

INFORMATION FOR CANDIDATES

for appointment as

Postdoctoral Fellow in the Inference Group in the Department of Physics
(Fixed-term – Two years)

DEPARTMENT OF PHYSICS ŌTĀKOU WHAKAIHU WAKA

PRIMARY FUNCTION

- To undertake original research as part of the Marsden Fund project *Scalable Bayesian Algorithms for Multi-Physics Inverse Problems with High-Level Representations*. The Postdoctoral Fellow will work closely with Dr. Colin Fox and team members Dr. Tiangang Cui (University of Sydney), Prof. habil. Oliver Ernst (Chemnitz) and Dr. Youssef Marzouk (MIT).

KEY TASKS

- Develop scalable Bayesian inference algorithms for inverse problems with high-level structural representations.
- Develop high-level probabilistic models for interpretable representations of subsurface geological structure.
- Develop methods for integrating multiple geophysical data types within a unified Bayesian inference framework.
- Develop rapid Bayesian inversion methods to support adaptive field acquisition.
- Integrate modern machine learning techniques to accelerate Bayesian computation, including surrogate models, efficient proposal mechanisms, and learned transport maps.
- Analyse the mathematical properties of proposed algorithms, including convergence and ergodicity where appropriate.
- Deliver computational methods and open-source software for groundwater imaging in representative New Zealand settings.
- Publish research in high-impact journals and present results at leading international conferences.
- Mentor postgraduate students and contribute to the supervision of research students.
- Collaborate effectively with members of the Marsden research team and external project partners.
- Contribute to the development of an internationally recognised research programme in scalable Bayesian computation.

Relationships

Ultimately responsible to: Head of Department
Supervision by: A/Prof. Colin Fox

FUNCTIONAL RELATIONSHIPS: Collaborate with other team members of the Marsden project, as well as staff and students in the Departments of Physics, Mathematics and Statistics, and Computer Science.

Maintain working relationships with general and technical staff in the Physics Department

BUDGETARY RESPONSIBILITY

Over an agreed limit, purchases are to be authorised by supervisor.

EXPECTED OUTCOMES

- Regular collaborative contributions as part of a diverse research team.
- Regular and comprehensive liaison with supervisor.
- Reports on research results written clearly, comprehensively, and on time.
- Administration and record keeping completed accurately and efficiently.

EQUITY AND DIVERSITY:

Act in a manner consistent with the University's commitment to anti-racism and the co-creation of accessible, safe, respectful, and welcoming environments where all students and staff are supported to achieve their full potential.

MĀORI STRATEGIC FRAMEWORK:

Act in a manner consistent with the principles and implications, as well as the University's commitment to the Treaty as articulated in the Māori Strategic Framework.

PACIFIC STRATEGIC FRAMEWORK:

Act in a manner consistent with the strategies and goals contained in the University's Pacific Strategic Framework, role-modelling and promoting Pacific values, equity and diversity principles and cultural safety practices.

HEALTH & SAFETY:

Act and work in a manner compliant with current health and safety at work legislation and University procedures, frameworks and guidelines. Role model safe behaviour and practices, share the responsibility to prevent harm and contribute to a safe campus and work environment, including raising workplace health and safety concerns for self, students, visitors and other staff.

SUSTAINABILITY:

Act in a manner consistent with the University's sustainability commitments; role-modelling sustainable practices, with a particular emphasis on minimising the environmental impact of day-to-day activities.