HASINDU PIYUMANTHA KARIYAWASAM KANAThThAGE

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

🖥 EXPERIENCE

Center for Advanced Imaging, Harvard University	Cambridge, USA
Post-Baccalaureate Fellow	July 2022 – Present

- Developing computational models of diffractive deep neural networks for phase imaging.
- Differentiable modeling of optical non-linearities (Ex: Multimode fibers) using 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: A Data-driven Framework	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 IEEE Xplore

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,   IEEE
D.Samarasinghe, A.De Silva, C.U.S.Edussooriya
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 Collaborative Tool to Assist Novices in Humorous Content Generation   2023

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

SPIE Photonic West Quantitative Phase Imaging IX Conference - San Francisco, USA.
 View online

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 The University of Sydney	Jan. 2021 – Sep. 2022
Development of a Resistive Soft Bending Sensor for Multi-Joint, Multi-Dimensional Bending Angle Measurement The University of Sydney	Oct. 2020 – Apr. 2021
Development of a Low-Cost and User-Friendly EEG Monitoring System for Screening Neonatal Seizures Biomedical Research and Innovation Collective	Oct. 2020 – June 2022
Development of a Low-Cost AI-Powered Stethoscope for Cardiovascular Disease Management for Resource-Constraint Environments Biomedical Research and Innovation Collective	June 2020 – June 2022
Doppler Radar based Drone Detection University of Moratuwa	Aug. 2019 – June 2022
Real-time Sign Language to Speech Translator University of Moratuwa	July 2019 – Nov. 2019

👤 Volunteer Work

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

☆ 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

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