GEOSPATIAL RESEARCH INSTITUTE *Toi Hangarau*
University of Canterbury | Te Whare Wananga o Waitaha
Private Bag 4800, Christchurch 8140, New Zealand Aotearoa
Website: https://geospatial.ac.nz/

Geospatial Research Institute (GRI) – Toi Hangarau

PhD scholarship

Information for applicants

Aim:

The Geospatial Research Institute (GRI) scholarship has been implemented with the aim to increase the amount of novel geospatial research in all areas across the University of Canterbury.

The scholarship

Scholarship name:	The Geospatial Research Institute PhD scholarship
Scholarship value:	Total NZ$35000/year, plus fees and $2000 expenses.
Funding period:	The scholarship is tenable for the period necessary to complete up to 360 points of enrolment[1]
Number of scholarships:	One
Closing date for applications:	30 June 2023, 17:00 pm NZ Time

Selection of PhD candidates

The scholarship is open to national and international applicants and is awarded on a competitive selection process.

From all applicants, a selected group will be shortlisted and invited for an interview. The scholarship will be awarded to the best applicant.

The scholarship will be awarded for PhD research towards one of the projects advertised at: https://geospatial.ac.nz/jobs-and-scholarships/ and at the end of this document. In their application prospective students should identify which project they would like to be considered for.

The funding will be awarded to one PhD candidate under the following conditions:

- The candidate meets all UC criteria for enrolment in the PhD programme and applies for one of the geospatial projects advertised.
- The candidate demonstrates a clear interest in and aptitude for geospatial research.
- The candidate is selected based on their application and interview performance.
- The candidate is approved by the Senior (main) Supervisor of their selected project at UC (this happens as part of the shortlisting and interview process). Prospective PhD candidates interested in one of the advertised projects are encouraged to contact the project main supervisor to discuss the topic, and their suitability for it.

[1] In the case of a recipient either already enrolled for a PhD degree at the University of Canterbury or transferring from a doctoral programme at another university to complete a PhD programme at the University, the term of the stipend and grants is reduced by any period in excess of 60 points that the recipient has already completed for the degree at the time that the scholarship is conferred

Prospective PhD student applications must include the following five items:

- ☐ Application form (available here)
- ☐ Cover letter explaining motivation for doing a PhD outlining interest and experience in geospatial methods and analysis (maximum two pages)
- ☐ Curriculum Vitae including a list of any prior publications.
- ☐ Contact details of at least two academic or professional referees.
- ☐ A GPA report obtained from https://support.scholaro.com/portal/kb/articles/canterbury (those with New Zealand or United States qualifications are not required to use Scholaro).

Please send your completed application to: gri-enquires@canterbury.ac.nz

The deadline for applications is Friday June 30, 2023, at 17:00 NZ Time.

FAQs

Can I apply select multiple projects in my application?

Answer: No. Candidates should select one project only and are encouraged to contact the main supervisor to find out about the project and discussed their suitability for it.

How much detail should I include in my cover letter?

Answer: The panel will read your letter to assess your motivation and aptitude for PhD level geospatial research. You need to include enough detail to enable them to do this, giving examples from previous study or work experience. Around one to two pages is sufficient.

How important are prior publications for an application?

Answer: Being able to demonstrate previous experience in research will help the panel to determine your suitability for the PhD. Prior publications are not mandatory but can help your application to stand out.

Can I change my project after my application submission?

Answer: No. Please consider carefully which project you will apply for and contact the lead supervisor to understand the project in more detail ahead of application.

Can I modify the project during my PhD?

Answer: The fundamental topic should remain the same, including the geospatial focus, but it is the nature of PhD research that projects evolve over time. Such changes should only happen in consultation and agreement with the supervisory team.

Can I register part time?

Answer: Yes. If you register part time, the scholarship will be pro-rated. It is also possible to adjust your registration type during your PhD.

If I am the successful applicant, when can I start my PhD?

Answer: As soon as possible, no later than the end of 2023.

Projects available for applications in 2023

Project 1:
Spatio-Temporal Evolution of People and Place in the Hokianga, Aotearoa New Zealand

Main supervisor: Matthew Hughes (Civil and Natural Resources Engineering)

Email: matthew.hughes@canterbury.ac.nz

Project description: Indigenous approaches to environmental management and time can inform long-term land use, infrastructure development, and climate adaptation. This project embraces Te Ao Māori (the Māori world) concept *ka mua, ka muri* – walking backwards into the future – applying historical knowledge to inform future planning, using as a case study the Hokianga Harbour in Aotearoa New Zealand.

Geospatial concepts and tools will help co-create pre-European spatial narratives with local communities and develop spatiotemporal reconstructions of post-European settlement impacts on ecosystems, land tenure and infrastructure. This involves compiling and georeferencing archival materials including survey maps, reviewing other historical materials to characterise European settlement spatially, and conducting community engagement to inform and legitimise spatial narratives, for holistic understanding of colonisation processes on communities and place. Spatial evolution of land alienation leading to modern infrastructure systems will be characterised. Geospatial approaches will be used to produce dynamic and immersive visualisations, which will support hapū (subtribe) historical understanding, education initiatives, and aspirations for land sovereignty.

The ideal candidate is a visually creative cartographer/geospatial analyst, has interest in history and archival analysis, and excellent communication skills. Previous experience engaging with Māori communities is not essential, but commitment to learning cultural protocols and elementary Māori language is required.

Project 2:
Spatially-explicit population ecology of kororā in a New Zealand marine reserve

Main supervisors: Associate Professor Michelle LaRue (School of Earth and Environment) and Dr Sarah Flanagan (School of Biological Sciences).

Emails: michelle.larue@canterbury.ac.nz and sarah.flanagan@canterbury.ac.nz

Project description: The goal of this PhD project is to gain insights to the spatial ecology of kororā (little blue penguins [*Eudytupla minor*]). This will include investigating inter- and intra-annual foraging and movement patterns, fine-scale habitat selection, and spatial patterns with respect to relatedness and population health. Building upon our ongoing relationship with tangata whenua and conservation partners, we envision the project integrating multiple data sources to achieve three aims. First, we seek to understand foraging ecology of kororā through deployment of tracking devices on adult birds and subsequent spatial analysis of animal movement during the breeding season. Second, we will determine the diet of penguins during the breeding season by using stable isotopes to understand prey composition and linking that to tracking data. Third, we will explore spatial modelling techniques to understand foraging habitat and behaviour of penguins, spatially-explicit diet analysis, and intra-colony population dynamics.

We seek a motivated student with a degree (Master's preferred) in ecology, wildlife biology, or geography who is interested in cutting-edge techniques in spatial ecology and applying spatial science methods to better understand our environment. Ideal students will have experience with R, Python and/or ArcGIS/Pro; the ability to work independently, sometimes in poor/harsh weather conditions (e.g., wind and rain); and a team-oriented attitude.

Project 3:
Towards a machine learning driven framework for quantifying regional scale rock glacier change in mountain regions

Main supervisor: Shelley MacDonell (School of Earth and Environment)

Email: shelley.macdonell@canterbury.ac.nz

Project description: Snow, ice and permafrost are in a state of rapid change, directly impacting water resources, natural hazard occurrence and habitat availability in mountainous regions. While glacial and nival variability has been relatively well constrained using Earth Observation (EO) data, large uncertainties still remain in the state of mountain permafrost, including features such as rock glaciers. Recent advances in machine learning and computer vision offer new opportunities to automate detection and monitoring of rock glaciers over larger scales. The aim of this PhD thesis will be to develop a machine learning framework to reliably map rock glaciers in different environments at regional scales using EO datasets from Aotearoa New Zealand, the Andes, and Norway. The framework can work towards looking at changes over time. The successful candidate will be encouraged to explore geospatial portals such as Google Earth Engine or the Microsoft Planetary Computer as well to develop open-source scripts and routines.

The ideal candidate will have the following skills: Experience with programming, in particular machine learning libraries such as Tensorflow or Pytorch; Geospatial analysis including GIS and remote sensing is essential; Familiarity with methods such as differential radar interferometry (DInSAR), time series analysis, and topographic analysis are an advantage.

Project 4:
Spatially calibrated models for transmission and control of infectious diseases in Aotearoa New Zealand

Main supervisor: Michael Plank (Mathematics and Statistics)

Email: michael.plank@canterbury.ac.nz

Project description: Mathematical models are a key tool to understand and respond to infectious disease threats. Many models assume that the population is spatially homogeneous. But in reality local transmission patterns are affected by variables such as household size, age distribution, vaccination rates, and employment types. Some of these factors also affect the effectiveness of public health measures to control the spread of the disease.

The aim of this project is to develop new models that incorporate some of this variability using geospatial data, including census and administrative data. The models will be calibrated using spatially resolved epidemiological data on Covid-19 but will be applicable to a range of different pathogens.

The models developed will be of intermediate complexity – taking a relatively simple model as the starting point and building in variables that are relevant for disease transmission. This approach combines some of the advantages of simplified models with more complex models and will fill a need among stakeholders for models that include geographical variation and can inform planning and policy choices. The outputs will include a multivariate assessment of which places and communities are at risk of high rates of transmission, high disease burden, and/or low effectiveness of public health interventions.

This project will suit a student with an undergraduate degree in Mathematics, Statistics, or closely related discipline. The student should have a strong interest in epidemiological modelling and fitting models to real-world data, but prior experience in this is not required.