

## Mark N. Read, Ph.D.

My passion for advancing healthcare through computational technologies has seen me collaborate across disciplines, lead teams, manage and deliver projects. I have advanced the frontier of data science theory and its application in healthcare, neuroimaging, biological science, and robotics.

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## EMPLOYMENT AND RELEVANT EXPERIENCE

### Senior Data Scientist

2021-2023

Omniscient Neurotechnology

*Data science and MRI image processing pipelines to inform neurosurgery, to understand and treat mental health and neurological disorders*

**I led a research group** in theoretical and applied biomedical data science.

- 1 postdoctoral researcher, 3 PhDs, 8 Masters, 7 Honours students

Key areas of innovation:

- **Novel, purpose-built unsupervised machine learning pipelines** tailored towards specific data streams and problems
- Clinical decision support through novel theory and application of supervised machine learning
- Digital twin technologies to advance basic science and develop new therapeutics

### Lecturer in Biomedical Computation

2019-2021

School of Computer Science,  
The University of Sydney

*Engaging Westmead Health Precinct to build AI-driven research projects and training programs*

**Highly creative and successful cross-disciplinary scientist**

- Won over AU\$1 million in competitive research funding
- Published over 40 peer-reviewed scientific manuscripts
- Leading journals including *Briefings in Bioinformatics, Bioinformatics, PLOS Computational Biology, Nature Cell Biology, Cell Metabolism*

Proven capacity to:

- **Conceive and manage original hypothesis-driven interdisciplinary projects**
- Develop and productionise data science solutions & processing pipelines
- Build interdisciplinary collaborations
- Work constructively within committees to drive change in an organisation
- Work within dynamic teams and strategically prioritise resources and time across projects to meet deadlines

### Independent Research Fellow

2013-2018

The University of Sydney

*Application of computational methodologies to advancing healthcare through data*

*Based in the flagship multi-disciplinary biomedical research institute, the Charles Perkins Centre*

**Dedicated to the training and mentoring of others**

- Routinely in leading my research group
- Leading the development of the Master of Digital Health and Data Science
- Teaching biomedical data science at the postgraduate level

Expert and confident communicator

- Successful tenders for competitive funding
- Publishing in discipline-leading journals
- **Spoken and visual presentations tailored to audience and their expertise.** E.g., academic peers, senior managers, my team, and the general public

### Research Associate

2011-2013

The University of York, UK

## EXAMPLE PROJECTS

- A novel MRI neuroimaging pipeline to create personalised maps of the human brain, informing how neurosurgeons approach and remove tumours. This represented a complete overhaul of Omniscient Neurotechnology's core product. I handled design, implementation, invention & execution of tests for regulatory approval, and deployment. Specific sub-projects for which I had complete technical oversight:
  - o Novel algorithms to automatically locate deep-brain targets for electro-stimulation to treat Parkinson's, epilepsy, and obsessive-compulsive disorder. This is a new product to be brought to market in 2023.
  - o New approach and algorithm to segmenting nerve fibre bundles, robust to severe structural brain damage, from diffusion MRI data. This was a core product output that was receiving criticism from customers.
  - o Removal of scanner effects from functional MRI data, which occlude biological signals and the pooling of datasets for greater statistical power. This entailed both supervised and unsupervised ML and graph theory to identify features carrying scanner-contaminations, and frequency domain manipulations (wavelets), latent space and manifold representations to correct them. This work is being written up for publication.

- Building an analytical platform to characterise the evolving immune response and how this relates to clinical outcome. I led the creation of two novel time-series clustering algorithms specifically tailored to cytometry data. They were applied in modelling how immune responses to COVID led to recovery or hospitalisation.
- Supervised ML to provide clinical decision support from the gut microbial community profiling, e.g. building diet-recommender systems to optimise weight-loss for a given individual; forecasting melanoma patient responses to immunotherapy to avoid the administration of likely-ineffective treatments whilst risking side-effects.
- Creating bespoke digital twin simulations of 1) the gut microbial community and its response to diet, enabling us to shape it to benefit health, and 2) the immune cell population interactions that drive Crohn's disease.
- Uncovering the factors responsible for driving pressure injury incidence in Westmead hospital by applying supervised machine learning to electronic medical records. This will shape clinical care at the hospital and avoid financial penalties associated with pressure injury incidence.

## EXPERT TECHNICAL SKILLS

- Machine learning, feature engineering, data wrangling, statistics and visualisation in both Python (scikit-learn, seaborn, matplotlib, numpy, scipy) and R
- Supervised machine learning experience: auto-encoders, support vector machines, random forests, gradient boosting, multilayer perceptrons, sparse partial least squares discriminant analysis, regression
- Unsupervised ML: published novel algorithms in academic journals, applied to COVID immune responses
- Software development: AWS EC2 & S3, Git, CI/CD, pytest, Docker, bash, unix, test-driven development
- Development of data processing and analysis pipelines (e.g. neuroimaging and gut microbial genomics)
- Development of simulations of biological systems in Java and Python using object-oriented programming
- Expert in multi-objective optimisation technologies, e.g. NSGA-II and III.

## EDUCATION

2007-2012	<b>PhD in Computer Science</b> The University of York, UK. <i>Best Ph.D. thesis in Computer Science Department, 2<sup>nd</sup> prize</i>
2002-2007	<b>Master of Engineering in Computer Science and Systems Engineering</b> The University of York, UK. <i>1<sup>st</sup> Class Honours</i> <i>Thesis won national UK Science, Engineering and Technology award in 'Information Technology'</i>
2020	<b>Graduate Certificate in Educational Studies (Higher Education)</b> The University of Sydney. <i>High Distinction</i>

## SELECT PUBLICATIONS

\* Corresponding Author. [Full list here.](#)

GH Putri, I Koprinska, TM Ashhurst, NJC King, MN Read\*. (2021). Using single-cell cytometry to illustrate integrated multi-perspective evaluation of clustering algorithms using Pareto fronts. **Bioinformatics** :btab038.

GH Putri, J Chung, ..., MN Read\*. (2022). TrackSOM: Mapping immune response dynamics through clustering of time-course cytometry data. **Cytometry Part A**, 103(1):54-70.

MN Read\*, K Alden, J Timmis and PS Andrews. (2020). Strategies for calibrating models of biology. **Briefings in Bioinformatics** 21(1):24–35.

GH Putri, MN Read, et al. (2019). ChronoClust: Density-based clustering and cluster tracking in high-dimensional time-series data. **Knowledge-Based Systems** 174:9-26

MN Read\*, J Bailey, J Timmis and T Chtanova. (2016). Leukocyte motility models assessed through simulation and multi-objective optimization-based model selection. **PLOS Computational Biology** 12(9):e1005082

N Lamm, MN Read, et al. (2020). Nuclear F-actin Counteracts Nuclear Deformation and Promotes Fork Repair During Replication Stress. **Nature Cell Biology** 22(12):1460-1470

MN Read\*, K Alden, LM Rose, J Timmis. (2016). Automated multi-objective calibration of biological agent-based simulations. **Journal of the Royal Society Interface** 13(122):20160543

I Moran, ..., MN Read, T Phan. (2018). Memory B Cells Are Reactivated in Subcapsular Proliferative Foci of Lymph Nodes. **Nature Communications** 9:3372