

# RAMITH HETTIARACHCHI

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## SUMMARY

I am passionate towards using machine learning for scientific advancements (especially towards advancing biology and healthcare) while making sure these models are robust, interpretable and equitable.

Research Interests : [Computational Biology](#) [Robust, Fair, Interpretable ML](#) [Uncertainty Quantification](#) [Self-Supervised Learning](#)

## EDUCATION

### University of Moratuwa

B.Sc. Eng(Hons.) Electronic & Telecommunication Engineering

Moratuwa, Sri Lanka

Oct 2017 - June 2022

– Dean's List: Semesters 1,2,3,4,6,7,8

CGPA : 3.96/4.2 (First Class)

Thesis Title: "A Novel Hardware Accelerated Imaging Cytometry Modality Using Diffractive Deep Neural Networks (D2NNs)"

## RESEARCH EXPERIENCE

JULY 2022 - Present

### Post Baccalaureate Fellow, Division of Science, Harvard University

With the guidance of Dr. Sergey Ovchinnikov, I am developing a differentiable approach for phylogenetic inference. Furthermore, I am developing quantization-aware training methods and robust optical neural networks under the guidance of Dr. Dushan Wadduwage.

OCT 2020 - MAR 2021


### Research Intern at CSIRO Data61, Australia

The project involved real-time machine vision with a focus on 3D reconstruction from Intel Realsense D435 camera and performing dynamic obstacle avoidance.

## JOURNAL PUBLICATIONS

- [1] A. Ahmad, **R. Hettiarachchi**\*, A. Khezri\*, B. S. Ahluwalia, D.N. Wadduwage, R. Ahmad, "Highly sensitive quantitative phase microscopy and deep learning complement whole genome sequencing for rapid detection of infection and antimicrobial resistance," *Frontiers in Microbiology* (2023). [doi.org/10.3389/fmicb.2023.1154620](https://doi.org/10.3389/fmicb.2023.1154620)
- [2] H. Arguello, J. Bacca, H. Kariyawasam, E. Vargas, M. Marquez, **R. Hettiarachchi**, H. Garcia, K. Herath, U. Haputhanthri, B. S. Ahluwalia, P. So, D. N. Wadduwage, C. U. S. Edussooriya, "Deep Optical Coding Design in Computational Imaging". *IEEE Signal Processing Magazine*, Jan 2023. [doi.org/10.1109/MSP.2022.3200173](https://doi.org/10.1109/MSP.2022.3200173)  
↪ [Tutorial Paper](#)

## CONFERENCE/WORKSHOP PUBLICATIONS

- [1] **R. Hettiarachchi**, Avi Swartz, S. Ovchinnikov, "Differentiable Search of Evolutionary Trees"   
► Accepted to **International Conference on Machine Learning (ICML) 2023 - Workshops**  
"Sampling and Optimization in Discrete Space" (SODS) and "Differentiable Almost Everything" (DiffAE).  
[doi.org/10.1101/2023.07.23.550206](https://doi.org/10.1101/2023.07.23.550206) ↪ [Evolutionary Biology](#) [Soft Combinatorial Optimization](#) [Phylogenetic Inference](#)
- [2] **R. Hettiarachchi**, U. Haputhanthri, K. Herath, H. Kariyawasam, S. Munasinghe, K. Wickramasinghe, D. Samarasinghe, A. C. De Silva and C. U. S. Edussooriya, "A Novel Transfer Learning Based Approach for Screening Pre-existing Heart Diseases using Synchronized ECG Signals and Heart Sounds," *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2021, pp. 1-5, [doi.org/10.1109/ISCAS51556.2021.9401093](https://doi.org/10.1109/ISCAS51556.2021.9401093).  
↪ [Transfer-learning](#) [ECG ↔ PCG](#) [CNN](#)
- [3] S. Rajapakshe, **R. Hettiarachchi**, "Design and Development of a Research Oriented Low Cost Robotics Platform with a Novel Dynamic Global Path Planning Approach," *2022 8th International Conference on Control, Automation and Robotics (ICCAR)*, 2022, pp. 71-76, [doi.org/10.1109/ICCAR55106.2022.9782663](https://doi.org/10.1109/ICCAR55106.2022.9782663). ↪ [Path-planning](#) [Visualization](#)  
[C++](#)

## INVITED TALKS

- [1] “Towards Realizable Optical Meta-surfaces through Physics-informed Quantization Aware Training”, Northeast Symposium on Biomedical Optics - Nov, 2022 - MIT, Lansdowne St. [\[link\]](#)
- [2] “Towards Realizable D2NN Designs Through Quantization Aware Training”, Nano-SymBioSys workshop at UiT, The Arctic University of Norway - Sep, 2022 - Tromsø, Norway. [\[link\]](#)

## PATENT APPLICATIONS

- [1] K. Herath<sup>\*</sup>, U. Haputhanthri<sup>\*</sup>, **R. Hettiarachchi<sup>\*</sup>**, H. Kariyawasam<sup>\*</sup>, A. Ahmad, B. S. Ahluwalia, C. U. S. Edussooriya and D. Wadduwage, “Provisional Application – Harvard Ref. No. HU 8932 - F&L Ref. 098930-0366 “Differentiable Microscopy Designs an All-Optical Quantitative Phase Microscope”.

## OTHER RESEARCH PROJECTS

### Configuring an Intelligent Reflecting (IRS) Surface for Wireless Communications

FEB - JUNE, 2021

Supervisor : Dr. Prathapasinghe Dharmawansa, University of Moratuwa.

- Developed an alternative optimization procedure based on a genetic algorithm and the adaptive moment estimation optimizer to find optimized IRS configurations in a  $2^{4096}$  search space. It provided the best data rate and computational cost trade-off, and was the winning solution of the IEEE Signal Processing Cup 2021.

Python Genetic algorithm based optimization Mathematical Modeling

### Realtime Sign Language Translation to Speech

JUL - NOV, 2019

Self supervised project.

- Developed a solution capable of mapping the EMG signals obtained by an arm to sign language gestures using an ML model. For high-performance inference, the DE-10 Nano field-programmable gate array is used. Project won the Iron Award at the APAC Finals of innovate FPGA, a global FPGA design contest organized by Intel.

C++ SciPy Electromyography (EMG)

## HONORS, AWARDS, AND COMPETITIONS

<b>Scholar</b> - 2022 Princeton Pathways to Graduate School program	2022
<b>Winner</b> - IEEE Signal Processing Cup, ICASSP - <i>Team T<sup>3</sup></i>	2021
<b>1st Runner Up</b> - IEEE CASS COVID-19 Special Student Design Competition	2020
<b>2nd Runner Up</b> - IEEE IAS CMD Humanitarian Contest	2020
<b>1st in Sri Lanka, 48th in the World</b> - IEEEExtreme 13.0 Competitive Programming - <i>Team Siraa</i> <a href="#">[link]</a>	2019
<b>APAC - Iron Award</b> - InnovateFPGA - Global FPGA Design Contest	2019
<b>Sri Lankan Team Reserve</b> - International Olympiad in Informatics (IOI)	2015
<b>Bronze Medal</b> - ‘Young Computer Scientist’ (YCS) Competition	2012,2013
<b>Bronze Medal</b> - ‘Junior Inventor of the Year’ (JIY) Competition	2010

## VOLUNTEER / LEADERSHIP

PROJECT AYA, COHERE FOR AI	Contributing to Sinhala Language Datasets	2023
NEURIPS CONFERENCE	Student Volunteer	2021
IEEE SIGNAL PROCESSING SOCIETY, UoM.	Vice-Chairman, Chairman	2020 - 2022
ROTARACT CLUB OF UNIV. OF MORATUWA	Volunteer, Senior Director - IT	2019 - 2021
SUSTAINABLE EDUCATION FOUNDATION	Assistant Program Manager - ScholarX	2020 - 2021
SOCRATIC.ORG	Helping students with Chemistry & Math	2014 - 2016

## PROGRAMMING PROFICIENCY

LANGUAGES:	C/C++, Python, Scilab, MATLAB, Mathematica.
VISUALIZATION/TECHNICAL:	Javascript, Processing, Git, L <sup>A</sup> T <sub>E</sub> X.
LIBRARIES:	OpenCV, PyTorch, Tensorflow, JAX.

## RELEVANT COURSEWORK

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**SIGNAL PROCESSING:** Genomic Signal Processing [BM4321](#) (A+), Digital Signal Processing [EN2570](#) (A),  
Random Signals and Processes [EN2040](#) (A), Signals and Systems [EN1060](#) (A-)  
**MATHEMATICS:** Calculus [MA2023](#) (A+), Graph Theory [MA2053](#) (A+), Linear Algebra [MA2033](#) (A+)  
**COMPUTER VISION** Fundamentals of Image Processing and Machine Vision [EN2550](#) (A),  
Machine Vision [EN4553](#) (A+), Advances in Machine Vision [EN4583](#) (A+)

*References available upon request.*

August, 2023