

# Alexander Elzenaar

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## RESEARCH & TEACHING POSITIONS

School of Mathematics, **Monash University**, Melbourne, Australia

- Sessional teaching associate 2025
  - Tutoring and marking: single-variate calculus

**Ministry of Business, Innovation, and Employment**, Wellington, New Zealand

- Research and data analyst, Evidence & Insights branch 2023–2024
  - Mathematical modelling and statistics to support ministerial offices and policy evaluators with particular focus in carbon modelling and econometric forecasting for the building and construction industry.

**Max-Planck-Institut für Mathematik in den Naturwissenschaften**, Leipzig, Germany 2022–2023

Dept. of Mathematics, **The University of Auckland**, New Zealand

- Research assistant (Professional Casual Staff) 2020–2021
  - Construction and symmetry properties of spherical  $(t, t)$ -designs (with Dr. Shayne Waldron)
  - Teaching of semester-long graduate seminar/course on Kleinian groups (with Dr. Jeroen Schillewaert)
- Graduate Teaching Assistant (GTA) 2019–2022
  - Tutoring and marking: single- and multi-variate calculus; complex calculus; linear algebra; logic and proofwriting; mathematics for computer science; computational mathematics; mathematics for non-mathematicians (infinities, topology, fractals); real analysis

## TERTIARY EDUCATION

**Monash University**, Melbourne, Australia

- (Ongoing) PhD candidate, Geometry and topology Likely completion 2027
  - Advisor: Prof. Jessica Purcell

**The University of Auckland**, New Zealand

- Master of Science with First Class Honours in mathematics 2021–2022
  - Thesis: *Deformation spaces of Kleinian groups* ([https://aelzenaar.github.io/msc\\_thesis.pdf](https://aelzenaar.github.io/msc_thesis.pdf))
  - Advisors: Dist. Prof. Gaven Martin (NZ Inst. of Adv. Study, Massey Uni.), Dr. Jeroen Schillewaert
- Bachelor of Science (Hons) with First Class Honours in mathematics 2020
  - Dissertation: *Toric varieties* (<https://aelzenaar.github.io/hons/dissertation.pdf>)
  - Advisor: Dr. Jeroen Schillewaert
- Certificate in Languages awarded 2020
  - Russian and Ancient Egyptian
- Bachelor of Science, major in mathematics 2017–2019
  - Exchange student at the University of Toronto, 2018 fall semester

**The University of Canterbury**, New Zealand

- STAR programme 2016
  - First year university mathematics program for secondary school students

## AWARDS, GRANTS, & SCHOLARSHIPS

- AustMS Student Support Scheme 2024
  - for attendance of Joint Meeting of the NZMS, AustMS, and AMS in Auckland
- Institute for Mathematical Sciences (Singapore) travel allowance 2024
  - for attendance of program *Computational Aspects of Thin Groups* (3–14 June)
- Research Training Program (RTP) Stipend (Australian Government) ongoing from 2024
- Clay Mathematics Institute Early Career Researcher Support 2023
  - for attendance of NZMRI Summer School on Groups and Dynamics, Nelson
- Kalman Summer Scholarship 2022
  - for attendance of NZMRI summer meeting on number theory, Akaroa
- University of Auckland Department of Mathematics Student Research Conference prize 2021
- Kalman Summer Scholarship 2021
  - for attendance of NZMRI summer meeting, Napier
- University of Auckland Postgraduate Honours / PG Diploma Scholarship 2020
- University of Auckland Summer Research Scholarship 2019–2020
  - Project: Numerical construction of spherical  $(t, t)$ -designs
  - Advisor: Dr. Shayne Waldron
- University of Auckland Faculty of Arts Deans List 2017
- NZQA Outstanding Scholar Award 2016
  - Limited to top 40–60 secondary school students in New Zealand
- Royal Society of New Zealand scholarship 2016
  - to attend XVI Summer Research School in Mathematics and Informatics, Blagoevgrad, Bulgaria

## PUBLICATIONS & PREPRINTS

- [8] A. Elzenaar, “From disc patterns in the plane to character varieties of knot groups” (preprint). arXiv: 2503.13829 [math.GT], 2025.
- [7] A. Elzenaar, “Changing topological type of compression bodies through cone manifolds” (preprint). arXiv: 2411.17940 [math.GT], 2024.
- [6] A. Elzenaar, G. Martin, and J. Schillewaert, “On thin Heckoid and generalised triangle groups in  $\mathrm{PSL}(2, \mathbb{C})$ ” (preprint). arXiv: 2409.04438 [math.GR], 2024.
- [5] A. Elzenaar, J. Gong, G. Martin, and J. Schillewaert, “Bounding deformation spaces of 2-generator Kleinian groups” (preprint). arXiv: 2405.15970 [math.CV], 2024.
- [4] A. Elzenaar and S. Waldron, “Putatively optimal projective spherical designs with little apparent symmetry”. In: *Journal of Combinatorial Designs* **33.6** (2025), pp. 222–234. DOI: 10.1002/jcd.21979. arXiv: 2405.19353 [math.CO], 2024.
- [3] A. Elzenaar, G. Martin, and J. Schillewaert, “The combinatorics of the Farey words and their traces”. In: *Groups, Geometry and Dynamics* (2024), published online first. DOI: 10.4171/GGD/832. arXiv: 2204.08076 [math.GT], 2022.
- [2] A. Elzenaar, G. Martin, and J. Schillewaert, “Concrete one complex dimensional moduli spaces of hyperbolic manifolds and orbifolds”. In: *2021-22 MATRIX annals*. Ed. by David R. Wood, Jan de Gier, and Cheryl E. Prager. MATRIX Book Series 5. Springer, 2024, pp. 31–74. DOI: 10.1007/978-3-031-47417-0\_2. arXiv: 2204.11422 [math.GT], 2022.
- [1] A. Elzenaar, G. Martin, and J. Schillewaert, “Approximations of the Riley slice”. In: *Expositiones Mathematicae* **41.1** (2023), pp. 20–54. DOI: 10.1016/j.exmath.2022.12.002. arXiv: 2111.03230 [math.GT], 2021

## SELECTED TALKS

- [12] “Deformations of 3-orbifold holonomy groups and applications”, Early Career Showcase in Low-Dimensional Topology, Joint Meeting of the NZMS, AustMS, and AMS (Uni. of Auckland), 2024.
- [11] “Limit sets of cone manifolds”, Poster session, Joint Meeting of the NZMS, AustMS, and AMS (Uni. of Auckland), 2024.
- [10] “Combinatorial structures in trace polynomials of function groups”, 8th Australian Algebra Conference (ANU, Canberra), 2024.
- [9] “Two-bridge knots, genus two surfaces, and discrete groups with two generators”, Hodgsonfest: Geometry and topology in low dimensions (Uni. Melbourne), 2024.
- [8] “Is  $\mathrm{PSL}(2, \mathbb{C})$  discrete?”, Topology Seminar (Monash Uni.), 2024.
- [7] “The dynamic in the static: Manifolds, braids, and classical number theory”, Regiomontanus PhD Seminar (Uni. Leipzig), 2023.
- [6] “What is a Kleinian group?”, Australian Postgraduate Algebra Colloquium, 2022.
- [5] “Pictures of hyperbolic spaces”, Discrete Mathematics and Geometry Seminar (TU Berlin), 2022.
- [4] “Strange circles: The Riley slice of quasi-Fuchsian space”, Seminar on Nonlinear Algebra (MPI MiS), 2022.
- [3] “Approximating the Riley slice exterior”, Matrix Inst. workshop on Groups and Geometries, 2021.
- [2] “Some properties of  $2 \times 2$  matrices”, Dept. of Mathematics Student Research Conference (Uni. of Auckland), 2021.
- [1] “Real varieties of spherical designs”, Algebra and Combinatorics Seminar (Uni. of Auckland), 2021.

## PROFESSIONAL AFFILIATIONS

**New Zealand Mathematical Society**, Student member  
**Australian Mathematical Society**, Student member

[2025-04-19]