AARON STOCKDILL

Research Fellow in Informatics at the University of Sussex

a.a.stockdill@sussex.ac.uk · https://aaron.stockdill.nz/

EDUCATION

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

- Computer Science. Thesis: "Automating representation change across domains for reasoning". Developed a theory of cross-domain *correspondences* to enable user-aware, contextual AI explanations in an interdisciplinary team from Cambridge and Sussex.
- To date, have published six conference papers and one workshop paper, all peer reviewed, presenting two. Presented to peers and academic leaders: 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; provides 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.

National Certificate of Educational Achievement (NCEA), *Cashmere High School*. 2010–2012

- Awarded up to NCEA Level 3, all levels endorsed with Excellence.

PUBLICATIONS

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.
https://dx.doi.org/10.1007/978-3-030-86062-2_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.
https://dx.doi.org/10.1007/978-3-030-86062-2_43

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.
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.

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.
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.
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.
https://dx.doi.org/10.1007/978-3-030-23250-4_16

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.
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.
https://dx.doi.org/10.1007/978-3-319-50127-7_49

EMPLOYMENT

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

- Developing theory and tools to describe representations in a uniform, and cognitively centred, manner.
- Working as part of a research team of six split between Sussex and Cambridge, continuing work from my PhD.
- Bringing formality and rigour to the cognitive representation notation (RepNotation), while developing tooling as a web app developed 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 one postgraduate course; 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.

Founder, Web Designer, Programmer, *Potato Softworks*. 2014–2017

- Founded Potato Softworks web design and hosting in 2014 with a fellow university student, with the aim of learning how to operate and improve small businesses, including financial responsibilities, legal obligations, and client management.
- Acted as consultant and designer for clients, developing them a web presence to increase exposure, with some clients receiving in excess of 5000 unique visitors in a month.
- When acting in a forward-facing role I brought in more than half of our clients, and continued to work with them to ensure ongoing monthly revenue for the company; positive experiences generated further clients through referrals.

Software Developer Intern, *ARANZ Geo Leapfrog*. 2014–2015

- Worked as part of the software development team working on geological modelling software, learning professional software development, and implementing new features such as a mesh editing interface and automatically generated graphics.

Mathematics Tutor, *Private*. 2012–2017

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

Dick Smith Electronics, *Salesperson*. 2012–2014

- Responsible for sales, stock handling, conflict resolution, and store openings and closings.

COMMUNITY VOLUNTEERING

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.

PERSONAL SKILLS

- **Communication** My work has primarily been in education, where communication to both large groups and individuals is vital. I have strong conflict-resolution skills. I speak English natively, and French at approximately B1.
- **Organisation** I am an organised person, shown by pursuing higher education and engaging with communities. Both teaching and my extra-curricular work require planning, while a PhD requires extensive resource management.
- **Leadership** I have been responsible for many students, and have organised and run events for MathSoc and CompSoc at the University of Canterbury. I was on the MCR committee for Selwyn College.
- **Diligence** As a PhD student, I am completing a long-term project with shifting goals. The research is novel, and requires planning, resource management, motivation, and perseverance to bring to conclusion.

TECHNICAL SKILLS

- Specialist in artificial intelligence, principally logical but also statistical; applications range from education to analysis to physics. My research included 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, 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.

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.

Entrance Scholarship, *University of Canterbury*. 2013
Awarded based on achieving Excellence at Level 2 and Level 3 in NCEA.

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

Proxime Accessit, *Cashmere High School*. 2012

Fraser and Tonkin Scholarship, *Cashmere High School*. 2012
Awarded for Excellence in Mathematics and Sciences.

First Place in Subject, *Cashmere High School*. 2012
Calculus (Awarded 2011), Physics, Statistics, Digital Technologies.