# Sashini Liynage

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## RESEARCH INTERESTS

My research interest is in **technology-driven healthcare advancements**, focusing on **signal & image processing**, **deep learning**and **computer vision**—and their applications across wearables, assistive technologies, and human-computer interaction.

## EDUCATION

**BSc. (Hons.) in Computer Engineering** (First Class Honours) — Nov 2018 - Dec 2023
University of Peradeniya, Sri Lanka — **GPA: 3.95/4.00**

**G.C.E Advanced Level Examination** — 2017
Physics (A), Chemistry (A), Combine Mathematics (A) — National Rank - **80/32000+**

## PUBLICATIONS

J - Journals, C - Conferences

[J 1] **A Novel ECG Compression Algorithm Using Pulse-Width Modulation Integrated Quantization for Low-power Real-time Monitoring** | DOI | Presentation
in *Nature - Scientific Reports (IF-3.8)*
Isuri Devindi*, Sashini Liyanage*, Titus Jayarathna, Janaka Alawathugoda, Roshan Ragel. (* Equal contribution)
Contribution: Conceptualization, Methodology, Formal analysis, Software, Validation, Writing–Original Draft, Review & Editing.

[J 2] **Multimodal Deep Convolutional Neural Network Pipeline for AI-Assisted Early Detection of Oral Cancer** | DOI | Poster | YouTube
in *IEEE Access (IF-3.4)*
Isuri Devindi, Dinura Dissanayake, Sashini Liyanage, Achintha Francis, Nadisha Piyarathne, Sumudu Rasnayaka, Kalani Hettiarachchi, Ruwan Jayasinghe, Roshan Ragel, Dhanushki Mapitigama, Isuru Nawinne.
Contribution: Conceptualization, Methodology, Data Curation, Software, Validation, Writing - Review & Editing.

[J 3] **A Comprehensive Dataset of Annotated Oral Cavity Images for Diagnosis of Oral Cancer and Oral Potentially Malignant Disorders** | DOI | Dataset | YouTube | Software
in *ScienceDirect - Oral Oncology (IF-4.0)*
Nadisha Piyarathne, Sashini Liyanage, Sumudu Rasnayaka, Kalani Hettiarachchi, Isuri Devindi, Dinura Dissanayake, Achintha Francis, Dhanushki Mapitigama, Isuru Nawinne, Roshan Ragel, Ruwan Jayasinghe.
Contribution: Formal analysis, Data curation, Visualization, Software, Writing–Original Draft.

[J 4] **Application of an LSTM-Based Channel Attention and Classification Mechanism in Fetal Movement Monitoring** | Pre-print | Poster
Preprint available on *TechRxiv*
Praditha Alwis, Isuru Thilakasiri, Sashini Liyanage, Rahal Nanayakkara, Roshan Godaliyadda, Mervyn Ekanayake, Chathura Rathnayake, Janaka Wijayakulasooriya, Vijitha Herath.
Contribution: Conceptualization, Methodology, Data curation, Formal analysis, Writing–Original Draft.

[C 5] **Real World Data-Driven Agent-Based Modeling for Health Policy Insights During Epidemics**
in *International Conference on Advancements in Computing 2024 (ICAC 2024)* [Accepted and to be published]
***Outstanding Paper Award in ICAC***
Sashini Liyanage, Mahesha Viduranga, Mario De Silva, Roshan Godaliyadda, Mervyn Ekanayake, Vijitha Herath, Janaka Ekanayake.
Contribution: Conceptualization, Methodology, Formal analysis, Software, Writing–Original Draft.

[C 6] **Self-Paced Brain-Computer Interface on Sensorimotor Rhythms for Controlling Virtual Objects** | DOI | YouTube
in *Proceedings of the* $10^{th}$ *Moratuwa Engineering Research Conference (MERCon) 2024*
Avishka Athapattu, Prageeth Dassanayake, Sewwandie Nanayakkara, Sashini Liyanage, Isuri Devindi, Roshan Ragel, Theekshana Dissanayake, Isuru Nawinne.
Contribution: Writing - Review & Editing, Visualization, Conference presenter

[C 7] **EEG Based Brain-Computer Interface for Inner Speech Classification** | DOI
in *Proceedings of the* $10^{th}$ *Moratuwa Engineering Research Conference (MERCon) 2024*
***Best Paper Award in BioMedical Engineering Track***
Praveen Dhananjaya, Isurika Adikari, Sumudu Lakmali , Isuri Devindi, Sashini Liyanage, Mahanama Wickramasingha, Theekshana Dissanayake, Roshan Ragel, Isuru Nawinne.
Contribution: Writing - Review & Editing, Visualization.

[C 8] **Decoding Non-Motor Imagery Tasks with Non-Invasive EEG Based Brain-Computer Interface: A Review** | DOI
in *Proceedings of the* $10^{th}$ *Moratuwa Engineering Research Conference (MERCon) 2024*
Sumudu Lakmali, Praveen Dhananjaya, Isurika Adikari, Isuri Devindi, Sashini Liyanage, Mahanama Wickramasingha, Theekshana Dissanayake, Roshan Ragel, Isuru Nawinne.
Contribution: Writing – Review & Editing.

## EXPERIENCE

- **Cornell, Maryland, Max Planck Research School (CMMRS)** 28 Jul - 04 Aug 2024
  *Pre-doctoral fellow at the CMMRS Research School in Computer Science*
  Learned about cutting-edge research and emerging trends in computer science, attended virtually.
- **Research Assistant** Apr 2024 - Present
  *Multidisciplinary AI Research Center (MARC) at the University of Peradeniya*
  - *AI4Covid Research Group*
    Mathematical and statistical agent-based modeling to analyze diseases spread in epidemiologic studies.
  - *BioMed and Wearable Tech Research Group*
    Non-invasive fetal health monitoring through fetal movement analysis and early detection of preterm birth.
- **Teaching Assistant** Jan 2024 - Jun 2024
  *Department of Computer Engineering, University of Peradeniya*
  Supervised a final-year research project - Automated Medical Image Annotation for Dataset Building.
  Instructed labs for GP106-Computing, CO503-Advanced Embedded Systems, CO421-Final Year Project I.
- **Software Engineering Intern** Dec 2022 - May 2023
  *Software engineering intern at WSO2 LLC*
- **Casual Instructor (TA)** 2021 - 2023
  *Department of Computer Engineering, University of Peradeniya*
  Instructed labs for CO224-Computer Architecture, CO321-Embedded Systems, CO325-Computer & Network Security, CO326-Computer Systems Engineering-Industrial Networks, CO327-Operating Systems.

## ACHIEVEMENTS

- **Outstanding Paper Award at ICAC 2024** 2024
  Outstanding Paper Award for the paper *"Real World Data-Driven Agent-Based Modeling for Health Policy Insights During Epidemics"* at the International Conference on Advancements in Computing (ICAC) 2024.
- **Best Paper Award in Biomedical Engineering Track at MERCon 2024** 2024
  Best Paper Award for the paper *"EEG-Based Brain-Computer Interface for Inner Speech Classification"* in the Biomedical Engineering track at the Moratuwa Engineering Research Conference (MERCon) 2024.
- **Bronze Award at the National ICT Awards** 2023
  The project titled *"Oral Cavity Image Annotation and Cancer Prediction from Smartphone Images"* won the Bronze award in the Student Category at the National ICT Awards and was **nominated for the International ICT Innovative Services Awards (InnoServe Awards)** 2023.
- **Professor E. F. Bartholomeusz Prize for Second Year Engineering Mathematics** 2022
  Best student in all engineering specialties who achieves the highest average marks in the engineering mathematics modules, including Calculus, Numerical Methods, Ordinary Differential Equations, Probability and Statistics, and Discrete Mathematics. (Out of 415 undergraduates)
- **IEEEXtreme 16.0** - Global 24-hours algorithmic programming competition 2022
  Team Name: IEEEMild (Team of three), Country Rank – 20, Global Rank – 388.
- **ACES Coders v9.0** - National 12-hours algorithmic programming competition 2022
  The largest algorithmic coding competition in Sri Lanka, organized by the University of Peradeniya.
  Team Name: Zblunt (Team of three), Country Rank - 6 (Out of 100+ teams).

- **Piripun Diyaniya Award – Best All-Rounder, Pushpadana Girls' College, Sri Lanka** 2018
  Recognition for academic excellence and resilience in overcoming challenges.

## SELECTED PROJECTS

1. **Early Detection of Preterm Birth from Non-invasive Wearable Devices** May 2024 - Present
   Identification of biophysical markers for early detection of preterm births using EHG and tocogram signals.
   - Methods: Karhunen-Loève transform, MUSIC (Multiple Signal Classification), Power spectrum analysis, U-Net

2. **Agent-Based Modelling for Disease Propagation Analysis** Mar 2024 - Present
   Modeling human behavior by utilizing GPS data along with mathematical models and advanced machine learning algorithms within Agent-based Models (ABMs).
   - Methods: DBSCAN & Spectral clustering, Mathematical & statistical models, Markov decision process

3. **Low-complexity Algorithm for Arrhythmia Detection** May 2023 - Dec 2023
   QRS-peak detection and ECG signal compression addressing the null-power consumption environments, along with a Spiking Neural Network implementation to classify ECG beats based on arrhythmia conditions.
   - Methods: Signal filtering, Leaky-boundary based QRS-peak detection, Spiking Neural Networks

4. **Reconstructing Highly Degraded License Plates** Feb 2022 - Apr 2022
   A procedure to extract a number plate from an image and reduce several noises due to low resolution, high or low lighting, and motion blur to reconstruct highly degraded images of license plates.
   - Techniques: Morphological transformation, Contouring, Spatial, and Frequency domain filtering
   - Technologies: OpenCV, EasyOCR

5. **Remote Proctoring Cyber-Physical Device** Jul 2021 - Nov 2022
   A single device that integrates the hardware and software components needed to conduct an examination in online mode with no technical interruption.
   - Technologies: IoT with Raspberry Pi, ReactJS, ElectronJs, Nodejs, MongoDB, Rest API, AWS

## SERVICES

- **Public Speaker, A Journey into AI workshops** 2024
  *Multidisciplinary AI Research Center*
  Introduced multidisciplinary research through biomedical engineering to school students.

- **Algorithmic Problem-Setter, Association of Computer Engineering Students (ACES)** 2022 - 2023
  *University of Peradeniya*
  Collaborated in creating algorithmic questions for ACES Pre-coders v9.0 and ACES Coders v10.0, the largest algorithmic programming competition in the country.

- **Design Team Member, ACES and Hackers' Club of University of Peradeniya** 2022 - 2023
  Created visual designs for university events and maintained digital communication with sponsors.

- **Volunteer Teacher, Nanathambara Webinar Series** 2022
  Conducted online Arduino and Python Programming courses for school students.

- **Community Service Member, Rotaract Club of University of Peradeniya** 2019 - 2022
  *NextStep360* - Led skill-building workshops for fresh undergraduates from various universities.
  *Reach for Water* - Led community services to reduce the risk of kidney disease and improve health in rural areas.

## TECHNICAL SKILLS

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|---|---|
| Programming Languages: | Python, Java, C, Javascript, Verilog HDL, ARM assembly, Ballerina |
| Libraries & frameworks: | TensorFlow, PyTorch, Scikit-Learn, Keras, cv2, Scipy |
| Other: | Latex, Git, HTML5, ReactJS, VueJS, ElectonJS, NPM, SQL, MongoDB |

## REFERENCES

**Prof. Roshan Ragel** — roshanr@eng.pdn.ac.lk
Head of Computer Engineering, University of Peradeniya, Sri Lanka.

**Prof. Roshan Godaliyadda** — roshang@eng.pdn.ac.lk
Senior Professor, Department of Electrical and Electronic Engineering, University of Peradeniya, Sri Lanka.

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