Rhuaidi Antonio Burke

rhuaidi.burke@maths.ox.ac.uk
https://www.raburke.xyz/

RESEARCH POSITIONS

Postdoctoral Research Associate   *2025 – Present*
Mathematical Institute, University of Oxford

Research Assistant   *September 2019 – January 2020*
UQ Computational Topology and Geometry Research Group

EDUCATION

Doctor of Philosophy   The University of Queensland   *2021–2025*
Thesis: *A Computational Approach to 4-Manifold Topology*
Advisor: Prof. Benjamin Burton

Master of Research   Macquarie University   *2020*
Thesis: *A Neo-Classical Approach to Sphere Parallelisability*
Advisor: Dr. Paul Bryan

Diploma of Language   The University of Queensland   *2016–2019*
Major: Japanese

Bachelor of Advanced Science (Honours)   The University of Queensland   *2015–2019*
Major: Mathematics | Honours: First Class (I)

AWARDS AND SCHOLARSHIPS

AWARDS

Honourable Mention for Best Student Publication in Mathematics   *2024*
School of Mathematics and Physics Annual Poster Day

Best Student Paper   *2024*
The 40th International Symposium on Computational Geometry

The B. H. Neumann Prize   *2023*
Annual Meeting of the Australian Mathematical Society

Dean's Commendation for Academic Excellence   *2018, 2019*
The University of Queensland

SCHOLARSHIPS

Research Training Program Scholarship   *2021–2024*
University of Queensland

Research Training Program Scholarship   *2020*
Macquarie University

Queensland Rail Institute Academic Scholarship   *2015*
Queensland Rail Institute

PUBLICATIONS

PAPERS

4. *Small Triangulations of 4-Manifolds and the 4-Manifold Census* (with Benjamin Burton and Jonathan Spreer)
   In *41st International Symposium on Computational Geometry (SoCG 2025)*.
   Leibniz International Proceedings in Informatics (LIPIcs), Volume 332, pp. 28:1-28:16, Schloss Dagstuhl – Leibniz-Zentrum für Informatik (2025)

3. *Algorithms in 4-manifold topology* (with Marc Kegel, et al.)
   arXiv: 2411.08775
   To appear in *Algebr. Geom. Topol.*

2. *Practical Software for Triangulating and Simplifying 4-Manifolds*
   Journal of Computational Geometry 16 (2):109–144

1. *Triangulations of Exotic 4-Manifolds*
   In *37th International Symposium on Computational Geometry (SoCG 2021) – Young Researchers Forum*

Software

All my software is available at `https://github.com/raburke/Comp4Top`

- ○ *Katie* — Software for triangulating 4-manifolds from Kirby diagrams.

- ○ *USDS* — A utility interface for the Up-Side-Down Simplification heuristic.

- ○ *Brute Force Builder* — Software for enumerating triangulations from a seed triangulation.

Talks and Lectures

Invited Talks

Plenary Speaker 7th Australian Mathematical Sciences Students Conference	December 2024
Observations on the Structure of Small 4-Manifold Triangulations Oklahoma State University, Topology Seminar	October 2024
Developments in Computational 4-Manifold Topology University of Modena & Reggio Emilia, Department Seminar	June 2024
Developments in Computational 4-Manifold Topology University of Melbourne, Topology Seminar	April 2024
Intersection Forms & Homotopy Classification of 4-Manifolds Australian Geometric PDE Seminar	February 2024
Triangulating Exotic 4-Manifolds University of Modena & Reggio Emilia, Geometric Topology Seminar	September 2021

Other Selected Talks

Small Triangulations of 4-Manifolds, the 4-Manifold Census, and 2-Knots University of Sydney, Geometry and Topology Seminar	August 2025
Small Triangulations of 4-Manifolds and the 4-Manifold Census The 41st International Symposium on Computational Geometry	June 2025
Small Triangulations of 4-Manifolds and the 4-Manifold Census Triangulations in Low-Dimensional Topology, MATRIX Institute	June 2025
Observations on the Structure of Small 4-Manifold Triangulations Joint meeting of the NZMS, AustMS and AMS	December 2024
Developments in computational 4-manifold topology Regensburg University, Workshop on 4-Manifolds and Algorithms	September 2024
Practical Software for Triangulating and Simplifying 4-Manifolds The 40th International Symposium on Computational Geometry (SoCG 2024)	June 2024
Developments in Computational 4-Manifold Topology (Lightning Edition) Combinatorial and gauge theoretical methods in low dimensional topology and geometry	June 2024
Developments in computational 4-manifold topology The 67th Annual Meeting of the Australian Mathematical Society	December 2023
Nightmares from the 4th Dimension University of Queensland Mathematics Graduate Student Seminar	September 2023
4-Dimensional Ice-Cream Cones and Donuts University of Sydney, Geometry & Topology Seminar	April 2023
Modular Melodies, Ridiculous Rhythms, and Chaotic Compositions UQ Mathematics Students Society Talks	March 2022
Triangulating Exotic 4-Manifolds Graduate Talks in Geometry & Topology (GT^2)	October 2021
Vorticity & Navier-Stokes UQ Mathematics Department Analysis Seminar	October 2021
Triangulating Exotic 4-Manifolds The 37th International Symposium on Computational Geometry: Young Researchers Forum	June 2021

Conference and Workshop Participation

The 41st International Symposium on Computational Geometry Kanazawa, Japan	*June 2025*
Workshop on Triangulations in Low-Dimensional Topology MATRIX, Australia	*June 2025*
Joint Meeting of the AustMS, NZMS, and AMS Auckland, New Zealand	*December 2024*
The 11th Heidelberg Laureate Forum Heidelberg, Germany	*September 2024*
Workshop on 4-Manifolds and Algorithms Regensburg, Germany	*September 2024*
The 40th International Symposium on Computational Geometry Athens, Greece	*June 2024*
Combinatorial and Gauge theoretical methods in low dimensional topology and geometry Pisa, Italy	*June 2024*
The 67th Annual Meeting of the Australian Mathematical Society Brisbane, Australia	*December 2023*
The 37th International Symposium on Computational Geometry Dallas, USA (Virtual)	*June, 2021*

Service

Category Theory Seminar (Co-Organiser)	*Semester 1, 2019*
UQ Mathematics Department Analysis Seminar (Organiser)	*Semester 1, 2018*

Teaching Experience

Teaching Assistant *2016–2019; 2021–Present*
UQ Mathematics Department
Courses Taught:
Multivariable Calculus & Ordinary Differential Equations (MATH1052),
Advanced Calculus & Linear Algebra I (MATH1071),
Advanced Calculus & Linear Algebra II (MATH2901),
Calculus & Linear Algebra II (MATH2001),
Optimisation Theory (MATH3404), Differential Geometry (MATH3405),
Chaos and Bifurcation Theory (MATH3101), Functional Analysis (MATH3402), MATLAB Instructor (MATH1052),
Analysis of Ordinary Differential Equations & Partial Differential Equations (MATH2100),
Mathematical Analysis (MATH2400), Analysis of Partial Differential Equations (MATH2011)

Programming Language Knowledge

- C++
- Mathematica
- Python
- Regina
- SnapPy
- SageMath
- MaxMSP

Languages

English	*Native*
Japanese	*Intermediate*