BUDDHI WIJENAYAKE

Research Assistant - Multidisciplinary AI Research Centre, University of Peradeniya

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HIGHLIGHTS

- **Top competitive programmer:** IEEEXtreme 19.0 **5th worldwide, 1st in Sri Lanka**; three-time national champion (IEEEXtreme 17.0–19.0).

- **STEM Olympiad achiever:** Multiple national and international medals in Mathematics, Physics, Chemistry, and Astronomy Olympiads.

- **First Class graduate & prize winner:** B.Sc. Eng. (Hons.) in Electrical and Electronic Engineering, GPA **3.85/4.00**; Manamperi Award and Prof. W. P. Jayasekara Prize for best undergraduate research.

- **Emerging researcher:** Co-author of three journal manuscripts and several conference papers; **Research Assistant** at MARC in remote sensing and trustworthy AI.

- **Open-source & outreach:** Active GitHub and YouTube presence with research code and tutorials in programming, control, and AI.

PERSONAL INFORMATION

- **Full name:** Warnasooriya Mudiyanselage Buddhi Saumya Kumara Wijenayake
- **Date of Birth:** 29/11/2000

EDUCATION

- **Bachelor of Science of Engineering Honours (B. Sc. Engineering)** *2021 - 2025*
  Specialized in Electrical and Electronic Engineering Peradeniya, Sri Lanka
  Faculty of Engineering, University of Peradeniya
  ◦ **GPA: 3.85/4.00** | Academic Record
  ◦ Graduated with **First Class Honors**
  ◦ Complete degree program was conducted and assessed in **English Medium** and accredited by the **Washington Accord**.

- **G. C. E Advanced Level Examination (University Entrance Examination)** *Aug 2019*
  3 Distinction (A) passes for Combined Mathematics, Physics, and Chemistry Kandy, Sri Lanka
  Top 0.8% in Kandy District, Top 0.5% in Sri Lanka out of 19000+ candidates
  Z-Score: 2.6473 | Result Sheet
- **G. C. E. Ordinary Level Examination** *Dec 2016*
  9 Distinction (A) passes | Result Sheet Kandy, Sri Lanka

PUBLICATIONS

Peer Reviewed Journals

[J.1] **Buddhi Wijenayake**, Athulya Ratnayake, Praveen Sumanasekara, Roshan Godaliyadda, Parakrama Ekanayake, Vijitha Herath, Nichula Wasalathilaka, **Mamba-FCS: Joint Spatio-Frequency Feature Fusion, Change-Guided Attention, and SeK Loss for Enhanced Semantic Change Detection in Remote Sensing**. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Archive DOI: 10.48550/arXiv.2508.08232 (Currently under second-round revision, following positive feedback from the initial review.)

Journals Under Review

[J.2] Tharaka Fonseka[†], **Buddhi Wijenayake**[†], Athulya Ratnayake, Inosha Alwis, Supun Manathunge, Roshan Godaliyadda, Vijitha Herath, Parakrama Ekanayake, Isuru Pamuditha, Samath Dharmaratne, **Devising PoPStat: A Metric to Assess Mortality Dynamics within Demographic Transition**, IEEE Transactions on Computational Social Systems. | Archive Doi: 10.48550/arXiv.2501.11514.

[J.3] Praveen Sumanasekara, Athulya Ratnayake, **Buddhi Wijenayake**, Keshawa Rathnayake, Roshan Godaliyadda, Vijitha Herath, Parakrama Ekanayake, **Preprocessing Algorithm Leveraging Geometric Modeling for Scale Correction in Hyperspectral Images for Improved Unmixing Performance**. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, Archive DOI: 10.48550/arXiv.2508.08431.

International Conferences

[C.1] Athulya Ratnayake, **Buddhi Wijenayake**, Praveen Sumanasekara, Roshan Godaliyadda, Vijitha Herath, Parakrama Ekanayake, **Enhanced SCanNet with CBAM and Dice Loss for Semantic Change Detection**, in Proceedings of the Moratuwa Engineering Research Conference (MERCon), University of Moratuwa, Sri Lanka, Aug. 2025 (11th Int. Conf.).

[C.2] **Buddhi Wijenayake**, Athulya Ratnayake, Praveen Sumanasekara, Nichula Wasalathilaka, Mathivathanan Piratheepan, Roshan Godaliyadda, Mervyn Ekanayake, Vijitha Herath. (2025). **Precision Spatio-Temporal Feature Fusion for Robust Remote Sensing Change Detection**. Accepted at **ICIIS 2025**. Archive DOI: 10.48550/arXiv.2507.11523.

[C.3] **Buddhi Wijenayake**, Athulya Ratnayake, Lelumi Edirisinghe, U. Wijeratne, Tharaka Fonseka, Roshan Godaliyadda, Samath Dharmaratne, Parakrama Ekanayake, Vijitha Herath, Inosha Alwis, Supun Manathunga, **PoPStat–COVID19: Leveraging Population Pyramids to Quantify Demographic Vulnerability to COVID-19**, **Accepted** to Proceedings of the International Conference on Advances in ICT for Emerging Regions (ICTer), Colombo, Sri Lanka, Nov. 2025 (25th Int. Conf.).

[C.4] **Buddhi Wijenayake**, Athulya Ratnayake, Tharaka Fonseka, Inosha Alwis, Supun Manathunge, Roshan Godaliyadda, Vijitha Herath, Parakrama Ekanayake, Samath Dharmaratne, **Demographic Insights into Disease Patterns: An Interactive Visualization Approach**, Proceedings of Peradeniya University International Research Symposium and Exposition (iPURSE) 2025, Sri Lanka, Vol. 26, 28-29 Aug. 2025

POSTER/ORAL PRESENTATIONS

1. **Demographic Insights into Disease Patterns: An Interactive Visualization Approach**, Proceedings of Peradeniya University International Research Symposium and Exposition (iPURSE) 2025, Sri Lanka. | Oral Presentation | Presentation

2. **Machine Learning for Satellite Images** — Engineering Exhibition 2025 by the University of Peradeniya (EngEx 25), Faculty of Engineering, University of Peradeniya (Sept 23–27, 2025) | Poster | LinkedIn Post.

3. **PoPStat–COVID19: Leveraging Population Pyramids to Quantify Demographic Vulnerability to COVID-19**, 25th International Conference on Advances in ICT for Emerging Regions, in Colombo, Sri Lanka | Poster Presentation

HONORS AND AWARDS

International Programming Contests

• **IEEEXtreme 19.0 – Ranked 1st in Sri Lanka, 5th Globally (Team Insomniacs)**
24-hour global programming competition | *Award*   *Oct 2025*

• **IEEEXtreme 17.0 – Ranked 1st in Sri Lanka, 65th Globally (Team Insomniacs)**
24-hour global programming competition | *Award* | *Certificate*   *Oct 2023*

• **IEEEXtreme 18.0 – Ranked 1st in Sri Lanka, 66th Globally (Team Insomniacs)**
24-hour global programming competition | *Award* | *Certificate*   *Oct 2024*

Research & Academic Awards

• **Merit Award for the best undergraduate research engineering project carried out at a faculty of engineering in a Sri Lankan university - Manamperi Award**
Sri Lanka Association for the Advancement of Science | *Certificate*   *Nov 2025*

- **Prof. W.P. Jayasekara Prize** – Best undergraduate research project in the Department of Electrical and Electronic Engineering, University of Peradeniya
  University of Peradeniya — *Nov 2025*

National & International Olympiad Awards

- **HKIMO – Silver Medal (Heat Round)**
  Hong Kong International Mathematics Olympiad | *Award* | *Certificate and Medal* — *June 2019*

- **Sri Lanka Mathematics Olympiad – Bronze Medal**
  Sri Lanka Olympiad Mathematics Foundation (SLOMF) | *Award* | *Certificate and Medal* — *2019*

- **Chemistry Olympiad Sri Lanka – Merit Award, Ranked 4th in Sri Lanka**
  Institute of Chemistry Ceylon (IChem) | *Award* | *Certificate* — *May 2019*

- **Chemistry Olympiad Sri Lanka – Finalist**
  Institute of Chemistry Ceylon (IChem) | *Award* | *Certificate* — *Feb 2020*

- **Sri Lankan Physics Olympiad – Bronze Medal**
  Institute of Physics Sri Lanka | *Award* | *Certificate* — *Nov 2019*

- **Sri Lankan Astronomy and Astrophysics Olympiad – Merit Award**
  Institute of Physics Sri Lanka | *Award* | *Certificate* — *Nov 2018*

Undergraduate Competition & Hackathon Awards

- **IEEE Electronic Design Competition – Ranked 3rd in Sri Lanka**
  Electronic Circuit Design Competition — *Sept 2023*

- **IESL ROBOGAMES – 1st Runners-Up (University Category)**
  Institute of Engineers Sri Lanka | *Certificate* — *Dec 2022*

- **Sri Lanka Robotics Challenge – University Category Finalist**
  Electronic Club, University of Moratuwa | *Certificate* — *March 2023*

- **RealHack 5.0 – 2nd Runners-Up**
  National Hackathon | *Certificate* — *Apr 2024*

- **Coders 11.0 – Overall Champions (Team Insomniacs)**
  National 12-hour programming competition | *Award* | *Certificate* — *Oct 2024*

- **Coders 10.0 – Second Runners Up (Team Insomniacs)**
  National 12-hour programming competition | *Award* — *Oct 2024*

- **CYPHER 2.0 – 2nd Runners-Up**
  National Hackathon | *Certificate* — *March 2024*

- **MoraXtreme 2023 – Overall Champions (Team Insomniacs)**
  National 12-hour programming competition — *Oct 2023*

SELECTED PROJECTS

- **Understanding the Correlation between Population Demographics and Mortality Causes through Quantifying the Population Pyramid (Ongoing - Research Project)**
  Tools: Python, pandas | March 2023–present |
  ◦ Initiated in the 2nd year of undergraduate study to quantify how population-pyramid shape relates to cause-specific mortality.
  ◦ Designed two novel metrics: **PoPDivergence**, a scalar representation of complex demographic structure, and **PoPStat**, a statistic linking pyramid shape to mortality patterns.
  ◦ Building an algorithm to reconstruct noisy/incomplete mortality records using PoPDivergence.
  ◦ Supervised by Prof. Roshan Godaliyadda, Prof. Samath Dharmaratne, Prof. Parakrama Ekanayake, and Prof. Vijitha Herath.

- **Satellite Image–based Remote Sensing for Change Detection and Landscape Mapping (Ongoing - Research Project)**
  Tools: Python, PyTorch | March 2024–present | ⦿ | ⦿ | 🌐
  ◦ Final Year Project: improve semantic change detection by combining spatial and frequency-domain cues.
  ◦ Developed a novel Mamba-based architecture to jointly model spatial and frequency information, exploring wavelets for further gains.
  ◦ Supervised by Prof. Roshan Godaliyadda, Prof. Parakrama Ekanayake, and Prof. Vijitha Herath.

- **Entropy-Based Hallucination Detection in Large Language Models (Ongoing - Research Project)**
  Tools: Python, PyTorch | Aug 2025–present | ⦿
  ◦ Cluster LLM responses using spectral clustering to reveal response modes.
  ◦ Propose an entropy-based detector that flags likely hallucinations from cluster distributions.
  ◦ Supervised by Prof. Roshan Godaliyadda, Prof. Parakrama Ekanayake, and Prof. Ranga Kalugampitiya

- **PythonLibrary — `proptables`: Thermodynamic Properties Library (Ongoing - Passion Project)**
  Tools: Python, pandas, PyPI | 2022–present | ⦿
  ◦ Developed a lightweight Python library to retrieve thermodynamic properties for R134a and water.
  ◦ Packaged and published on PyPI for easy installation (`pip install proptables`).
  ◦ Designed for use in engineering calculations and research workflows.

- **Calm Quest — Counselor Student Management System (UG)**
  Tools: TypeScript, React, Emotion Detection | 2023 | ⦿ | 🌐
  ◦ Developed a web platform to manage counselor–student interactions and monitor student well-being via emotion detection.
  ◦ Designed user-friendly interfaces and stress-management features.
  ◦ Awarded 3rd Place — ACES Hackathon 2023 (Smart Solutions for Healthcare).

- **Image Codec Lab — Toolkit for Image/Video Compression (UG)**
  Tools: Python, OpenCV | 2023 | ⦿
  ◦ Implemented DCT-based encoding, Huffman coding, and adaptive quantization modules.
  ◦ Built an end-to-end pipeline to explore bitrate–quality trade-offs and optimize compression parameters.

EXPERIENCE

- **Research Assistant** *Nov 2025 - Present*
  Multidisciplinary AI Research Centre, University of Peradeniya — Peradeniya, Sri Lanka
  ◦ Working on hallucination mechanisms in large language models.
  ◦ Working on remote sensing imagery and semantic change detection.
  ◦ Supervisors: Prof. Parakrama Ekanayake, Prof. Roshan Godaliyadda, and Prof. Ranga Kalugampitiya

- **Teaching Assistant** *Aug 2025 - Nov 2025*
  Department of Electrical and Electronic Engineering, University of Peradeniya — Peradeniya, Sri Lanka
  ◦ Designed and evaluated lab sessions, tutorials, and quizzes for Artificial Intelligence, Machine Learning, and Embedded Systems.

- **Volunteer Teaching Assistant** *March 2024 - July 2024*
  Department of Computer Engineering, University of Peradeniya — Peradeniya, Sri Lanka
  ◦ Designed and evaluated lab sessions in Introduction to Programming and Networking for Electrical Engineering (CO: 253).

- **Embedded System Engineer- Intern** *July 2024 - November 2024*
  SwartUp (PVT) Limited — Remote
  ◦ Development of software for a Smart Home system using the **Zephyr RTOS**.
  ◦ Designed and implemented both hardware and embedded software for a Smart City sensor node.

- **Electronic Engineer- Intern** *July 2023 - October 2023*
  Vega Innovations (PVT) Limited — Colombo, Sri Lanka
  ◦ Designed and developed a custom Meter for measuring Electrical Conductivity and pH levels, including hardware design and embedded software development.

SKILLS

- **Programming Languages:** Python, C, C++, R, JavaScript, MATLAB
- **Web Technologies:** React, Node.js, HTML5, CSS3, TypeScript,
- **Data Science & Machine Learning:** TensorFlow, PyTorch, scikit-learn, NumPy, pandas, Matplotlib, Seaborn, Jupyter, OpenCV, Hugging Face Transformers
- **Version Control:** Git, GitHub
- **Operating Systems:** Linux, Raspbian

EXTRA CURRICULAR

Workshops and Presentations

- A Journey to AI - Involved in a workshop for approximately 500 school children and teachers in Sri Lanka. Introduced concepts of Artificial Intelligence (AI) and shared insights from research projects.
- Path to IEEEXtreme - Conducted inspirational sessions for undergraduate students in Sri Lanka, to motivate them in participating at IEEEXtreme.
- Future Makers Arduino Workshop series for Inventors - Conducted a workshop on PID controllers for undergraduate students at the Faculty of Engineering, University of Peradeniya.
- The Winning Strategy - Conducted a Lecture series on Dynamic Programming to university students.

Volunteer Tutor

- Provided tutoring in Linear Algebra, Programming in Python, C, and C++, Signals and Systems, Control Systems for Undergraduate Students and Advanced Level Combined Mathematics, for School Students
- Find Posted Videos on ▶

Societies

- Chairperson of the Microwave Theory and Techniques Society of University of Peradeniya (2024/2025)

See my Extracurricular Record at School

REFERENCES

1. **Prof. G. M. Roshan Godaliyadda, Ph.D. (National University of Singapore), B.Sc.Eng. (Peradeniya, Sri Lanka), SMIEEE, AMIESL**
   Professor, Department of Electrical and Electronic Engineering
   University of Peradeniya, Peradeniya, Sri Lanka.
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   Google Scholar: Profile.

2. **Prof. M. Parakrama. B. Ekanayake, Ph.D. (Texas Tech University), B.Sc.Eng. (Peradeniya, Sri Lanka)**
   Professor, Department of Electrical and Electronic Engineering
   University of Peradeniya, Peradeniya, Sri Lanka.
   Email: mpb.ekanayake@ee.pdn.ac.lk
   Google Scholar: Profile.

3. **Prof. H. M. V. R. (Vijitha) Herath, Ph.D. (University of Paderborn, Germany), M.Sc. (University of Miami, USA), B.Sc.Eng. (Peradeniya, Sri Lanka), SMIEEE, AMIESL**
   Professor & Head, Department of Electrical and Electronic Engineering
   University of Peradeniya, Peradeniya, Sri Lanka.
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