

Current Projects

1. Dr Linh Nghiem - School of Mathematics and Statistics

Project title:

Statistical methodologies for complex data settings

Project summary:

We are seeking up to two PhD students to join our team in developing new theory, methods, and applications of statistical dimension reduction for data with complex structures, including but not limited to, multi-way clustered, spatial-temporal, and network dependence. The student will be undertaking research in connection with the Australian Research Council Discovery Project (DP260100579), addressing important challenges of distilling high-dimensional regression and classification relationships, with little to no loss of information, into results readily understood by domain experts.

The supervision team will include Dr Linh Nghiem, Dr Shila Ghazanfar, A/Prof Rachel Wang (all from the School of Mathematics and Statistics, University of Sydney), and A/Prof Francis Hui from the Australian National University.

Requirements:

- Minimum USyd requirements for all PhD candidates, typically by completing an undergraduate Honours or Master's degree with a research component of at least 25% in the final year of study.
- Pre-requisite courses:
- Calculus-based probability (equivalent to USyd STAT2x11), introductory statistical inference (equivalent to STAT3x23)
- At least two courses in applied statistics or relevant, e.g., linear models, statistical/machine learning, deep learning, correlated data analysis
- Familiar with R and/or Python, Latex, and GitHub
- Desirable: A (mathematical) real analysis course (measure theory is optional).

2. A/Prof. Thomas Roberts – School of Life and Environmental Sciences

Project title:

Local, tacit and Indigenous socio-ecological knowledges of native grains and grasses on Gamilaroi and Wiradyuri Country

Project summary:

This PhD project, supported by ARC Discovery grant DP250101050, will be grounded in co-design processes to generate collective local, tacit and Indigenous landscape-scale knowledges of the environmental variability of native grains and grasses across Gamilaraay and Wiradyuri Nations. The successful candidate will collate these knowledges alongside Gamilaraay researchers by targeting Indigenous and non-Indigenous landowners, landholders, land managers and other local stakeholders involved in regeneration and restoration of native grasses at specific locations. The knowledge the successful candidate will synthesise will focus on environmental histories and local observations to further our understanding of the socio-ecological geographies of native grains and grasses. Questions of access, governance, conservation and use of native grains and grasses will be overlaid on this data and analysed alongside local environmental knowledges. On a theoretical level, it is expected that this research will contribute to new ways of thinking about the diverse ontologies and epistemologies associated with grassland and grassy woodland Country.

The PhD student will make contributions to scholarship on co-design processes and outcomes in environmental studies in Australia. The successful candidate is expected to work closely with Gamilaraay researchers, including the Gamilaroi Grains Custodians, who represent Indigenous stakeholders in the University of Sydney's native grains research program. Gamilaraay researchers and custodians will co-design, co-execute and co-evaluate this project to co-shape the enquiry and analysis, and to ensure Indigenous Cultural Intellectual Property protocols are upheld and inform culturally appropriate dissemination of results.

3. Dr Tiangang Cui - **School of Mathematics and Statistics**

Project title:

Measure Transport Methods for Data-Centric, PDE-Constrained Decision Making

Project summary:

We are seeking up to two PhD students to join our team in developing new theory, computational methods, and applications of measure transport for high-dimensional and sequential inverse problems. The project will develop scalable computational methods with rigorous theoretical guarantees for data-driven, model-constrained decision making, with applications in areas such as biomedical engineering, geoscience, and digital water technologies.

The project sits at the intersection of computational mathematics and statistics, with opportunities to work on both mathematical foundations and large-scale applications.

Requirements:

- Meet the minimum University of Sydney admission requirements for PhD candidates, typically by completion of an undergraduate Honours degree or a Master's degree with a research component of at least 25% in the final year of study.
- Have a strong mathematical background, with knowledge of at least two of the following areas at an advanced undergraduate or graduate level: numerical analysis, tensor computation, mathematical statistics, dynamical systems, optimal transport, functional analysis, and probability theory.
- Be familiar with Python, Julia, or another high-level programming language.