

Curriculum Vitae

Alex Rutar

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Personal Information

Institution University of Jyväskylä
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Website <https://rutar.org>
Citizenship Canadian
Languages English (native), French (reading)

Academic work experience

2024–2026 **Postdoctoral Researcher, University of Jyväskylä, Jyväskylä, Finland**
Funded by Tuomas Orponen's Academy of Finland Grant

Education

2020–2024 **PhD in Mathematics, University of St Andrews, St Andrews, Scotland**
Advisors: Kenneth Falconer and Jonathan Fraser
Thesis: *Assouad-type dimensions and the local geometry of fractal sets*
2016–2020 **Bachelor of Mathematics, University of Waterloo, Waterloo, Canada**
Major: Pure Mathematics, Minor: Combinatorics and Optimization
GPA: 95.7/100

Funding

2024 \$140,000 **NSERC Postdoctoral Fellowship**
2022 \$105,000 **NSERC CGS-D**
2020 £66,080 **EPSRC Doctoral Funding**

Scholarships and Awards

2023 £6,000 **Cecil King Travel Scholarship, London Math Society**
2020 £73,000 **Handsel Scholarship, University of St Andrews**
2020 \$1,000 **Pure Math Undergraduate Research Prize, University of Waterloo**

2019	\$4,500	NSERC Undergraduate Research Award , Government of Canada
2018	\$4,500	NSERC Undergraduate Research Award , Government of Canada
2016	\$20,000	W. T. Tutte National Scholarship , University of Waterloo
2016	\$5,000	President's Scholarship , University of Waterloo
2016	\$2,500	Rutherford Scholarship , Government of Alberta
2016	\$0	Governor General's Bronze , Government of Alberta

Publications

1. (with Vilma Orgoványi) *Two-scale branching functions and inhomogeneous attractors*. arXiv Preprint, 34 pp.
2. (with David Beltran, Joris Roos, and Andreas Seeger) *A fractal local smoothing problem for the wave equation*. To appear in: Bull. Lond. Math. Soc.
3. (with Richárd Balka and Vilma Orgoványi) *On the uniformity and size of microsets*. To appear in: Proc. Roy. Soc. Edinburgh Sect. A
4. (with Roope Anttila) *Fibre stability for dominated self-affine sets*. arXiv Preprint, 39 pp.
5. (with Antti Käenmäki) *Tangents and slices of self-affine carpets*. arXiv Preprint, 35 pp.
6. (with Antti Käenmäki) *Regularity of non-autonomous self-similar sets*. Math. Proc. Camb. Philos. Soc. **179** (2025), 623–648
7. (with Amlan Banaji) *Lower box dimension of infinitely generated self-conformal sets*. arXiv Preprint, 35 pp.
8. (with Amlan Banaji, Jonathan Fraser, and István Kolossváry) *Assouad spectrum of Gatzouras–Lalley carpets*. arXiv Preprint, 43 pp.
9. (with Antti Käenmäki) *Tangents of invariant sets*. arXiv Preprint, 19 pp.
10. (with Amlan Banaji and Sascha Troscheit) *Interpolating with generalized Assouad dimensions*. J. Geom. Anal. **35** (2025), Paper No. 270, 57 pp.
11. (with Andrew Mitchell) *Multifractal analysis of measures arising from random substitutions*. Comm. Math. Phys. **405** (2024), Paper No. 63, 44 pp.
12. (with Jonathan Fraser) *Assouad-type dimensions of overlapping self-affine sets*. Ann. Fenn. Math. **49** (2024), 3–21
13. *Attainable forms of Assouad spectra*. Indiana Univ. Math. J. **73** (2024), 1331–1356
14. (with Amlan Banaji) *Attainable forms of intermediate dimensions*. Ann. Fenn. Math. **47** (2022), 939–960
15. *A multifractal decomposition for self-similar measures with exact overlaps*. arXiv Preprint, 61 pp.
16. (with Kathryn Hare) *Local dimensions of self-similar measures satisfying the Finite Neighbour Condition*. Nonlinearity **35** (2022), 4876–4904
17. *Geometric and combinatorial properties of self-similar multifractal measures*. Ergodic Theory Dyn. Syst. **43** (2023), 2028–2072

18. (with Kathryn Hare and Kevin Hare) *When the Weak Separation Condition implies the Generalized Finite Type Condition*. Proc. Amer. Math. Soc. **149** (2021), 1555–1568

Conferences and Presentations

- 2025.10 **University of Edinburgh Analysis Seminar:** *Multi-scale properties of continued fraction sets*
- 2025.10 **University of St Andrews Analysis Seminar:** *Conformal attractors, inhomogeneous iterated function systems, and branching functions*
- 2025.10 **University of Helsinki Dynamical Systems Seminar:** *Conformal attractors and branching functions*
- 2025.02 **University of Massachusetts Lowell Mathematics Colloquium:** *Continued fractions and the geometry of conformally invariant sets*
- 2025.02 **Brown University Geometric Analysis Seminar:** *Conformal dimension beyond self-similarity*
- 2024.11 **Focused workshop on Harmonic analysis methods in fractal geometry at Erdős Center:** *Fourier decay outside sparse frequencies*
- 2024.10 **Rényi Institute Analysis Seminar:** *Non-convex optimization in fractal geometry*
- 2024.10 **University of Jyväskylä Analysis Seminar:** *Assouad dimension and uniformity of microsets*
- 2024.09 **Fractal geometry and stochastics 7:** *Box dimensions of countably-generated self-conformal sets*
- 2024.09 **Workshop on the Geometry of Deterministic and Random Fractals II:** *Box dimensions of countably-generated self-conformal sets*
- 2024.06 **Geometry and Fractals under the Midnight Sun Conference:** *Dynamical covering arguments and Assouad spectra of Gatzouras–Lalley carpets*
- 2024.03 **University of Loughborough Dynamical Systems Seminar:** *Dynamical covering arguments via large deviations and non-convex optimization*
- 2024.03 **University of Warwick DAGGER Seminar:** *Multifractal analysis via Lagrange duality*
- 2024.02 **UW Madison Analysis Seminar:** *Dynamical covering arguments via large deviations and non-convex optimization*
- 2024.02 **Shenzhen Fractal Geometry Seminar:** *Some exotic phenomena for Assouad spectra*
- 2024.02 **UBC Harmonic Analysis and Fractal Geometry Seminar:** *Pointwise Assouad dimension and tangents of invariant sets*
- 2023.12 **University of St Andrews Research Day:** *Multifractal analysis and the geometry of Lagrange multipliers*
- 2023.11 **Bristol Ergodic Theory and Dynamical Systems Seminar:** *Pointwise Assouad dimension and regularity of invariant sets*
- 2023.10 **BudWiSer: Budapest–Wien Dynamical Systems Seminar:** *Multifractal analysis of non-conformal measures*
- 2023.10 **OARS: Online Analysis Research Seminar:** *Assouad-type dimensions: finer information on scaling and homogeneity*

2023.10	University of Edinburgh Analysis Seminar: <i>Pointwise Assouad dimension and regularity of invariant sets</i>
2023.09	St Andrews Analysis Seminar: <i>Multifractal analysis of planar self-affine measures via convex optimization</i>
2023.07	ICMS: Fractal Geometry: <i>Pointwise Assouad dimension and regularity of invariant sets</i>
2023.06	Multifractal analysis and self-similarity: <i>Multifractal analysis on (some) self-affine carpets</i>
2023.05	Thermodynamic Formalism: Non-additive Aspects and Related Topics: <i>Multifractal analysis of random substitutions</i>
2023.04	St Andrews Analysis Seminar: <i>Assouad dimension and tangents of dynamically invariant sets</i>
2023.04	Oulu Analysis Seminar: <i>Interpolating between box and Assouad dimension</i>
2023.04	Jyväskylä Geometric Analysis Seminar: <i>Assouad dimension and tangents of dynamically invariant sets</i>
2023.01	Oulu Analysis Seminar: <i>Convex optimization and multifractal analysis</i>
2022.11	St Andrews Analysis Seminar: <i>L^q-spectra and multifractal analysis of random substitutions</i>
2022.10	Manchester Dynamics Seminar: <i>Assouad dimension and slices of self-affine sets</i>
2022.09	Fractals and Related Fields IV: <i>Geometric and combinatorial properties of self-similar measures</i>
2022.08	BME Dynamical Systems Seminar: <i>Geometric and combinatorial properties of self-similar measures</i>
2022.07	BECMC 2022: <i>Attainable forms of intermediate dimensions</i>
2022.07	University of Vienna Ergodic Theory Seminar: <i>Dimension theory and classification of Assouad spectra through homogeneous Moran sets</i>
2022.06	Geometry of Deterministic and Random Fractals: <i>Classifying dimension spectra</i>
2022.05	Workshop on Self-affine and Overlapping IFS: <i>Geometric and combinatorial properties of self-similar Measures</i>
2022.04	Postgraduate Interdisciplinary Symposium for Mathematics: <i>Pisot numbers and Bernoulli convolutions</i>
2022.04	Probability, Analysis, and Dynamics 2022: <i>Geometric and combinatorial properties of self-similar measures</i>
2022.02	St Andrews Analysis Seminar: <i>Attainable forms of intermediate dimensions</i>
2021.04	Junior Ergodic Theory Seminar: <i>Self-similar measures with non-concave spectra and multifractal analysis</i>
2021.01	Postgraduate Interdisciplinary Symposium for Mathematics: <i>Analysis group intro talk</i>
2020.10	St Andrews Analysis Seminar: <i>Multifractal analysis for self-similar measures with exact overlaps</i>
2020.02	University of Waterloo Analysis Seminar: <i>Geometric and combinatorial separation conditions for IFSs</i>
2019.07	CUMC 2019: <i>An algebraic proof of quadratic reciprocity</i>
2018.07	CUMC 2018: <i>Pisot–Vijayaraghavan numbers</i>

Other Skills

L ^A T _E X	typesetting and package development
Rust	library development, text-based interfaces, command-line tools
git	version control, project management for research and software development
Python	software development, numerical computation, symbolic computation, graphical tools
Mathematica	functional programming, algorithm implementation for research papers, visualization
HTML / CSS	web development, webpage design