Pasindu Malshan

Research Assistant: Multidisciplinary AI Research Centre, University of Peradeniya

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Personal Data

Full name: Hikkaduwa Liyanage Pasindu Malshan **Nationality:** Sri Lankan **Gender:** Male

Profile

I am a self-motivated, diligent, and trustworthy person with the ability to overcome challenging situations. I am keen on integrating my knowledge of Mathematics, including Probability and Statistics, to optimize Machine Learning and Deep Learning models. I explore various Signal and Image Processing techniques to enhance the performance of these models and am passionate about applying them to innovative research projects. I perform well in both collaborative environments and independent roles.

Research Interests

Signal Processing | Machine Learning | Deep Learning | Generative AI | Computer Vision

Education

B.Sc.(Eng) University of Peradeniya, Electrical and Electronic Engineering — Dec 2023

- First Class Honors with GPA: **3.85**/4.0 | Transcript

G.C.E. Advanced Level Examination (University Entrance Examination) — Aug 2017

- 3 Distinction 'A' passes (for: Combined Mathematics, Physics and Chemistry)
- Ranked top 0.79 % in the country

Test Scores

GRE (07th November, 2024) | Total: **316**
Quantitative Reasoning: **170** | Verbal Reasoning: **146** | Analytical Writing Assessment: **3.5**

IELTS (10th August, 2024) | Overall Band Score: **7.0**
Listening: **8.0** | Reading: **8.0** | Speaking: **6.5** | Writing: **6.0**

Publications

Iso-Diffusion: Improving Diffusion Probabilistic Models using the Isotropy of the Additive Gaussian Noise preprint — Under Review
Conference on Computer Vision and Pattern Recognition
Dilum Fernando, Shakthi Perera, Pathum Madushan, **H.L.P. Malshan**, Roshan Godaliyadda, Mervyn Parakrama Bandara Ekanayake, Vijitha R. Herath, Dhananjaya Jayasundara, Welagedara Chaminda Bandara.

Aflatoxin Contamination Level Estimation in Food using Reflectance Multispectral Imaging Based System — Sep 2024
Published in the **Journal of Agriculture and Food Research**
(Journal Metrics: **Q1**, Impact Factor: **4.8**)
H.L.P. Malshan, H.M.P.S. Madushan, K.K. Abewickrama, H.M.V.R. Herath, Roshan Godaliyadda, M.P.B. Ekanayake, A.D.S.N.P. Athukorala, M.D.H.M. Kumari, Darsha Udayanga. 10.1016/j.jafr.2024.101401

Dual Mode Multispectral Imaging System for Food and Agriculture Product Quality Estimation — Feb 2024
Published in **IEEE Transactions on Instrumentation and Measurement**,
(Journal Metrics: **Q1**, Impact Factor: **5.6**)
Darsha Udayanga, Ashan Serasinghe, Supun Dassanayake, Roshan Godaliyadda, H.M.V.R. Herath, Mervyn Parakrama Ekanayake, **H.L.P. Malshan**. 10.1109/TIM.2024.3369129

Assessing the Stress Levels of Parents Caring for Children with Autism Spectrum Disorder (ASD) at Rehabilitation Hospital, Digana, Central Province, Sri Lanka — July 2024
Presented at 15th SAARC International Psychiatry Conference
M.P.M. Weerasooriya, M.N. Weerasooriya, J.A.M.D. Jayasinghe, **H.L.P. Malshan**.

Honors and Awards

Won 2nd place at Undergrad Thesis Project Competition 2023 organized by IEEE Signal Processing Society Sri Lanka Chapter for presenting "Multispectral Imaging for Condition Monitoring".

2022/2023: **Nominee for the Eng. E. W. Karunarathne Award**, which is for the Best Undergraduate Project in Electrical Engineering (Island-wide), for the research project "Multispectral Imaging for Condition Monitoring."

2024: **Nominee for the Manamperi Award (Engineering)** that is awarded to outstanding undergraduate research projects carried out at a Faculty of Engineering, awarded by Sri Lanka Association for the Advancement of Science (SLAAS), for the research project "Multispectral Imaging for Condition Monitoring".

Projects

Improving Denoising Diffusion Probabilistic Models (Ongoing) Jan 2024 - Present

- One of our findings of Diffusion Models is that the model does not necessarily check if it moves in a trajectory in which isotropy increases.
- Thus, the goal of this project is to try and improve the training process of Diffusion Models by forcing the model to go along the directions that increase the isotropy of the generated samples by the model.
- Hence, several signal processing techniques and statistical parameters have been explored to measure the isotropic nature and have utilized them in the objective function to introduce the isotropic constraint resulting in a diffusion model that outperforms the original DDPM model.
- Precision, Recall, Density and Coverage were utilized to measure the fidelity and diversity of the generated samples in addition to Frechet Inception Distance (FID) and Inception Score (IS).
- Currently working on enhancing the performance of the developed model and how Gaussianity and the isotropic nature of image samples have been changed along the training and generative process.

Multispectral imaging device commercialization and multispectral image corrections due to noise and device imperfections (Ongoing) Jan 2024 - Present

- Developing robust algorithms to correct device-related imperfections in multispectral image data captured in both reflectance and transmittance modes, leveraging advanced signal processing and machine learning methods.
- Exploring approaches such as adaptive Wiener filters, Principal Component Analysis (PCA), fuzzy logic, and Bhattacharyya distance to optimize algorithms and effectively mitigate noise and distortions.
- Conducting in-depth frequency spectrum analysis on image data collected with an in-house built multispectral imaging device, assessing variations and identifying enhancement opportunities.
- Enhancing device performance by designing efficient LED lighting systems and integrating other critical electronic components.

Multispectral Imaging for Condition Monitoring (UG) Oct 2022 - Dec 2023

- Developed an innovative methodology for processing multispectral image data, incorporating image pre-processing techniques (noise reduction filters), dimensionality reduction, and machine learning-driven classification models.
- Designed regression models utilizing statistical parameters such as Bhattacharyya distance and KL Divergence to enhance the accuracy and reliability of the imaging analysis.
- Applied this approach in real-world problems to estimate critical quality metrics, including aflatoxin levels in food samples, dry rubber content in latex, palm oil adulteration in coconut oil, and wheat flour adulteration in authentic turmeric.

Smart Key Chain (UG) Oct 2022 - Feb 2023

- Designed and manufactured a comprehensive smart key chain solution for locating misplaced objects.
- Mainly Arduino microcontroller and ESP8266 Wifi module were used and Android Studio was used to develop the mobile phone application.

High Speed Traffic Indicator (UG) Jun 2022 - Oct 2022

- Designed and simulated a high-speed traffic indicator that can identify vehicles' speed and indicate warnings.
- PIC16F877A microcontroller, IR sensors and Assembly Language were utilized for the design.

Professional Experience

Multidisciplinary AI Research Centre, University of Peradeniya, Research Assistant Apr 2024 - Present

- Conducting research on multispectral image corrections, commercialization of the in-house built multispectral imaging device and more applications using the device.
- Conducting research on improving diffusion based GenAI models, especially DDPM and DDIM.

Department of Engineering Mathematics, Teaching Assistant Jan 2024 – Mar 2024

- Conducted tutorial discussion classes for: Linear Algebra, Probability and Statistics and Numerical Methods.

Sri Lanka Telecom PLC, Trainee Electrical Engineer Jan 2022 - May 2022

Technical Strength

Programming	Python, Java	**ML Frameworks**	PyTorch, Keras
Applications	R Studio	**Word Processing**	LaTeX, Microsoft Office

Extra-Curricular

Clubs and Societies

- Student member of the Institute of Engineers Sri Lanka (IESL).
- Coordinator of the Reach for Water program at the Rotaract Club of University of Peradeniya (2021), supporting communities with limited access to clean water and those affected by waterborne kidney diseases.

Sports

- Member of the Kingswood Baseball team who were the 2nd Runners Up at All Island School Baseball Tournament 2008.
- Special Award for Baseball at Kingswood Colors Night 2009.
- Member of the Kingswood Chess team (2008-2012).

Volunteer Experiences

- Volunteering in organizing and conducting "Frontiers in AI and Sharing Experiences", an AI technology awareness session for school students organized by Multidisciplinary AI Research Centre - 2024.
- Volunteered by creating and managing a YouTube channel named Past Paper TV to assist Advanced Level students in Combined Mathematics, garnering over 65,000 subscribers since its inception during the COVID-19 pandemic.
- Contributed to a book donation project, enhancing educational resources for a school library in a rural community.
- Donated hair to support the creation of wigs for cancer patients, helping individuals facing hair loss due to treatment.

References

Prof. Roshan Godaliyadda
Ph.D.(National University of Singapore)

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Faculty of Engineering
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Prof. M.P.B. Ekanayake
Ph.D.(Texas Tech,Lubbock,USA)

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