Kenneth N. Reid, Ph.D.

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Positioning Statement

I am currently a post-doc at Michigan State University (MSU) where I focus on the utilization of machine learning and evolutionary algorithms for genomic prediction. During this time I have collaborated on grant writings with various professors; led a team focusing on a research project of my own creation; met research requirements for the grant which funded my position; co-supervised a Ph.D. student and presented research and lectures to multiple universities and institutions. I am a Scottish citizen and currently hold a J-1 Scholar visa in the United States. I plan to continue my residence here through work-sponsored visas.

Overview - Timeline

Research Associate at MSU	11/2019 -
Research Assistant (3 Separate Projects) at UoS	04/2019 - 10-2019
INTO UoS **Module Coordinator**	01/2017 - 12/2018
Teaching Assistant at UoS	05/2015 - 04/2019
Ph.D. Student in Computing Science, University of Stirling (UoS)	05/2015 - 07/2019
Technical Graduate at Hewlett Packard Enterprise Services	08/2013 - 04/2015
B.Sc. with Honours in Computing Science	08/2009 - 05/2013

Publications

Li, S.S., Peeler, H., Sloss, A., **Reid, K.N.**, Banzhaf, W. Genetic Improvement in the Shackleton Framework for Optimizing LLVM Pass Sequences. GECCO'22: The Genetic and Evolutionary Computation Conference Companion 2022.

> Li, S.S., Peeler, H., Sloss, A., **Reid, K.N.**, Banzhaf, W. Genetic Improvement in the Shackleton Framework for Optimizing LLVM Pass Sequences. arxiv (2022).

Peeler, H., Li, S.S., Sloss, A., **Reid, K.N.**, Yuan Y., Banzhaf, W. Optimizing LLVM Pass Sequences with Shackleton: A Linear Genetic Programming Framework. GECCO'22: The Genetic and Evolutionary Computation Conference Companion 2022. ACM, 201 (2022).

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Reid, K.N., Miralavy, I., Kelly, S., Banzhaf, W., Gondro, C. 2021, July. *The Factory Must Grow: Automation in Factorio*. GECCO'21: The Genetic and Evolutionary Computation Conference Companion 2021. ACM, 201

> **Reid, K.N.**, Miralavy, I., Kelly, S., Banzhaf, W., Gondro, C. The Factory Must Grow: Automation in Factorio. arxiv (2021).

Han, J., Gondro, C., **Reid, K.N.**, Steibel, J.P. Heuristic hyperparameter optimization of deep learning models for genomic prediction. G3 Genes | Genomes | Genetics (2021).

> Han, J., Gondro, C., **Reid, K.N.**, Steibel, J.P. Heuristic hyperparameter optimization of deep learning models for genomic prediction. bioRxiv (2021).

Reid, K.N., 2019, September. *Metaheuristics for Solving Real World Employee Rostering and Shift Scheduling Problems*. Thesis.

Reid, K.N., Li, J., Brownlee, A., Veerapen, N., Swan, J., Kern, M. and Owusu, G. 2019, July. *A Hybrid Metaheuristic Approach to a Real World Employee Scheduling Problem*. GECCO'19: The Genetic and Evolutionary Computation Conference 2019. ACM, 201

Reid, K.N., Li, J., Veerapen, N., Swan, J., McCormick, A., Kern, M. and Owusu, G. 2018, September. *Shift Scheduling and Employee Rostering: An Evolutionary Ruin & Recreate Solution*. In Computer Science and Electronic Engineering (CEEC), 2018. IEEE.

Reid, K.N., Li, J., Swan, J., McCormick, A. and Owusu, G., 2016, December. *Variable Neighbourhood Search: A case study for a highly-constrained workforce scheduling problem*. In Computational Intelligence (SSCI), 2016 IEEE Symposium Series on (pp. 1-6). IEEE.

Grants and Funding

April, 2022 - **Recipient** of extended funding for research associate position on genomic prediction project at MSU, worth approximately $100,000. *Accepted*

February, 2022 - **Author** of grant application to the Templeton Foundation workshop on artificial life. If accepted, this will provide the opportunity to apply for for stakes in up to $5 million in funding. *Rejected*

February, 2022 - **Named researcher** and grant author for an M-AAA seed grant with Prof. Cedric Gondro as PI. *Pending*

July, 2021 - **Named researcher** and grant author on a $1M grant to the National Science Foundation with Profs. Anand Naird and Wolfgang Banzhaf. *Rejected*

January, 2021 - **Named researcher** on a $150k grant to the SLOAN foundation, as a leader on 2 / 3 project streams described. *Rejected*

July, 2019 - **Named researcher** on an innovation voucher worth £5k from the Scottish Funding Council. I contributed extensively to the application on behalf of Dr Deepayan Bhowmik. *Accepted*

June, 2019 - 2 month employment research grant focusing on industry collaboration within UoS. *Accepted*

March, 2019 - **Travel grant** to visit British Telecommunications in Ipswich, England to aid in generating preliminary results for the aforementioned 2 month funded RA position. *Accepted*

Research Experience

Novel Methods to Increase the Accuracy of Genomic Prediction Using Sequence Data

Based in the Quantitative Genetics group, in Prof. Cedric Gondro's lab. The project goals:

- Improved accuracy of genomic prediction has immediate practical and commercial value for agricultural production as it leads to improved accuracy of selection and higher rates of genetic gain.
- Even small improvements in accuracy of prediction, wider adoption and higher rates of genetic improvement, on a broad scale, will have large multiplicative effects across the industry and across selection generations with direct financial gains in the order of millions of dollars across the livestock industry.
- Genomic prediction is currently the main worldwide research effort being undertaken in Animal Genetics to improve agricultural production. Results from this project have potential to better leverage international competitiveness and could lead to higher, more efficient food production yields.

Malaria Risk Mapping Through Machine Learning

This project was funded by a 2 month UoS SPARK initiative. This role focused on:

- Exploiting new mathematical models can provide fundamental signal decomposition methodologies that can be used in deriving unique adaptive signal processing techniques for robust texture analysis optimised in handling noisy satellite image data.
- Explore use of state of the art machine learning methods, e.g. deep learning, to achieve highly accurate remote waterbody segmentation maps by analysing EO data from different satellites leading to creation of environmental feature map to identify, in a timely way, the emergence of malaria vector breeding sites.
- Improve malaria risk mapping through the derivation of novel mathematical models, leading to development of robust signal and image processing algorithms using input from remote satellite data.

Highly Customisable Employee Scheduling Optimisation

This project was funded from a proposal I wrote. This role focused on the following:

- Repurposing an algorithm used in previous works to create schedules with different characteristics, for a different workforce.
- Implementing a 'suggestion' system which can recommend beneficial changes to known roster patterns.
- Implementing a front-end interface to allow managers to view the effects of manually changing schedules.

Mining Surrogates for Cheaper Optimisation with Explanation

This project was funded by a 2 month UoS SPARK initiative. This role had several foci:

- Functional ANOVA on surrogate models including Markov networks, random forests & neural networks, to aid in the search of explainability in AI.
- Compiled a literature review to lay the groundwork for a larger future grant proposal.
- Explore how the explanations produced by models vary over the length of a GA run as the populations converge.

Ph.D.

My research at UoS was funded by both British Telecommunications Plc (BT) and the UK's EPSRC DAASE project (grant no. EP/J017515/1). Implementation of this research was conducted in **collaboration with British Telecommunications Research & Innovation Plc**. Outcomes listed below:

- **Novel research** published using **real world data**, focusing on employee scheduling and rostering using **mixed metaheuristics, matheuristics, and exact methods.**
- **Impact** by this project will be highlighted in an upcoming **REF submission**, as this work affects up to 25k employees across the UK.
- Software implemented in Java and integrated for use by BT to provide simulations for potential "What if" scenarios regarding shift scheduling and employee rostering. The software is also being considered for use in scheduling employees and in other business sections, with the potential to be rolled out across the UK.
- Built ties between UoS CS&M (Computing Science & Mathematics) and BT. This included **supervising** two undergraduate honours projects using data generated by soft-

ware I wrote. I also designed the projects, proposed them and interviewed potential students on behalf of BT.

- Winner of **best poster & presentation** at Ph.D. day within UoS on two occasions out of three attended.

Teaching Experience

INTO University Partnerships

Course coordinator for Computing Science at INTO - UoS. My time at INTO **strengthened both my teaching abilities and techniques**. The list below highlights some of these duties.

- **Write all course materials**, including syllabus, practical sheets, lecture material, exams, assignments, homework and reports.
- Deliver all above materials to students **across all available mediums**: lectures, seminars, online classes, group discussions, practical laboratories and live coding.
- **Support students** regarding academic progress and pastoral issues. This included providing advice regarding time management, stress, cultural differences and career direction.
- **Create documentation** on class progress, disciplinary issues, grades, and present this at staff meetings and to international managerial staff.

Undergraduate & Masters

- **Lecturing** various undergraduate and masters modules, topics including data science, cyber security, programming, design and testing (over 100 hours).
- Presenting **public lectures** on cyber-security, ethical hacking and penetration testing.
- Responsible for tutoring in classrooms and lead-demonstrating laboratory sessions.
- Marking essays, coursework and exams. Invigilating exams and assessments.

In 2019 I was **nominated for a RATE (Recognised Achievement in Teaching Excellence) award**.

Technical Skills

- Java
- Python & Anaconda
- R
- Research
- Data Visualization
- LaTeX
- SQL
- Git

Key Attributes

- Experienced Industrial Collaborator
- Advocate for Equality
- Confident Speaker
- Logical and Analytical Problem Solver
- Effective Communicator
- Intellectually Curious
- Participative Leader
- Efficient Time Management
- Excellent Presenter
- Communication-Focused Team Member

Extra Curricular

COSMoS - **CO**mputing **S**cience and **M**athematics **S**kill sharing is a monthly initiative in the CS&M division at UoS. I chaired COSMoS since founding it in 2015 till my departure in 2019. I invited speakers, organised sessions and managed the website. Over 25 sessions were hosted. I also presented at COSMoS 5 times. COSMoS has since spread to two other UK universities. I have also begun this initiative at MSU, under a different acronym.

Paper Reviewing - IJCAI-PRICAI 2021, GI@GECCO19

ATHENA Swan - As an active **advocate for equality** I was a board member on an application for bronze award within CS&M at UoS.

Invited Seminars

In addition to hosting several seminars at MSU, I also presented my research internationally:

- February 2021, Division of Computing Science, University of Stirling
- November 2020, BEACON, MSU
- February 2020, BEACON, MSU.
- February 2020, Animal Breeding & Genetics, MSU.
- April 2019, School of Computing Science, Robert Gordon University.
- November 2018, Operation Research Group, Queen Mary University of London.

Other

Podcast:	Over **1000 hours recorded** of audio and video. Weekly since 2008. Over 150k downloads across all episodes.
Photography:	Hosted 10+ photography competitions (1, 2, 3) totaling over **161M votes**. Google Chrome themes with **thousands of users** (1, 2, 3)
Avid Reader:	I read dozens of books a year, more details here. I review books with my wife on YouTube.
Memberships:	**ACM**.
GitHub:	Software I have created is **published on my GitHub page.**
Website:	I compile my various hobbies into one place.

References

Industrial and academic referee details available on request.