Chatura Samarakoon (M.Eng, Ph.D)

Full-Stack Developer | Applied Machine Learning Engineer | Engineering Consultant

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Professional Summary

Software developer with more than 12 years of experience with high-level programming languages, machine learning research and ML Ops, modern web frameworks, and backend technologies, as well as a background in research and development across several engineering disciplines, including solid-state physics, machine learning, computer vision, quantum computing algorithms, and computer architectures, in both industrial and academic settings. Have led the development of a flagship product of two deep-tech startups, a production line management system, the design and fabrication of an electric car, and a robotic porter, demonstrating the ability to leverage deep technical skills to lead teams tackling complex engineering projects with non-trivial requirements. The diversity in experiences illustrating the capacity and passion for acquiring new knowledge and adapting existing skills to solve novel problems.

Areas of Experience

- Frontend Web Development
- Processor Design
- Electronic Circuit Design
- Embedded System Design
- Software Project Management
- Backend Web Development
- Embedded Programming
- Human Computer Interaction
- Computer Vision
- Leadership
- Applied Machine Learning
- Quantum Computing
- Quantum-Dot Semiconductors
- Solid-State Physics
- Recruitment

Education

Ph.D in Engineering. *University of Cambridge, Cambridge, UK.* *2017 – 2021*

Thesis: "Perception-Aware Optimisation Methodologies for Quantum Dot Displays and Lighting".
Topics: Quantum Devices, Machine Learning (Neural Networks and Gaussian Processes), Image Compression, Functional Optimisation, Affective Computing, Embedded Systems, Human Colour Vision, Semiconductor Physics.

M.Eng Electronic Engineering. *University of Sheffield, Sheffield, UK.* *2013 – 2017*

Class One Honours with Best results in the department - Grade: 86.8%.
Fourth Year - Grade: 85%
Group Project: "Autonomous Robotic Porter" (Grade - 81%)
Third Year - Grade: 88.8%
Dissertation: "Design of an Edge Termination Structure for a 6.5kV CIGBT" (Grade - 85%)
Second Year - Grade: 86.5%
Individual Project: "Design and fabrication of a surface acoustic wave filter" (Grade - 85%)
First Year - Grade: 90.2%

G.C.E. Advanced Level. *Cardiff High School, Cardiff, UK.* *2010 – 2012*

Subjects: Maths: A*, Further Maths: A*, Physics: A Chemistry: A, Computing (AS): A
Welsh Baccalaureate Advanced Diploma: Distinction

Professional Experience

Software and AI Systems Lead *2024 – Present*
Cambridge Heartwear Ltd, UK.

Skills: *Applied Machine learning, Embedded system programming, iOS/Android app development using web technologies, Engineering Project management, Medical device research*

Cambridge Heartwear develops a wearable multi-lead ECG device I am developing the machine learning models at the heart of the device, responsible for ECG screening and for assisting clinicians with diagnoses by providing predictive health metrics. I also lead the development of the patient-facing mobile app and the web-based admin panel used by the clinicians (full stack), as well as lead the hardware design and development of the future iterations of Cambridge Heartwear's primary product. I am currently researching the use of ECG as a biometric for patient authentication.

Research Associate in Probabilistic Computation Hardware *2021 – Present*
Physical Computation Laboratory, University of Cambridge.

Skills: *C, Python, LaTeX, Research, Project management, Git and Github, Shell Scripting, Verilog, Applied Machine Learning Research, Computer Architectures, Probabilistic Computing.*

Researched novel hardware approaches to uncertainty aware computation and applications that leverage the capabilities of uncertainty tracking computer architectures for improved on-task performance and accuracy.

- Presented a novel computer architecture, *Laplace*, for carrying out arithmetic operations on arbitrary probability distributions; the key technology behind the startup *Signaloid*.
- Created a Python library for modelling and computing with finite-dimensional representations of arbitrary empirical distributions without using Monte Carlo simulations.
- Devised improvements to a probabilistic serial communications scheme that can improve the energy efficiency of embedded systems.
- Presented a framework for discussing Monte-Carlo based uncertainty tracking methods and carried out a comprehensive evaluation of the performance of different uncertainty tracking methods.
- Investigating how to use this approach to accelerate machine learning models based on Gaussian Processes and improve Hybrid Quantum algorithms.

Cloud Platform Growth Lead *2022 – 2024*
Signaloid Ltd, UK.

Skills: *Full-stack development, Git/Github, UI design, Unit testing and E2E testing for Web Frontends and APIs, AWS Technologies, Python, C, Sentry, Shell Scripting, Project Management, Recruitment.*

Signaloid develops a cloud-based processor that is capable of automatically computing how uncertainties in the inputs of a program affects its output. Access to this processor is provided through its flagship products; the *Cloud Developer Platform* and the *Cloud Compute Engine*. I spearheaded the development of the *Cloud Developer Platform*'s core services (including 45 public releases), user-behaviour tracking and analysis systems, and performance-monitoring systems, and also authored comprehensive documentation to support increased daily active users and user growth.

- Conducted weekly update meetings as the DRI for the *Cloud Developer Platform* and was the primary contact for technical questions from the finance team, ensuring clear communication and understanding of the progress of different engineering activities and platform health across departments.
- Upgraded the cloud platform with white-labeling support for enterprise users, that let users set-up a brand consistent version of the cloud platform in less than 2 days.
- Devised tests and interview questions for recruiting new team members, evaluated more than 400 candidates and conducted interviews.

Applications Engineering Lead *2021 – 2022*
Signaloid Ltd, UK.

Skills: *Full-stack development, Git/Github, UI design, Unit testing and E2E testing for Web Frontends and APIs, AWS Technologies, Python, C, Sentry, Shell Scripting, Project Management, Recruitment.*

Transformed the Signaloid *Cloud Developer Platform* from an MVP to a production ready application, personally developed more than 25 core features; including support for running applications in GitHub repositories, instantiating custom processor cores, and connecting to real-time data sources.

- Overhauled the cloud platform and migrated to use the new *Cloud Compute Engine API*.
- Set-up comprehensive E2E tests for the cloud development platform codebase using Cypress.
- Coordinated the development of a distribution input widget in collaboration with a 3rd party team, enhancing data input and manipulation capabilities.
- Built a GO SDK and a VSCode extension for interacting with the Signaloid cloud compute engine.

Technical Consultant *2019 – 2021*
Kutuu Ltd., Sophia Victoria Joy Ltd., Gabrielle Solly Art, and Cocoba Ltd., UK.

Skills: *Python, Google App Script, API integration.*

Streamlined the retailers' production line management by creating software systems that connect with 3rd-party retailers' APIs to synchronise the different systems responsible for managing inventory, customer relationships, and billing, to increase productivity. These systems automate numerous repetitive tasks such as generating printed assets. The different implementations are currently processing over 1,000 orders a day totalling more than £2 million worth of transactions annually.

AI Research Scientist *2019 – 2020*
Extract-AI, Singapore.

Skills: *Python, Applied Machine Learning.*

Proposed a machine learning based system to predict well-bore stability and industrial equipment failure using machine learning for a large petrochemical client in Malaysia.

Programmer and Web Developer for the *Grapples* Project *2017 – 2018*
Physical Computation Laboratory, University of Cambridge.

Skills: *HTML, CSS, Javascript, Django, Python, Vue.js.*

Implemented a web platform for a microprocessor simulator which allows users to configure the simulator using a graphical interface on the web and request the back-end server to provision compute resources and run the user's commands. Integrated this work into a remote teaching platform used by the *Physical Computation Lab.*

Electrical and Control Systems Team Lead and Founding Member *2015 – 2017*
Sheffield Eco Motorsports, University of Sheffield.

Skills: *Matlab, Simulink, Proteus, Leadership, Project Management.*

Coordinated a team of eight engineering students in designing, fabricating, and testing the electrical subsystems for a prototype electric car. Designed a bespoke 3-phase BLDC motor drive, a 1kW Li-ion battery management system, a custom BLDC motor, and a complex control system to enable safe regenerative braking and system health monitoring. Fabricated a seven layer carbon-fibre composite monocoque using wet-layup with the team principle. Presented the car at the department's centennial anniversary celebration as one of the flagship student projects.

Animator and Graphic Designer for Sheffield Open Online Learning (MOOCs) *2015 – 2016*
Sheffield Methods Institute, University of Sheffield.

Skills: *Adobe After Effects, Adobe Illustrator, Maxon Cinema 4D.*

Designed visualisations for an online course designed by the University to promote statistical literacy and critical thinking when interpreting statistics presented in the media. Created digital assets and compositions to compliment the voice-over. The course is available on *FutureLearn* as *'Making Sense of Data in the Media'*.

Assistant Circuit Designer for the Kandy Zonal Education Office Project *Summer 2015*
Ministry of Education, Sri Lanka.

Skills: *Electrical Design, Design Validation, Safety Regulation Compliance.*

Designed the three-phase electrical circuitry for the ministry's proposed five-story zonal education office in Kandy, Sri Lanka. Computed the load distribution across single-phase sub-circuits, and calculated the required cable sizing and circuit breaker arrangement, while also managing load balancing and diversity management calculations to enable the sub-circuits to safely connect to the 3-phase national grid.

Recent Publications and Preprints

Gaussian Process Predictions with Uncertain Inputs Enabled by Uncertainty-Tracking Microprocessors. *2024*
J. Petangoda, C. Samarakoon, P. Stanley-Marbell
Will Appear at the Machine Learning with New Compute Paradigms (MLNCP) Workshop at *NeurIPS 2024*.

Simulated Eyeblink Artifact Removal with ICA: Effect of Measurement Uncertainty. *2024*
J. Couchman, O. Kaparounakis, C. Samarakoon, and P. Stanley-Marbell
ArXiv preprint: 2410.03261 [eess.SY].

Optoelectronic system and device integration for quantum-dot light-emitting diode white lighting with computational design framework. *2022*
C. Samarakoon, H.W. Choi, S. Lee, X.B. Fan, D.W. Shin, S.Y. Bang, J.W. Jo, L. Ni, J. Yang, Y. Kim, S.M. Jung, L.G. Occhipinti, G.A.J. Amaratunga, J.M. Kim
Appears in Nature Communications 13 (1), 4189.

The Laplace Microarchitecture for Tracking Data Uncertainty. *2022*
V. Tsoutsouras, O. Kaparounakis, C. Samarakoon, B. Bilgin, J. Meech, J. Heck, P. Stanley-Marbell
Appears in IEEE MICRO Top Picks 2022.

Engineering Core Size of InP Quantum Dot with Incipient ZnS for Blue Emission. *2022*
Y.H. Suh, S. Lee, S.M. Jung, S.Y. Bang, J. Yang, X.B. Fan, S. Zhan, C. Samarakoon, J.W. Jo, Y. Kim, H.W. Choi, L.G. Occhipinti, T.H. Lee, D.W. Shin, J.M. Kim
Appears in Advanced Optical Materials, Issue 2102372.

Color controllable smart white lighting based on various device architectures of electrically driven quantum-dot light-emitting diodes. *2022*
Y.H. Suh, S. Lee, S.M. Jung, S.Y. Bang, J. Yang, X.B. Fan, S. Zhan, C. Samarakoon, J.W. Jo, Y. Kim, H.W. Choi, L.G. Occhipinti, T.H. Lee, D.W. Shin, J.M. Kim
Appears in Journal of Materials Chemistry C 10 (29), 10728-10741.

The Laplace Microarchitecture for Tracking Data Uncertainty and Its Implementation in a RISC-V Processor. *2022*
V. Tsoutsouras, O. Kaparounakis, B. Bilgin, C. Samarakoon, J. Meech, J. Heck, and P. Stanley-Marbell
Appears in the proceedings of the 54th IEEE/ACM International Symposium on Microarchitecture.

Perception-Aware Optimisation Methodologies for Quantum Dot Based Displays and Lighting. *2021*
C. Samarakoon
PhD Thesis. Available at the the University of Cambridge Library.

Modelling Charge Transport and Electro-Optical Characteristics of Quantum Dot Light-Emitting Diodes. *2021*
S.M. Jung, T.H. Lee, S.Y. Bang, S.D. Han, D.W. Shin, S. Lee, H.W. Choi, Y.H. Suh, X.B. Fan, J.W. Jo, S. Zhan, J. Yang, C. Samarakoon, Y. Kim, L. Occhipinti, G. Amaratunga, & J.M. Kim
Appears in npj Computational Materials, Vol 7, 2021.

Technology progress on quantum dot light-emitting diodes for next-generation displays. *2021*
S.Y. Bang, Y.H. Suh, X.B. Fan, D.W. Shin, S.H. Lee, H.W. Choi, T.H. Lee, J. Yang, S. Zhan, W. Harden-Chaters, C. Samarakoon, L.G. Occhipinti, S.D. Han, S.M. Jung, & J.M. Kim
Appears in Nanoscale Horizons, Vol 6, 2021.

Content-Aware Automated Parameter Tuning for Approximate Color Transforms. *2020*
C. Samarakoon, G. Amaratunga, & P. Stanley-Marbell
Appears in the proceedings of *Mobile HCI, 2020 (Extended Abstracts)*. ArXiv preprint: 2007.00494 [cs.HC].

Inferring Human Observer Spectral Sensitivities from Video Game Data. *2020*
C. Samarakoon, G. Amaratunga, & P. Stanley-Marbell
ArXiv preprint: 2007.00490 [q-bio.QM].

Teaching Experience

Teaching Assistant for *IIA-GB3: RISC-V Processor Design Project* *2019, 2021 – 2023*
Department of Engineering, University of Cambridge.

Conducted the course for ∼ 80 students, coaching them to design and implement a RISC-V instruction set architecture on a state of the art miniature FPGA and optimise their implementations for performance, power efficiency, and resource usage. I helped restructure and streamline the course notes to improve student satisfaction, improved the usability of the software tools provided to the students, and coordinated the report marking.

IEP Lab Demonstrator *2017 – 2020*
Department of Engineering, University of Cambridge.

Guided ∼ 300 first-year engineering students through the design and testing of an AM radio. Conducted lectures on the concepts behind the operation of the radio and assisted the students in debugging any issues they encountered.

Teaching Assistant for *4B25: Embedded systems for IoT* *2017 – 2018*
Department of Engineering, University of Cambridge.

Validated the microprocessor programming exercises given to the students and proofreading the lecture notes for errors and clarity.

Student Ambassador for Learning and Teaching *2015 – 2016*
The University of Sheffield.

Investigated how the student experience in the university's new engineering building can be improved, and compiled a list of actions for the faculty based on student feedback.

Honours, Awards and Scholarships

2017 - 2021 **EPSRC DTP Studentship Award** – *"Smart Flexible Quantum Dot Lighting"* project.

2017 **Sir Fredrick Mappin Medal** – Awarded by the University of Sheffield for the *"Greatest distinction shown by a candidate studying towards a degree in Engineering"*.

2016 **Frank Benson Memorial Prize** – Awarded by the University of Sheffield for *"Outstanding contribution to the well-being of the Electronic and Electrical Engineering community at the University"*.

2015 **IET Undergraduate Grant**

2015 **Bramwell Prize** – Awarded by the University of Sheffield for the *"Best coursework performance by a student in their second year of study"*.

2014 **Sir William Siemens Medal (Shortlisted nominee)** – Awarded by Siemens AG.

2014 **Sir Harold West Award** – Awarded by the University of Sheffield to the top undergraduate student in each department in recognition of *"Academic and personal promise"*.

2014 - 2017 **Faculty Undergraduate Scholarship** – Awarded by the University of Sheffield for *"Sustained excellence throughout the years of study"*.

Programming Languages and Frameworks

Python
Developed a library for computing with probability distributions and full stack applications using Django.

React.js
Created the Signaloid cloud documentation and used in personal projects.

C/C++
Improved firmware for an embedded research platform, created C applications at Signaloid, developed an uncertainty-aware ray tracer.

Go
Created a compute worker pool at Signaloid and developed an SDK for interacting with the Signaloid Cloud API.

LaTeX
Frequently used for writing papers and articles, and also used to typeset this CV.

Javascript and TypeScript
Authored the Signaloid cloud documentation, frequently used in personal projects, and web hook pipelines.

Vue.js
Developed the Signaloid Cloud Developer Platform and many personal projects.

AWS Technologies
Built Signaloid's Cloud Compute Engine infrastructure (Lambda, Cognito, DynamoDB, SQS).

Matlab, Simulink, and Mathematica
Modeled the dynamics of an electric car at Sheffield Eco Motorsports.

Bash
Built miscellaneous automation tools and benchmarking tools at Signaloid.

A Selection of Relevant Technical Projects

Signaloid Cloud Developer Platform *2021 – 2023*
Signaloid Ltd. UK

Technologies: *Vue.js, Node.js, Apache, Cloudflare, AWS (Lambda, DynamoDB, AthenaDB, S3, API Gateway), Cypress, Jest, Userflow, Hubspot, Sentry.*

The Signaloid *Cloud Developer Platform (SCDP)* is a Vue.js based application that is the flagship product offered by Signaloid which demonstrates the capabilities of Signaloid's uncertainty tracking cloud processors. As the "directly responsible individual" (DRI) for the SCDP, I was responsible for the design, development, testing and deployment of new features for the SCDP while also developing infrastructure for monitoring user behaviours to drive user-centric development of features. When I joined Signaloid, the SCDP had 2 pages; one for running simple C applications and one for picking the account tier. In the 2 years I have been with Signaloid, I have built out the SCDP to be a production ready application used by many commercial and academic customers. Few features I'm most proud of include the *Repositories* feature which allows users to connect the SCDP to Github through OAuth to run complex multi source file applications, the Custom Cores feature which allowed users to instantiate custom compute cores optimised for their application requirements, and the *Data Sources* feature which allows users to connect sensor data streams to their applications that run on the Signaloid Cloud Compute Engine. I also helped develop the pipelines feature which is an integral part of Signaloid's hardware offering and helped set-up end-to-end testing for the SCDP and added support for user behaviour tracking to facilitate user-driven development of features for the platform. I was also responsible for personally migrating the entirety of the SCDP to use the new (mid 2023) Signaloid Cloud Compute Engine API to improve parity between Signaloid's product offerings, improving cross compatibility, and simplifying the engineering effort required for application upkeep. In total I led the development and release of over 45 public releases of the SCDP and with me personally contributing more than 500k lines of source code changes.

Signaloid Cloud Documentation *2021 – 2023*
Signaloid Ltd. UK

Technologies: *React.js, Docusaurus, JSX/MDX, Puppeteer, OpenAPI, Redocly, Algolia Search.*

As the Directly Responsible Individual (DRI) for the Signaloid Cloud Documentation, I led two distinct iterations of the documentation: one leveraging Ruby with Jekyll and the other employing React with Docusaurus, with the goal of making the documentation visually appealing and easy to understand. A primary engineering objective was to simplify the editing process, empowering team members with limited frontend programming experience to easily update the documentation, while simultaneously reducing the engineering overhead required to keep it up-to-date. To streamline this process, I developed a tool that leveraged Puppeteer for automated screenshot capturing and devised a simple JSON config for defining the application state required for the screenshot with support for overriding the screen capture process using a custom .mjs Puppeteer script for capturing more complex application states. Additionally, I created a mechanism for testable code examples with a simple templating schema to allow the markdown renderer to pick parts of the example code from a single source of truth, ensuring accuracy and consistency across documentation sections. Furthermore, I worked with the Cloud Architect to craft the API documentation using Redocly and while adhering to OpenAPI specifications, enhancing the accessibility and usability the documentation.

Signaloid API Demo Web-app Frontend *2021 – 2023*
Signaloid Ltd. UK

Technologies: *Vue.js, Node.js, Apache, Cypress, Cloudflare.*

I contributed to the development of a comprehensive set of UI components for quickly (<5 mins) scaffolding a web app that runs a compute kernel on the Signaloid Cloud compute engine, significantly reducing development time and accelerating time-to-market. Using this template, a small team of two programmers were able to successfully deliver over ten web applications spanning a diverse set of application domains with about two-weeks of engineering effort (see signaloid.io/apps). Furthermore, I integrated rudimentary performance monitoring functionalities into the framework, empowering the backend team with invaluable data insights to optimize end-to-end application latency.

Signaloid Cloud Compute Engine *2021 – 2023*
Signaloid Ltd. UK

Technologies: *Go Lang, AWS (S3, S3FS, SQS, DynamoDB).*

Conceived the infrastructure for the cloud compute engine backend building support for accessing github repositories using user's OAuth credentials and helped update the client code build infrastructure to support large repository based applications. I also helped refactor the code base to be more modular and easier to update.

Membership management system *2021 – 2022*
University of Cambridge, Jiu-Jitsu Club

Technologies: *Web Hooks, Pipedream, Airtable, Google App Script.*

I developed a system for tracking session attendance and payments using Airtable frontend and a backend using Pipedream, which connects to the club's banking system to automatically reconcile membership payments.

***"Trinkets"*: A lightweight ERP platform for small manufacturing businesses** *2020*
Personal Project

Technologies: *Vue.js, Celery, PostgreSQL, Redis, Django/DRF, AWS, Heroku, Google Cloud Platform.*

This software allows small business owners to manage inventory and production lines without being over-encumbered by the numerous redundant features of more "general-purpose" ERP services. It provides a simple way to connect with 3rd-party retailer APIs to manage orders and maintain inventory while also enabling automation of routine tasks like generating printed assets from order details. I am building and managing every component in the technology stack, including, but not limited to, the *Vue.js* based frontend, *Django* backend server, the CI/CD pipeline, the asynchronous worker pools using *Celery* and *Redis*, and the *PostgreSQL* based database, all running on a mixture of services from *Heroku*, *Amazon Web Services*, and the *Google Cloud Platform*.

Extra-Curricular Activities and Hobbies

2019 - 2023 **Jitsuka (4th Kyu) and Junior Treasurer**, Cambridge University Jiu-Jitsu Club.
2019 - 2020 **Member of the *Girton College Rowing Crew (M2)***, University of Cambridge.
2015 - 2016 **Teaching Committee Representative**, Department of Electronic and Electrical Engineering, University of Sheffield.
2015 - 2016 **Student Ambassador for Learning and Teaching**, Faculty of Engineering, University of Sheffield.
2015 - 2016 **Departmental Student Representative**, Department of Electronic and Electrical Engineering, University of Sheffield.
2015 - 2016 **Student Mentor**, University of Sheffield.
2014 - 2016 **Bassist, Sri Lankan Society band**, University of Sheffield.
Runners up, *"Octave 2014"* and *"Encore 2015"* Band Competitions, University of Sheffield.
2014 - 2015 **Treasurer, Film making Society**, University of Sheffield.
2014 - 2015 **Publicity officer, Sri Lankan Society**, University of Sheffield.
2013 - 2014 **Departmental Student Representative**, Department of Electronic and Electrical Engineering, University of Sheffield.

Language Proficiency

Sinhala
Native (CEFR C1-C2)

English
Bilingual (CEFR C1-C2)

Japanese
Beginner (CEFR A1)