for the course Introduction to Programming and Networking for Electrical Engineering.

Voluntary Research Assistant *2020*
National Institute of Fundamental Studies

- Worked as a Voluntary Research Assistant studying Dye-Sensitized Solar Cells

Selected Projects

Hypersepctral Unmixing for Remote Sensing
This project focuses on developing algorithms for analyzing hyperspectral images acquired from satellites. Unlike traditional RGB images with three color bands, hyperspectral images capture reflected light across hundreds of narrow wavelength bands, resulting in high-dimensional data. Each pixel's spectral signature represents a mixture of multiple materials (endmembers) such as soil, vegetation, and water. The objective is to estimate both the spectral signatures of these endmembers and their corresponding abundances (proportions) within each pixel using unsupervised methods. Our work includes developing cross-attention-based unmixing algorithms, designing preprocessing techniques grounded in mathematical modeling to enhance existing methods, and analyzing various initialization schemes to improve algorithm performance.

Non-Instrusive Load Monitoring
Non-Intrusive Load Monitoring (NILM) focuses on the development of algorithms for extracting individual appliance power consumptions from the aggregate signals obtained from smart meters. Our current research focuses on the development of NILM algorithms that are computationally efficient and easily deployable to edge devices.

Change Detection in Satellite Images
The aim of this project is to estimate and characterize changes between two satellite images captured at different times by identifying regions that have changed and determining the nature of those changes. The research focuses on addressing key challenges such as class imbalance and the need to capture global context. To overcome these issues, we developed specialized loss functions and incorporated architectural features that effectively enhance change detection performance.

Voice Controlled Score-Board for Table Tennis— 
This project consisted of a complete design and implementation of a scoreboard which can be controlled via voice command with accompanying wrist-bands to wirelessly communicate with the score-board. I did the complete electronic design and firmware of the wrist band with custom communication protocols and the embedded AI system for the Score-Board.

Twin Rotor Research Platform —
The Twin Rotor Research Platform is a repository dedicated to the development, control, and research of twin rotor systems with 2 degrees of freedom (2DOF). Responsible for the development of the Interfacing Library, Embedded code and communication protocols for the device.

Circuit King - Component Tester and Circuit Analyzer Tool —
This is a hardware tool with accompanying software to analyze circuits and test various components as an assistant to an electronic engineer. The tool includes an Oscilloscope (1 Msp/s), A Signal Generator (up to 200 kHz), an IV curve analyzer, a Transistor Characteristic Plotter, a Circuit Bode Plotter, Capacitor, Resistor, Inductor measurement among other things. Developed our own analog circuitry for the analysis. Digital Processing is done using an STM32 micorcontroller, while communication with the user application is handled by an ESP32 microcontroller. The User application was developed using the Tauri Framework using React and Rust.

Complete Design of an Electrocardiogram (ECG) System
Designed and implemented a complete ECG signal acquisition and conditioning system as part of the Biomedical Engineering course project. The design included low-noise instrumentation amplifiers for differential signal measurement, active band-pass and notch filters for artifact and interference suppression, and a driven-right-leg (DRL) circuit for common-mode noise reduction. Successfully achieved stable and high-fidelity ECG waveform acquisition suitable for further digital processing and analysis.

3D Renderer using Ray Marching —
Implemented a 3D rendering engine based on the Ray Marching algorithm, which iteratively advances rays through a scene using signed distance functions (SDFs) to determine surface intersections. Developed a framework to model complex shapes through mathematical composition of primitive distance fields and smooth blending operations. Incorporated lighting and shadow estimation via surface normal approximation and recursive ray evaluation. GPU acceleration was utilized for parallel computation.

Custom Interpreter for the BASIC Language in Python —
Implemented a functional interpreter for the BASIC programming language in Python. Designed a custom lexical analyzer and parser based on Reverse Polish Notation (RPN) for efficient expression evaluation. Constructed an execution engine supporting variable management, control structures, and runtime error handling within a modular interpreter framework.

Skills

Programming: Python, C\C++, JavaScript, Rust, Go, Matlab, Prolog, Haskell, Verilog

Software: Python notebooks (marimo, Jupyter), Pytorch, GNU/Linux, Webots Robotic Simulation Software, Matlab and Simulink, Git and Github, Inkscape

Technical Skills: Machine Learning and AI, Embedded System Design, Full-Stack Web Development, Electronic Circuit Design and Soldering, Data Structures and Algorithms, Symbolic Computing (Using sympy), Scientific Computing and Simulations

Other Skills: Compiling Documents in LaTeX, Familiar with Overleaf and Zotero

Extracurricular Achievements and Outreach Activities

STEM Outreach and Education

- Delivered programming workshops as a **Speaker and Resource Person** for the Hackers Club, University of Peradeniya, and multiple IEEEXtreme Student Chapters (2023–2025).
- Speaker at **AI Readiness Workshops** organized by the Multidisciplinary AI Research Center (MARC) (2025).
- Volunteered in teaching and educational resource development for rural schools through **Sasnaka Sanasada** and **Nanathambara** (2019, 2022).
- Contributed to problem setting and evaluation for competitive programming contests (ACES) and mathematics competitions (Engineering Mathematics Society) (2024–2025).
- Volunteer Trainer for the **Electrical Safety Workshop** organized by IEEE Women in Engineering (2023).
- Delivered astronomy outreach talks at **AstroNights** workshops and authored an astrophysics article series for the Foundation of Astronomical Studies and Exploration (2022).

Leadership, Service, and Community Engagement

- Member of the **Environmental Upgrading Society**, contributing to sustainability initiatives within the Faculty of Engineering (2025).
- Lead and key contributor to the design and automation of the research-project management workflow for the **MARC website** (2025).

Arts and Personal Development

- **National Winner** at Piano Music Festivals (2013–2015).
- Completed Western Music Practical Examinations conducted by the Institute of Western Music and Speech.
- Achieved **Red Belt** in Karate.

References

Prof. R. Godaliyadda
Ph.D.(National Univerity of Singapore)
B.Sc.Eng.(Peradeniya, Sri Lanka)
SMIEEE , AMIESL
Professor
Department of Electrical and Electronic Engineering,
Faculty of Engineering, University of Peradeniya
Mobile: +94 77 770 9035
Email: roshang@eng.pdn.ac.lk

Prof. V. R. Herath
Ph.D.(University of Paderborn, Germany)
M.Sc.(University of Miami, USA)
B.Sc.Eng.(Peradeniya, Sri Lanka)
SMIEEE, AMIESL
Professor
Head of the Department
Department of Electrical and Electronic Engineering,
Faculty of Engineering, University of Peradeniya
Mobile: +94 71 673 2688
Email: vijitha@ee.pdn.ac.lk

Prof. M. P. B. Ekanayake
Ph.D.(Texas Tech, Lubbock, USA)
B.Sc.Eng.(Peradeniya, Sri Lanka)
SMIEEE , AMIESL
Professor
Department of Electrical and Electronic Engineering,
Faculty of Engineering, University of Peradeniya
Mobile: +94 77 364 8882
Email: mpbe@eng.pdn.ac.lk