Laknath Ashwin De Silva

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

Research Interests

- machine learning
- signal processing
- computer vision
- information theory
- computational neuroscience
- neuromorphic computing

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***. (2020). "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 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 sEMG sensors and acquisition circuitry, formulated forearm sEMG pattern recognition algorithms to predict hand gestures, and interfaced the sensors and recognition algorithms with a bionic hand. *objective*: Developing technologies to address the increased demand for affordable arm prostheses.

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 Spring 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, Communications Systems and Electronics (teaching & preparing course material) *IET, Sri Lanka Spring 2020*

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

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
- Project Chair, TechMedImpact Forum 2017 - Sri Lanka's first ever BME Conference
- Organizing Committee Member, "Hack Your Thoughts" Brain-Computer Interfaces Workshop at MerCON 2018

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 2017 - 2019
- 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

Personal Information

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