HASINDU PIYUMANTHA KARIYAWASAM KANATHTHAGE

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 No. 12, Galkanda Mawatha, Ampara, Sri Lanka.

 LinkedIn

Research Interests : *Physics-Based Machine Learning, Computational Imaging, Mathematical Modeling, Optical Neural Networks, Deep Learning, Signal Processing*

EXPERIENCE

Center for Advanced Imaging, Harvard University
MA, USA

Post-Baccalaureate Fellow
July 2022 – Present

- Developing computational models of diffractive deep neural networks for phase imaging.
- Computational modeling of differentiable optical non-linearities for diffractive deep neural networks.

The University of Sydney
NSW, Australia

Visiting Researcher (Student)
Oct. 2020 – Mar. 2021

- Worked on a soft bending sensor development project.
- Worked on a research on harnessing incongruity to generate humor through computers.

Biomedical Research and Innovation Collective
Colombo, Sri Lanka

Researcher (Part time)
June 2020 – June 2022

- Research on developing a low-cost, AI powered digital stethoscope.
- Research on developing a low-cost, user-friendly EEG monitoring system for screening neonatal seizures.

EDUCATION

University of Moratuwa
Sri Lanka

B.Sc. Eng (Hons.) Electronics and Telecommunication Engineering
Aug. 2017 – July 2022

- CGPA: 4.14/4.20 (Rank: 2/115)
- Modules Undertaken - Signals and Systems, Fundamentals of Computer Organization and Design, Robot Design and Competition, Fundamentals of Image Processing and Machine Vision, Digital Signal Processing, Circuits and Systems Design, Electronics Design Realization, Electronic Devices, Advanced Digital Systems, Digital IC Design, Machine Vision, Computer Systems Architecture

D.S.Senanayake College
Ampara, Sri Lanka

General Certificate of Education Advanced Level
Mar. 2008 – Aug. 2016

- 3A (High Distinction) passes and ranked 27th in all island (out of 28,000 candidates) in Physical Science Stream (University Entrance).

Further Education

MOOCs

- Improving Deep Neural Networks: Hyperparameter Tuning, Regularization and Optimization [Credential ID GVTNBAV2XD2J]
- Neural Networks and Deep Learning [Credential ID DF8NF557BY42]
- 3D Model Creation with Autodesk Fusion 360 [Credential ID 3VG9YHFLC95D]

PUBLICATIONS

PEER-REVIEWED

Deep Optical Coding Design in Computational Imaging
2023

H.Arguello, J.Bacca, **H.Kariyawasam**, E.Vargas, M.Marquez, R.Hettiarachchi, H.Garcia, K.Herath, U.Haputhanthri, B.S.Ahluwalia, P.So, D.Wadduwage and C.U.S.Edussooriya
IEEE

IEEE SPM Special Issue on Physics-Driven Machine Learning for Computational Imaging

 View on arXiv.org (Accepted and to be published in Jan. 2023)

A Novel Transfer Learning-Based Approach for Screening Pre-existing Heart Diseases Using Synchronized ECG Signals and Heart Sounds   2021

R.Hettiarachchi, U.Haputhanthri, K.Herath, **H.Kariyawasam**, S.Munasinghe, K.Wickramasinghe, D.Samarasinghe, A.De Silva, C.U.S.Edussooriya   IEEE

IEEE International Symposium on Circuits and Systems (ISCAS) 2021

 View on IEEE Xplore

PREPRINTS

From Hours to Seconds: Towards 100x Faster Quantitative Phase Imaging via Differentiable Microscopy   2022

Udith Haputhanthri, Kithmini Herath, Ramith Hettiarachchi, **Hasindu Kariyawasam**, Azeem Ahmad, Balpreet S. Ahluwalia, C.U.S.Edussooriya and D.Wadduwage

 View on arXiv.org

Differentiable Microscopy Designs an All Optical Quantitative Phase Microscope   2022

K.Herath, U.Haputhanthri, R.Hettiarachchi, **H.Kariyawasam**, A.Ahmad, B.S.Ahluwalia, C.U.S.Edussooriya and D.Wadduwage

 View on arXiv.org

Appropriate Incongruity Driven Co-Creation Tool to Help Novices Write Humorous Cartoon Captions   2022

H.Kariyawasam, A.Niwarthana, A.Palmer, J.Kay, A.Withana

[Under Review]

INVITED/ CONFERENCE TALKS

Towards Fabricating Visible Wavelength D2NNs through Multi-Level Quantization for Quantitative Phase Imaging   Jan. 2023

Photonic West Quantitative Phase Imaging IX Conference - CA, USA.

A Workshop on Healthcare Research: From Sketchbook to Real-World Implementation During a Global Pandemic   Feb. 2021

IEEE EMBS International Student Conference - Virtual.

PATENT APPLICATIONS

Differentiable Microscopy Designs an All Optical Quantitative Phase Microscope

K.Herath[*], U.Haputhanthri[*], R.Hettiarachchi[*], **H.Kariyawasam**[*], A.Ahmad, B.S.Ahluwalia, C.U.S.Edussooriya and D.Wadduwage

Provisional Application - Harvard Ref. No. HU 8932.

HONORS AND AWARDS

BR41N.IO Brain-Computer Interface Designers' Hackathon   Oct. 2020

Intheon Winner

2020 CASS COVID-19 Special Student Design Competition   Sep. 2020

1st Runner Up

IEEE IAS CMD Humanitarian Contest 2020   May 2020

2nd Runner Up

Innovate FPGA 2019   Nov. 2019

Iron Award in the Asia-Pacific Region

✔ SELECTED RESEARCH PROJECTS

**Quantization Aware Training of Diffractive Deep Neural Networks
for Nano-Fabrication**   June 2022 – Present

Center for Advanced Imaging, Harvard University

Advisors: Dr. Dushan Wadduwage, Prof. Peter So

Modeled and trained diffractive deep neural networks operating in the visible wavelength range considering
the limitations in the nano-fabrication methods such as quantization and fabrication noise. The quantized mo
-del showed similar level of performance to the full-precision model.

Fourier optics, Mathematical modelling, Quantization aware training, Physics-based machine learning, Pytorch, Python

**Modeling Differentiable Non-Linear Optical Models for Diffractive
Deep Neural Networks**   June 2022 – Present

Center for Advanced Imaging, Harvard University

Advisor: Dr. Dushan Wadduwage

Trained a neural network to model a multimode fiber using neural ordinary differential equations. Modeled
saturable absorption using a system of differential equations. Introduced optical non-linear layers to diffract
-ive deep neural networks.

Mathematical modelling, Physics-based machine learning, Neural ODE, Pytorch, Python

**A Novel Hardware Accelerated Imaging Cytometry Modality Using
Diffractive Deep Neural Networks**   June 2021 – June 2022

University of Moratuwa

Advisors: Dr. Chamira Edussooriya, Dr. Dushan Wadduwage

Modeled light propagation through diffractive deep neural networks using an efficient method. Implemented
a hardware accelerated image reconstruction network in a cloud FPGA. Resulted an accelerated imaging cyto
-metry modality and an all-optical phase imaging system.

Fourier optics, Mathematical modeling, Physics-based machine learning, High level synthesis using Vitis AI, Pytorch, Python

✔ OTHER PROJECTS

Development of a Co-Design Tool to Write Humorous Cartoon Captions   Jan. 2021 – Sep. 2022
The University of Sydney

**Development of a Resistive Soft Bending Sensor for Multi-Joint, Multi-
Dimensional Bending Angle Measurement**   Oct. 2020 – Apr. 2021
The University of Sydney

**Development of a Low-Cost and User-Friendly EEG Monitoring System
for Screening Neonatal Seizures**   Oct. 2020 – June 2022
Biomedical Research and Innovation Collective

**Development of a Low-Cost AI-Powered Stethoscope for Cardiovascular
Disease Management for Resource-Constraint Environments**   June 2020 – June 2022
Biomedical Research and Innovation Collective

Doppler Radar based Drone Detection   Aug. 2019 – June 2022
University of Moratuwa

Real-time Sign Language to Speech Translator   July 2019 – Nov. 2019
University of Moratuwa

👤 VOLUNTEER WORK

University Students' Association, Ampara   2017 – Present
Taught physics and mathematics to high school students in the rural areas of Sri Lanka.   Ampara, Sri Lanka
Conducted workshops on basic robotics for high school students.

☆ SKILLS

Languages: Sinhala, English
Programming Skills: Python, PyTorch, MATLAB, C++, Verilog, OpenCL C++, CUDA
Technical Skills: Electronics, Altium Designer, Solidworks, R Studio, Unity, Autodesk Fusion 360, OrCAD, ANSYS, Vitis AI, Mathematical Modelling
Other Skills: Leadership, Team Work

👤 REFERENCES

Dr. Chamira Edussooriya
Senior Lecturer
Dept. of Electronic and Telecom. Eng
University of Moratuwa
Sri Lanka.
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Dr. Ranga Rodrigo
Head of the Department
Dept. of Electronic and Telecom. Eng
University of Moratuwa
Sri Lanka.
✈ ranga@uom.lk

Dr. Dushan Wadduwage
John Harvard Distinguished Science
-Fellow in Imaging
Ctr. for Advanced Imaging
Harvard University
Cambridge, MA
USA.
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