

# LAKNATH ASHWIN DE SILVA

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Biomedical Engineering Laboratory, University of Moratuwa  
Bandaranayake Mawatha, Moratuwa 10400, Sri Lanka

## RESEARCH INTERESTS

- machine learning
- brain-computer interfaces
- neuromorphic computing
- signal processing
- computational neuroscience
- neural prostheses

## EDUCATION

### University of Moratuwa, Sri Lanka

Jan 2016 - Feb 2020

B.Sc Engineering (Hons) specialized in Biomedical Engineering

Department of Electronics and Telecommunication Engineering

First Class Honors with a GPA of 4.09 (Out of 4.20) - Included in Dean's Honors List in all 8 consecutive semesters

Class Rank : 1<sup>st</sup> among 117 students (Gold Medalist), Faculty Rank : 1<sup>st</sup> among 948 students

### Richmond College, Galle, Sri Lanka

Aug 2014

G.C.E Advanced Level Examination

High Distinctions for Combined Mathematics, Chemistry, Physics and General English

District Rank : 1, National Rank : 10 (out of ~ 35, 000 candidates)

## PUBLICATIONS

### Preprints

- **A. De Silva\***, M. V. Perera\*, N. Wijethilake, S. Jayasinghe, N. Dayananda, and A.C. De Silva. (2020). "A Thickness Sensitive Vessel Extraction Framework for Retinal and Conjunctival Vascular Tortuosity Analysis". *Transactions on Biomedical Engineering*, Under Review. [[paper](#)]

### Peer-Reviewed Conference Papers

- M. V. Perera\*, **A. De Silva\***. (2021). "A Joint Convolutional and Spatial Quad-Directional LSTM Network for Phase Unwrapping". *46th International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, Accepted. [[paper](#)]
- **A. De Silva\***, M. V. Perera\*, K. Wickramasinghe, A. M. Naim, T. D. Lalitharatne, S. L. Kappel. (2020). "Real-Time Hand Gesture Recognition Using Temporal Muscle Activation Maps of Multi-Channel sEMG Signals". In *Proceedings of 45th International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, pp. 1299-1303. [[paper](#)]
- A. M. Naim, K. Wickramasinghe, **A. De Silva**, M. V. Perera, T. Dulantha Lalitharatne, and S. L. Kappel. (2020). "Low-Cost Active Dry-Contact Surface EMG Sensor for Bionic Arms". In *Proceedings of IEEE International Conference on Systems, Man and Cybernetics (SMC)*, [[paper](#)].

### Theses

- **A. De Silva\***, M. V. Perera\*, K. Wickramasinghe\*, A. M. Naim\*. (2020). "Designing a Cost-Effective Dry Contact sEMG Sensor System for Controlling a Bionic Hand". *Undergraduate Graduation Project Report, University of Moratuwa*, Grade : 4.20/4.20. [[thesis](#)]

Note : \* denotes joint lead authors.

## RESEARCH EXPERIENCE

### University of Moratuwa, Sri Lanka.

Feb 2020 - Present

Biomedical Engineering Laboratory, Dept. of Electronic & Telecom. Engineering

Graduate Researcher

Research Projects

- Developing algorithms to remove EEG artifacts (Advisor : Dr. Yogatheesan Varatharajah, A collaboration with the University of Illinois, Urbana-Champaign, USA) [[on-going](#)]
- Developing a Graph Neural Network (GNN) based real-time hand gesture classification algorithm using forearm multi-channel sEMG signals. *objective*: Exploring the possibilities of employing GNNs to exploit the inter-channel correlations in multi-channel signals (Advisor : Dr. Chamira Edussooriya)[[on-going](#)]
- Developing deep learning methods for rodent behavior classification (Advisor : Dr. Ranga Rodrigo) [[on-going](#)]
- Developed a novel Vessel Extraction Framework featuring a Fully Convolutional Network paired with a Hessian based multi-scale vessel enhancement technique. This work addressed the lack of robust algorithms that can effectively segment conjunctival vessels from eye images. *objective*: Developing technology to facilitate large-scale patient screening for diabetes. (Advisors : Dr. Anjula De Silva, Dr. Nuwan Dayananda, Prof. Saroj Jayasinghe)

**University of Moratuwa, Sri Lanka.**

Feb 2019 - Feb 2020

Bionics Laboratory, Dept. of Mechanical Engineering

Undergraduate

Advisors : Dr. Simon Kappel, Dr. Thilina Lalitharatne

Final Year Project : *Designing a Cost-Effective Dry Contact sEMG Sensor System for Controlling a Bionic Hand*

- Designed and developed cost-effective active dry-contact sEMG sensors and acquisition circuitry
- Formulated a real-time hand gesture recognition algorithm using Temporal Muscle Activation maps based on multi-channel sEMG signals
- Interfaced the sensors and the recognition algorithm to produce control signals to drive a bionic hand.
- *objective*: Developing technologies to address the increased demand for affordable upper-limb prostheses in Sri Lanka.

**Florey Institute of Neuroscience, Melbourne, Australia**

Jun - Dec 2018

Ion Channels and Human Diseases Laboratory

Research Assistant

Advisors : Prof. Steven Petrou, Prof. Saman Halgamuge

Research Internship

- Developed MEALearn, a software that can process 64-channel Multi-Electrode Array (MEA) signals acquired from in-vitro neuronal networks, extract robust interpretable features, classify these networks based on the Sodium ion channel mutation they contain, and visualize the mutation-clusters in the latent feature space.
- Developed MEACON, a software aimed at determining whether the ion channel mutations cause changes to the connectivity patterns of in-vitro neuronal networks by modeling them as time varying graphs based on high density 120-channel MEA signals.

**Center for Advanced Imaging, University of Queensland, Australia**

Aug - Nov 2018

Barth Group

Research Assistant

Advisor : Dr. Steffen Bollmann

Summer Internship

- Formulated a joint convolutional and spatial quad-directional Long Short-Term Memory network architecture to unwrap the noisy wrapped phase images. *objective*: Developing deep learning methods to solve the phase unwrapping problem prevalent in Quantity Susceptibility Mapping using MRI.

**Florey Institute of Neuroscience, Melbourne, Australia**

Jun - Dec 2017

Ion Channels and Human Diseases Laboratory

Software Engineering Intern

Advisor : Prof. Steven Petrou, Ms. Claire Cuddy

Summer Internship

- Developed software to visualize MEA spike trains and perform time series analysis of MEA parameters

**SELECTED AWARDS AND HONORS****Gold Medal sponsored by Technomedics International Pvt Ltd**

2020

- For the *highest* overall academic performance in the Biomedical Engineering Stream (University of Moratuwa)

**Prof. Pathuwathawithana Memorial Prize**

2020

- For attaining the *highest* GPA at the Faculty of Engineering, University of Moratuwa, Sri Lanka

**National Finalists at the Migara Ranatunga Awards**

2020

- Awarded by Institution of Engineers, Sri Lanka (IESL) for the *best* performance in the research internship

**World Finalists at the IEEE ComSoc Student Competition**

2019

- Ranked among *the top 15 in the world*, Received an Honorable Mention

**Merit Award at SLAAS Awards**

2020

- Awarded by Sri Lanka Association for the Advancement of Science for the *best undergraduate project of Sri Lanka*

**National Finalists at the Sri Lankan IoT Challenge**

2019

- Ranked among *the top 10 in the country*, Received an Honorable Mention

**Runners-Up at the the National Inter-University Statistics Quiz Competition**

2018

- Organized by University of Sri Jayawardenapura, Sri Lanka

**Dialog Merit Scholarship for Engineering Undergraduates**

2016

- Awarded by Dialog Axiata PLC for the students who excelled at the university entrance examinations

**Mahapola Merit Scholarship for Engineering Undergraduates**

2016

- Awarded by the Government of Sri Lanka for the students who excelled at the university entrance examinations

**Darrel Medal**

2014

- Awarded to the *most outstanding student* of Richmond College

**High Distinction in Australian National Chemistry Quiz Competition**

2011 &amp; 2013

- Awarded for the students who excelled at the quiz competition

## TEACHING

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### Junior Lecturer

- EN1060 - Signals and Systems (tutorials) *UoM 2021*
- BM4111 - Medical Electronics and Instrumentation (lab classes) *UoM Fall 2020*
- EN2030 - Laboratory Practice II (analog electronics lab classes) *UoM Spring 2020*
- EN3030 - Circuits and Systems Design (lab classes) *UoM Spring 2020*
- BM2101 - Analysis of Physiological Systems (teaching & neuro-modeling assignments) *UoM Fall 2020*
- BM2011 - Human Anatomy and Physiology (lab classes & assignments) *UoM Fall 2020*

### Visiting Lecturer

- Workshop on MATLAB for Signal/Image Processing, *IET, Sri Lanka Spring 2020*  
Communications Systems and Electronics (teaching & preparing course material)

### Visiting Instructor

- EN1093 - Laboratory Practice I (conducting signals and systems lab classes) *UoM Fall 2019*
- DE2410 - Astronomy and Cosmology (conducting observation sessions) *UoM Spring 2018*

## PROFESSIONAL SERVICE ACTIVITIES

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### Conference Organization

- Session Chair *2021*  
*Medical Instrumentation and Biomechanics Track*  
IEEE EMBS International Student Conference, Moratuwa, Sri Lanka
- Session Chair *2021*  
*Biochemistry, Wearables, Healthcare, and Biomaterials Track*  
IEEE EMBS International Student Conference, Moratuwa, Sri Lanka
- Organizing Committee Member *2018*  
*“Hack Your Thoughts” Brain-Computer Interfaces Workshop*  
Moratuwa Engineering Research Conference, Moratuwa, Sri Lanka
- Organizing Committee Chair *2017*  
*TechMedImpact Forum*  
Sri Lanka’s first ever BME Conference

### Conference Reviewing Activities

- IEEE EMBS International Student Conference, Moratuwa, Sri Lanka *2021*

## PARTICIPATED WORKSHOPS

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- Neuromatch Academy (Observer Track) *2020*
- Graph Filters with Applications to Distributed Optimization and Neural Networks, ICASSP’20 *2020*
- Graph Neural Networks, ICASSP’20 *2020*
- Biomedical Image Reconstruction—From Foundations to Deep Neural Networks, ICASSP’20 *2020*
- Neural Computational Modelling Workshop, University of Melbourne *2018*
- Advanced Magnetic Resonance Imaging Workshop, University of Melbourne *2018*
- QSM Workshop, 1<sup>st</sup> OHBM Australia Chapter Symposium *2018*

## TECHNICAL SKILLS AND COMPETENCIES

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### Programming Languages

Python, C/C++, Verilog

### Libraries

Tensorflow, Keras, PyTorch, ITK/VTK, Neuron, Nengo

### Software Tools

L<sup>A</sup>T<sub>E</sub>X, MATLAB, Quartus, Multisim, AutoCAD, Altium, Solidworks

### Operating Systems

MacOS, Linux, Windows

### Hardware

STM32 Family, Atmel AVR, Altera DE2, Raspberry Pi

## SELECTED COURSE PROJECTS

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### Bachelors Projects

- De-noising Diffusion MRI using non-local means algorithm in the joint X-Q space *2019*
- Designing and Manufacturing a Finger-Tip Pulse Sensor *2019*
- Simulating Wave-functions within Various Potential Wells using Schrodinger’s Wave Equation *2019*
- Custom Processor Implemented on FPGA for Image Down-sampling *2018*

## SERVICES AND LEADERSHIP

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### IEEE Engineering in Medicine and Biology Student Branch Chapter at UoM

2016-2020

Chairperson 2019/20

Vice Chairperson 2018/19, 2017/18

- Received the *Most Outstanding EMB Student Branch Chapter Regional Award* for the term 2019/20
- Received the *IEEE Darrel Chong Award (Silver Category)* for Brainstorm 2019
- Organizing Committee Member, Brainstorm BME Design Competition 2018 & 2019
- Organizing Committee Member, BME Seminar Series during 2016 - 2020

### UoM Mathematics Society

2016-2017

Assistant Secretary 2016/17

Session Coordinator 2016/17

- Conducted weekly sessions of mathematical discussions and helped organize M-Talks

## OUTREACH

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### Volunteering

2016 - 2019

- Organized and conducted recreational astronomy observation sessions for several local communities including a group of autistic children and their parents
- Conducted “Akurata Mali Nowemu”, a high school ordinary level mathematics workshop for a under-privileged school in Southern Sri Lanka
- Organized workshops in Central Sri Lanka to promote robotics among school girls

### SL2College

2017-2019

Assistant Program Manager

- Facilitated the mentor-mentee matching in the research collaboration program of SL2College

### Richmond to University (R2U)

2018-Present

Co-Founder

- Formed R2U with the intention of organizing motivation and career guidance programs for the advanced level students of Richmond College

## PROFESSIONAL SOCIETY MEMBERSHIPS

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- Institution of Electronic and Electrical Engineers (IEEE)

2017-Present

- IEEE Engineering in Medicine and Biology Society

2017-Present

- IEEE Signal Processing Society

2019-Present

- IEEE Communications Society

2019-Present

## PERSONAL INFORMATION

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**Full Name**

Laknath Ashwin De Silva Kariyawasam Gonapinuwalla Gamage

**Other Name(s)**

Laknath Ashwin De Silva K G G, Ashwin De Silva

**Interests and Skills**

Music (Piano), Public Speaking, Travelling, Astronomy