Become a DARE PhD

DARE
ARC Training Centre in
Data Analytics for Resources & Environments

Modern data science methods are created through the convergence of mathematical, statistical, and computing disciplines. With an extensive team of supervisors that include national and international world leaders in modern data and environmental sciences, the DARE Centre is looking to supervise at least 15 PhD students that will form a cohort to develop new data analytic methods that may be used to address applications of critical importance to Australia's environment and resources.

Central to this task are Bayesian statistical approaches to quantifying uncertainty and individual projects will focus on the fusion of probabilistic and physically derived models, spatio-temporal models, extreme value theory, expert elicitation and new algorithmic procedures to estimate such models. Applicants are expected to have an excellent academic record in undergraduate or post graduate mathematical and/or computer sciences, ideally with a substantial component comprising probability and statistics.

The motivation for DARE is the recognition that the cumulative impacts of our natural resource consumption and management has important long-term consequences for Australia's economic, societal and environmental health. Yet many decisions and policies are based on limited amounts of data and rudimentary analyses, with little appreciation of the critical role that understanding and quantifying uncertainty plays in the process. The DARE Centre will develop and deliver the data science skills and tools for Australia's resource industries and stakeholders to make the best possible evidence-based decisions in stewarding the nations natural resources.

The importance of DARE, and its recognition of the foundational role of mathematical sciences, is high-lighted by the funding of generous PhD stipends jointly by the Australian government and industry partners.

Stipends support candidatures of three years, with the opportunity to spend some of the time (up to one year) in an industry placement programme, applying their data science skills to support best possible evidence-based management of the nation's natural resources. Candidates may also undertake field work in rural and regional Australia as part of their industrial placement. Opportunities for conference presentations, exchange study with the Alan Turing Institute (UK) and employment in industry or government at the end of the program are also available.

For more information or to submit an expression of interest, please email **dare.centre@sydney.edu.au**, or visit **www.darecentre.org.au**.

Applications with mathematical rigour

It's your future.
A data science PhD can help you shape it.

Generous scholarships of up to $40,000 per annum are available to successful applicants.

Applicants who receive an Australian Government Research Training Program Scholarship (RTP) are also invited to apply and will receive a top-up of up to $10,000.

![DARE - ARC Training Centre in Data Analytics for Resources & Environments]

Current projects

Biodiversity

1. Bayesian Optimisation and Sequential Sampling for Subterranean Fauna (WABSI)
2. Flexible methods for longitudinal data to predicting occupancy and distribution trajectories of forest dependent fauna and flora species (NRC)
3. Computationally efficient uncertainty quantification of deep learning models using LIDAR data to track forest health (NRC)

Water/Biodiversity

17. Copula Models for Multivariate Extremes (IAG)
18. Novel Multivariate Gaussian Processes for Prediction of Bushfires (DPIE)
19. Embedding SDEs in probabilistic models to model propagation of bushfires (DPIE/Minderoo)

Water

12. Variable selection and causal inference techniques for bacteria growth in water catchment areas (WaterNSW)
13. Flexible Spatial temporal models of impact of mining practices in catchment areas on surface and ground water quantity and quality.
14. Where has the water gone?. Probabilistic models for water balance dynamics (NSSN)
15. Reef Evolution
16. Bayesian data fusion for the construction of global fishing Index (Minderoo)

Biodiversity/Minerals

4. GeoBiomics – Dimension Reduction and variable selection in BN to link geochemistry and biomics (GA)

Minerals

5. Novel transition kernels in MCMC to explore posterior distribution of National Depth to Basement Map (GA)
6. Ensemble methods to improve process automation for sustainable mines (McKinsey)
7. Reducing uncertainty via Transfer Learning in process automation. (McKinsey)
8. Bayesian optimization for optimal drilling sequences for ore exploration (Newcrest, GA)
9. Computationally efficient uncertainty quantification of deep learning models for mine automation using LIDAR data. (Newcrest)

Water/Minerals

10. Simulation methods for marginalization to constrain/map 3D hydraulic conductivity. (GA)
11. Environmental impact of Mines and water security (Newcrest)

DARE partners

GOVERNMENT
- WaterNSW
- Department of Planning and Environment (DPIE)
- Geoscience Australia (GA)
- The Western Australian Biodiversity Science Institute (WABSI)
- NSW Data Analytics Centre (DAC)
- NSW Smart Sensing Network (NSSN)
- Natural Resources Commission (NRC)

INDUSTRY
- IAG
- Newcrest
- McKinsey
- Minderoo

Potential supervisors

DATA SCIENCE	BIODIVERSITY	WATER	MINERALS
Sally Cripps	Glenda Wardle	Lucy Marshall	Mark Jessell
Robert Kohn	Aaron Greenville	Willem Vervoort	Mark Lindsay
Dacheng Tao	Jody Webster	Fiona Johnson	Tristan Salles
Fabio Ramos			
Mark Girolami			
Ed Cripps			
Lamiae Azizi			
Emi Tanaka			
Rohit Chandra			