Alexander Elzenaar

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RESEARCH & TEACHING POSITIONS

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)
  - 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

[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 $\mathsf{PSL}(2,\mathbb{C})$” (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” (preprint).
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* (accepted, to appear).
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 $\mathsf{PSL}(2,\mathbb{C})$ 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 2×2 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

[*2025-01-19*]