# AARON STOCKDILL

Quantitative Technologist at Qube Research and Technologies
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## EDUCATION

**Doctor of Philosophy**, *University of Cambridge, UK.* 2017–2021

- Computer Science. Thesis: "Automating representation change across domains for reasoning", supervised by Prof. Mateja Jamnik. Developed a theory of cross-domain *correspondences* to enable user-aware, contextual AI explanations in an interdisciplinary team from Cambridge and Sussex.
- Have published six conference papers and one workshop paper, all peer reviewed, presenting two. One further is under review. Presented a one hour seminar for the AI Research Group Seminar Series in the Computer Lab, and a 15 minute Postgraduate Seminar at college.
- Hamilton Cambridge International Scholarship recipient, awarded once every three years; gives full funding and stipend.
- Computing Officer for the Selwyn College MCR Committee, which represents graduate students at the college; I managed the punt reservations, committee elections, and website. In the department, I managed the AI Research Group website.

**Bachelor of Science with First Class Honours**, *University of Canterbury, NZ.* 2016

- Computer Science honours, GPA 8.9 of 9, 2016. Report: "Neuromorphic Computing with Reservoir Neural Networks on Memristive Hardware". Simulated new hardware to implement faster and more power efficient neural networks.
- Published two peer-reviewed conference papers.
- Graduating BSc(Hons) Computer Science Student of the Year Prize 2016 recipient, for highest cohort grades.
- Committee member of the Computing Society and Mathematics Society, providing academic support, social functions, and subject promotion. Built the Computing Society website. Helped co-ordinate the eventual merger of these two societies.

**Bachelor of Science**, *University of Canterbury, NZ.* 2013–2015

- Computer Science and Mathematics, GPA 8.83 of 9.
- Graduating BSc Computer Science Student of the Year Prize recipient for highest cohort grades.
- Became a member of the Golden Key International Honour Society for being in the top 15% of my cohort.
- Supported by a UC Entrance Scholarship, the UC Computer Science High Achievers Scholarship, the Allied Telesis Labs Scholarship, the G B Battersby Trimble Scholarship, two UC Mathematics and Statistics Scholarships, the Peter Bryant Memorial Prize, and the Page Memorial Prize.

## EMPLOYMENT

**Quantitative Technologist**, *Qube Research and Technologies, London.* Feb 2023–*present*

**Research Fellow in Informatics**, *University of Sussex, UK.* Sept 2021–Jan 2023

- Developing theory and tools to describe representations in a uniform, and cognitively centred, manner (RIST).
- Working as part of a research team of six split between Sussex and Cambridge, continuing work from my PhD.
- Formalising the cognitive representation notation (RISN), while developing a web app using React and ReScript.

**Software Engineer**, *Jane Street Europe.* Jan 2021–July 2021

- Worked with an international team to develop, deploy, and support in-house software in the finance industry.
- New and existing software was developed using OCaml; the environment demanded software that was fault-tolerant, distributed, and real-time. Development was backed up by extensive testing and code review.
- Provided operational support deploying our software to servers around the globe, and ensured 24/7 up-time for users of our software. We also supported users with trouble-shooting, and providing new features both responsively and proactively.

**Supervisor, Computer Science**, *University of Cambridge, UK.* 2017–2020

- Organised and ran small group teaching sessions for undergraduate students in their first and second years.

- Tailored individual and group work to the students' needs, ensuring my time and feedback was used effectively and targeted to their interests and weaknesses for both coursework and future career.
- Encouraged and moderated group discussions that included all members of the group, ensuring the students were teaching each other as much as I was teaching them; this gave new perspectives to their peers and verified their own understanding.

**Lecturer, Computer Science**, *University of Canterbury, NZ.* 2017

- Planned then delivered lectures full time in Term 3 for more than 400 students in the 'Introduction to Computer Science' course which covers foundational concepts; in I received an average 4.30 of 5 in teaching effectiveness.
- Developed and graded a cohesive, comprehensive three-part assignment, which was delivered and assessed online.
- Worked with students individually both as part of the lab tutor teams and during office hours, the latter allowing me to spend time working with students that otherwise struggle in higher education environments.

**Tutor, Computer Science**, *University of Canterbury, NZ.* 2015–2017

- Computer-lab-based teaching with groups of 20–80 students across all three years of undergraduate courses, and two postgraduate courses; focus on theory and skill acquisition, with assignment guidance and exam preparation as appropriate.
- Developed effective relationships with the students; student surveys of tutor effectiveness provided valuable feedback, and indicated an average 4.83 of 5 overall effectiveness, one of the top results in the department.
- Provided feedback to improve lecturers' effectiveness by observing the students, and then indicating where the challenging points have been in labs to improve the understanding and thus exam scores for students; produced new resources.

**Mathematics Tutor**, *Private.* 2012–2017

- Provided in-home mathematics tutoring for high school students, teaching all levels from Years 9 to 13.

## TECHNICAL SKILLS

- Specialist in artificial intelligence, principally logical but also statistical; applications range from education to analysis to physics. My research includes theoretical proofs, human participant evaluations, and statistical analysis.
- Secondary computer science specialisation in machine learning, algorithms, and data structures; mathematics specialisation in graph theory, algebraic structures, linear algebra, and probability.
- Proficient with OCaml, ReScript, Python, Standard ML, HTML/CSS/Javascript, C, and LaTeX. Familiar with APL, C++, Fortran, Haskell, Lisp, and PHP. Others can be learnt quickly. Familiar with standard office software.

## PUBLICATIONS – FIRST AUTHOR

**Examining Experts' Recommendations of Representational Systems for Problem Solving**. *Aaron Stockdill, Gem Stapleton, Daniel Raggi, Mateja Jamnik, Grecia Garcia Garcia, and Peter C.-H. Cheng*, IEEE Symposium on Visual Languages and Human-Centric Computing, 2022, pp. 1–6. https://dx.doi.org/10.1109/VL/HCC53370.2022.9833141

**Cognitive Modeling of Interpretations of Representations**. *Aaron Stockdill, Grecia Garcia Garcia, Peter C.-H. Cheng, Daniel Raggi, and Mateja Jamnik*, Conference on Advances in Cognitive Systems, 2022, pp. 1–20.

**Considerations in Representation Selection for Problem Solving: a Review**. *Aaron Stockdill, Daniel Raggi, Mateja Jamnik, Grecia Garcia Garcia, and Peter C.-H. Cheng*, 12th International Conference on the Theory and Application of Diagrams, 2021, pp. 35–51. https://dx.doi.org/10.1007/978-3-030-86062-2_4

**Correspondence-based analogies for choosing problem representations**. *Aaron Stockdill, Daniel Raggi, Mateja Jamnik, Grecia Garcia Garcia, Holly E. A. Sutherland, Peter C.-H. Cheng, and Advait Sarkar*, IEEE Symposium on Visual Languages and Human-Centric Computing, 2020, pp. 1–5.
https://dx.doi.org/10.1109/VL/HCC50065.2020.9127258

**Cross-domain correspondences for explainable recommendations**. *Aaron Stockdill, Daniel Raggi, Mateja Jamnik, Grecia Garcia Garcia, Holly E. A. Sutherland, Peter C.-H. Cheng, and Advait Sarkar*, Proceedings of the Workshop on Explainable Smart Systems for Algorithmic Transparency in Emerging Technologies (ExSS-ATEC), 2020.

**Simulating neuromorphic reservoir computing: Abstract feed-forward hardware models**. *Aaron Stockdill and*

*Kourosh Neshatian*, 2017 International Conference on Image and Vision Computing New Zealand (IVCNZ), 2017, pp. 1–7. https://dx.doi.org/10.1109/IVCNZ.2017.8402482

**Restricted Echo State Networks**. *Aaron Stockdill and Kourosh Neshatian*, AI 2016: Advances in Artificial Intelligence: 29th Australasian Joint Conference, 2016, pp. 555–560. https://dx.doi.org/10.1007/978-3-319-50127-7_49

#### PUBLICATIONS – CONTRIBUTING RESEARCHER

**Representational Interpretive Structure: Theory and Notation**. *Peter C.-H. Cheng, Aaron Stockdill, Grecia Garcia Garcia, Daniel Raggi, and Mateja Jamnik*, 13th International Conference on the Theory and Application of Diagrams, 2022, pp. 54–69. https://dx.doi.org/10.1007/978-3-031-15146-0_4

**Cognitive Properties of Representations: A Framework**. *Peter C.-H. Cheng, Grecia Garcia Garcia, Daniel Raggi, Aaron Stockdill, and Mateja Jamnik*, 12th International Conference on the Theory and Application of Diagrams, 2021, pp. 415–430. https://dx.doi.org/10.1007/978-3-030-86062-2_43

**How to (Re)represent it?**. *Daniel Raggi, Gem Stapleton, Aaron Stockdill, Mateja Jamnik, Grecia Garcia Garcia, and Peter C.-H. Cheng*, IEEE 32nd International Conference on Tools with Artificial Intelligence, 2020, pp. 1224–1232. https://dx.doi.org/10.1109/ICTAI50040.2020.00185

**Dissecting Representations**. *Daniel Raggi, Aaron Stockdill, Mateja Jamnik, Grecia Garcia Garcia, Holly E. A. Sutherland, and Peter C.-H. Cheng*, 11th International Conference on the Theory and Application of Diagrams, 2020, pp. 144–152. https://dx.doi.org/10.1007/978-3-030-54249-8_11

**Inspection and Selection of Representations**. *Daniel Raggi, Aaron Stockdill, Mateja Jamnik, Grecia Garcia Garcia, Holly E. A. Sutherland, and Peter C.-H. Cheng*, Intelligent Computer Mathematics, 2019, pp. 227–242. https://dx.doi.org/10.1007/978-3-030-23250-4_16

#### OUTREACH AND VOLUNTEERING

**Representational Systems Theory: What, Why and How**, *Diagrams 2022 tutorial*. 2022

- Co-organising and will run a 90 minute tutorial at Diagrams 2022, targeted at researchers in diagrammatic representations.
- The tutorial will be an interactive introduction to Representational Systems Theory, using a web app we have developed.

**STIMULUS Volunteer**, *University of Cambridge*. 2018–2020

- Volunteered 90 minutes per week at a local sixth form college, working with the teacher to extend both their knowledge and that of the students, providing extra resources and information, raising their enthusiasm for computer science.
- Engaged individually with students to provide practical help, extension activities, or alternative explanations, developing and encouraging their passion for computer science and programming.

**Scholarship Calculus Coordinator**, *Cashmere High School, NZ*. 2015–2016

- Developed the Scholarship Calculus programme for advanced Year 13 students, building on their standard curriculum and producing a set of resources for myself and future teachers running this programme.
- As a result of the new programme and teaching pattern, my 2016 cohort received a record four scholarships, double the previous best record for the school, and helping fund the students' tertiary education.

#### AWARDS

**Best Student Paper**, *Diagrams Conference 2021*. 2021
Awarded for 'Considerations in Representation Selection for Problem Solving: a Review'.

**Hamilton Cambridge International Scholarship**, *Cambridge Trust*, University of Cambridge. 2017
Full scholarship to study towards my PhD at the University of Cambridge.

**Graduating BSc(Hons) Computer Science Student of the Year**, *University of Canterbury*. 2016
Awarded for academic achievement throughout my undergraduate and honours study.

**Summer Research Scholarship**, *Department of Physics and Astronomy*, University of Canterbury. 2016
To continue my Honours research throughout the summer 2016–2017 break.

**G B Battersby Trimble Scholarship in Computer Science**, *University of Canterbury*. 2016
Awarded for academic merit, broad knowledge outside of computer science, and research of benefit to New Zealand.

**Finalist for the Sir Paul Callaghan Eureka Award**, *Eureka Trust*, for innovation and STEM communication. 2016

**Freemasons University Scholarship.** For academic merit, community involvement, and leadership potential. 2016

**UC Senior Scholarship**, *University of Canterbury*, for academic merit at 200 and 300 level. 2016

**Graduating BSc Computer Science Student of the Year**, *University of Canterbury*. 2015
Awarded for academic achievement throughout my undergraduate study.

**Page Memorial Prize**, *University of Canterbury*, for academic achievement in Level 300 Mathematics. 2015

**Allied Telesis Labs Scholarship in Computer Science**, *University of Canterbury*. 2015

**Mathematics and Statistics Scholarship**, *University of Canterbury*, Tier I. 2015

**Member of the Golden Key International Honour Society**, *University of Canterbury*. 2014

**Mathematics and Statistics Scholarship**, *University of Canterbury*, Tier II. 2014

**Dean's Congratulations**, *University of Canterbury*. 2013
Received in recognition of Academic Achievement from Associate Professor Catherine Moran, Dean of Science.

**Peter Bryant Memorial Prize**, *University of Canterbury*. 2013
Awarded for First Place in 100-Level Mathematics.

**Computer Science High Achievers Scholarship**, *University of Canterbury*. 2012
Awarded to high achieving students commencing a degree in Computer Science in 2013.