AYANGA IMESHA KALUPAHANA

Personal Information

UNIVERSITY:	National University of Singapore
MAJOR:	Computer Science
EMAIL:	ayangaim@comp.nus.edu.sg
ADDRESS:	Systems and Networking Lab, School of Computing, NUS
PERSONAL WEBPAGE:	https://ayanga1991.github.io
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Research Interests

Wearable computing/sensing, application of privacy and security to wearable, wearable energy harvesting, wearable power and latency optimization

Education

2020-Feb 2025 — Ph.D. Candidate in Computer Science
National University of Singapore
Advisor : Prof. Peh Li-Shiuan
CAP: **4.08/5**

2011-2016 — BSc. Eng. (Hons) specialized in Electronics and Telecommunication Engineering
University of Moratuwa (UoM), Sri Lanka
FYP Advisor: Dr. Ajith Pasqual
CGPA: **3.57/4.2 (34th of 101)**

Work Experience

Jan 2023 - May 2023 — **Graduate Teaching Assistant -CS4222/CS5222 Wireless Networking**
@ School of Computing, NUS
Module Instructor: Prof. Ambuj Varshney

- Conducted tutorials and provided consultation for Final-year undergraduate and postgraduate students
- Evaluated assignments and course projects of 150 enrolled students

Aug 2019 - Dec 2019 — **Research Intern** @ LSP Group, NUS
Advisors : Prof. Peh Li-Shiuan and Prof. Xiaokui Xiao
Evaluated Rastogi et al.s' Distributed Differential Privacy algorithm's performance and limitations on off-the-shelf smartwatches

May 2016 - July 2019 — **Research Engineer** @ Synergen Technology Labs LLC, USA
(Headquarters in Dallas, Texas, USA, Innovation center in Sri Lanka)

- Designed a 4-layer PCB (36mmx19mm) for a spine care wearable patch with inductive wireless charging circuit
- Developed a single IMU-based smoke detection mechanism
- Developed an algorithm for de-noising Ambulatory ECG by fusion with accelerometer data and activity detection for Synergen's now FDA-approved Scio-Cardio ambulatory ECG monitor
- Developed a respiration estimation algorithm for the PPG signal input taken from the infant's ankle-worn wearable in patented Synergen Baby monitor
- Developed a cry detection algorithm

- Supervised six UoM undergraduate engineering students' internships related to wearable stress monitor, smoke detection, baby monitor and hydration monitor in 2016, 2018 and 2019

Nov 2014 - March 2015

Research & Development Engineering Intern
@ Integrated System Development (ISD) Ltd, UK
(Headquarters in London, UK, Research & Development center in Sri Lanka) Now ISD is operated as Verox Labs Ltd
Mentor: Mr. Harin De Silva, Managing/Technical Director

- Assisted in developing their next version of the "Heated Glass Stage Device", which is used to inject sperm into egg cells in-vitro fertilization process
- Researched, experimented, and developed algorithms to provide even heat signature to the living cell
- Designed a heated glass stage protection circuit

Journal Publications

1. SeRaNDiP - Leveraging Inherent Sensor Random Noise for Differential Privacy Preservation in Wearable Community Sensing Applications
   Ayanga Kalupahana, *Ananta Narayanan Balaji, Xiaokui Xiao and Li-Shiuan Peh*
   Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies 2023 (IMWUT/Ubicomp)
   Project webpage : SeRaNDiP: Leveraging Inherent Sensor Random Noise for Differential Privacy Preservation in Wearable Community Sensing Applications

Conference Publications

1. FPAA and FPGA Based Universal Sensor Node Design
   Ayanga Kalupahana, *Nisal Hemadasa, Nipun Wijerathne, Anuranga Ranasinghe and Ajith Pasqual*
   Proceedings of the 11th International Conference on Sensing Technology (ICST 2017), Sydney, Australia

PhD Thesis

Advisor: Prof. Peh Li Shiuan, Dept. of Computer Science, NUS

Under my Ph.D. thesis, I am studying and solving problems, gaps, and bottlenecks in implementing privacy and security algorithms for wearable devices in both community sensing and remote monitoring.
First I have proposed SeRaNDiP which is a framework that leverages low-power wearable sensors' inherent noise for varying Differential Privacy noise requirements without hardware modification. As per our knowledge, this is the first inherent noise-based Differential Privacy providing framework applicable to existing smart watches and fitness trackers. It resulted 1.4X-1.8X computation/communication speedup and 1.2X-1.5X energy savings against state-of-the-art DP implementation.

Reviewer

2022 | ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies(IMWUT)

Awards and Scholarships

2020-2024	NUS Research Scholarship Award
2017	Presentation Award- 2nd Runner up (Student Category), 11th International Conference on Sensing Technology, ICST 2017, Sydney, Australia
2011	18 plus Scholarship 2010 Award For the outstanding academic performance of G.C.E. Advanced Level 2010

Programming Skills

Proficient:	C/C++ (Embedded software development), Python, Java, Matlab, Bluetooth Low Energy
Basic Knowledge:	Differential Privacy, Verilog, Altium, Solid Works, Eagle, R language
Development Boards:	Raspberry Pi, Beaglebone, Odroid, Pynq FPGA, ESP-32, Spartan 3E FPGA, AN231E04 FPAA etc.
Sensors:	PPG, ECG, Temperature, Accelerometer, Barometer sensors, GSR and microphones

References

1. Dr. Li-Shiuan Peh
   Provost's chair professor, School of Computing, National University of Singapore.
2. Dr. Ajith Pasqual
   Senior Lecturer, Department of Electronic & Telecommunication Engineering,
   University of Moratuwa, Sri Lanka