LAKNATH ASHWIN DE SILVA

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Biomedical Engineering Laboratory, University of Moratuwa
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RESEARCH INTERESTS

- machine learning
- signal processing
- brain-computer interfaces
- computational neuroscience
- neuromorphic computing
- 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 : 1st among 117 students (Gold Medalist), Faculty Rank : 1st 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 $\sim 35,000$ 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, Urabana-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 algorithms using Temporal Muscle Activation maps based on multi-channel sEMG signals
- Interfaced the sensors and recognition algorithms to produce control signals to drive a bionic hand.
- *objective*: Developing technologies to address the increased demand for affordable arm 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 & 2013*
– Awarded for the students who excelled at the quiz competition

Teaching

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

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

- · 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, 1st OHBM Australia Chapter Symposium   *2018*

Technical Skills and Competencies

Programming Languages	Python, C/C++, Verilog
Libraries	Tensorflow, Keras, PyTorch, ITK/VTK, Neuron, Nengo
Software Tools	LaTeX, MATLAB, Quartus, Multisim, AutoCAD, Altium, Solidworks
Operating Systems	MacOS, Linux, Windows
Hardware	STM32 Family, Atmel AVR, Altera DE2, Raspberry Pi

Selected Course Projects

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

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

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

  · 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

Full Name	Laknath Ashwin De Silva Kariyawasam Gonapinuwala Gamage
Other Name(s)	Laknath Ashwin De Silva K G G, Ashwin De Silva
Interests and Skills	Music (Piano), Public Speaking, Travelling, Astronomy