PhD Scholarship in Geometric Flows

Connected to ARC Future Fellowship (2026–2030)

Supervisor: Dr. Glen Wheeler (Homepage: https://glenw83.github.io/, School of Mathematics & Applied Statistics, University of Wollongong)
Start: 2026 (flexible) **Stipend:** AUD $35,522 p.a. (indexed; includes $3,000 top-up) **Duration:** 3.5–4 years **Location:** Wollongong, NSW, Australia

Project Overview

I invite applications for a fully funded PhD in *geometric flows*. The project should be related to my ARC Future Fellowship (https://dataportal.arc.gov.au/NCGP/Web/Grant/Grant/FT250100880). The core theme is curvature-driven evolution via *Sobolev gradient flows* and the *target flow*, with rigorous analysis at the interface of partial differential equations (PDE), functional analysis, and differential geometry. In general, projects will be tailored to the successful candidate's skills and interests. Two sample projects are below.

Suggested PhD Topics

(P1) The family of $H^{-k}(ds)$ gradient flows.
Develop existence/uniqueness theory, weak/variational formulations, regularity, and long-time behaviour for curvature energies under negative-index Sobolev metrics along curves or surfaces. Questions include metric completeness, well-posedness across topological changes, energy dissipation, and convergence to canonical equilibria.

(P2) The $H^2(d\mu)$-gradient flow of the ideal energy (a second-order flow).
Study the flow generated by the H^2 Riemannian metric on the space of immersions with area measure $d\mu$. The completeness of the H^2-metric is expected to aid stability analysis of constant-mean-curvature (CMC) surfaces. Targets include linear and nonlinear stability, spectral-gap estimates, Łojasiewicz–Simon type inequalities, and sharp convergence criteria.

Each project equips the candidate with cutting-edge knowledge in geometric flows with intersections across PDE, functional analysis, and differential geometry.

What You Will Do

- Build rigorous PDE/variational theory for geometric gradient flows (well-posedness, regularity, asymptotics).
- Prove stability and convergence results (e.g. around CMC equilibria) using analytic and geometric tools.
- (Optional) Design numerical experiments (e.g. MATLAB/Python/Julia) to explore conjectures and guide analysis.
- Disseminate results via publications and international conferences.

Training & Environment

You will join an active group in analysis and geometry at the University of Wollongong, Training covers: high-order elliptic/parabolic PDE, calculus of variations, geometric analysis of curvature energies, Sobolev Riemannian metrics on shape spaces, and gradient-flow techniques (including metric-space and Łojasiewicz–Simon frameworks).

Candidate Profile

- Honours/Master's degree (or equivalent) in mathematics with strong results.
- Background in at least one of: PDE, functional analysis, differential geometry, calculus of variations.
- Evidence of research potential (thesis, preprints, strong references).
- Programming experience is welcome but not required.

Funding & Teaching

The scholarship provides **AUD $35,522 p.a. (from 2026, indexed; includes $3,000 top-up)**. Candidates may *optionally* supplement their income through casual teaching, subject to availability and provided this does not impede research progress.

Diversity & Inclusion

We welcome applicants from all backgrounds and strongly encourage applications from groups under-represented in mathematics.

How to Apply

Email **glenw@uow.edu.au** (cc **glenwheelermath@gmail.com**) with:

- a brief cover letter describing your interests (and, if applicable, a short project idea),
- CV and academic transcript(s), and
- contact details for two referees.

Please use the subject line *"PhD Application — Geometric Flows"* and indicate your preferred start window in 2026. Review is rolling until the position is filled.