Amlan Banaji

Curriculum Vitae

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Nationality: UK

Research Associate in Fractal Geometry at Loughborough University's mathematics department since March 2023

RESEARCH INTERESTS

My main research interests are in geometry and analysis related to fractal sets and measures. These 'fractals' exhibit complexity over a wide range of scales, and often arise in a natural dynamical way, such as via (conformal or non-conformal) iterated function systems. Currently, I am especially interested in the rate of decay of the Fourier transform of stationary measures for such systems. I have also done a lot of work exploring different ways one can define 'dimension,' to provide refined information about the global or local scaling properties of classes of sets or measures. I enjoy finding connections between these topics and other areas of mathematics such as number theory and probability theory.

PUBLICATIONS AND PREPRINTS

Submitted preprints:

11. A. Banaji and A. Rutar. Lower box dimension of infinitely generated self-conformal sets. arXiv

10. S. Baker and A. Banaji. *Polynomial Fourier decay for fractal measures and their pushforwards*. arXiv

9. A. Banaji, J. M. Fraser, I. Kolossváry and A. Rutar. *Assouad spectrum of Gatzouras–Lalley carpets.* arXiv

8. A. Banaji, A. Rutar and S. Troscheit. *Interpolating with generalized Assouad dimensions*. arXiv

Published:

7. A. Banaji and I. Kolossváry. *Intermediate dimensions of Bedford–McMullen carpets with applications to Lipschitz equivalence*
Advances in Mathematics 449 (2024), 109735. *arXiv*

6. A. Banaji and J. M. Fraser. *Assouad type dimensions of infinitely generated self-conformal sets*
Nonlinearity 37 (2024), 045004. arXiv

5. A. Banaji. *Generalised intermediate dimensions*
Monatshefte für Mathematik 202 (2023), 465–506. arXiv

4. A. Banaji. *Metric spaces where geodesics are never unique*
American Mathematical Monthly 130 (2023), 747–754. arXiv

3. A. Banaji and J. M. Fraser. *Intermediate dimensions of infinitely generated attractors*
Transactions of the American Mathematical Society 376 (2023), 2449–2479. arXiv

2. A. Banaji and H. Chen. *Dimensions of popcorn-like pyramid sets*
Journal of Fractal Geometry 10 (2023), 151–169. arXiv

1. A. Banaji and A. Rutar. *Attainable forms of intermediate dimensions*
Annales Fennici Mathematici 47 (2022), 939–960. arXiv

EDUCATION

University of St Andrews
2019–2023

PhD Mathematics

Thesis: "Interpolating between Hausdorff and box dimension" (defended May 2023)
With the Analysis Research Group
Topic: Fractal geometry and dimension theory
Supervisors: Prof. Jonathan Fraser (primary), Prof. Kenneth Falconer
Fully funded by the Leverhulme Trust

University of St Andrews *2018–2019*	**MSc Mathematics, Distinction**
	GPA: 19.5/20. Ranked 1st in the Faculty of Science and Medicine
	Dissertation: <u>Solvability of Partial Differential Equations on Fractal Domains</u> (Score: 19.1/20, supervised by <u>Professor Kenneth Falconer</u>)
University of Cambridge, King's College *2015–2018*	**BA (Hons) Mathematics**
	Selected Part II courses: Linear Analysis, Analysis of Functions, Topics in Analysis, Differential Geometry, Riemann Surfaces, Logic and Set Theory

PRIZES AND GRANTS

- *2023–4:* Awarded **£500 LMS Travel Grant** for Early Career Researchers to visit the University of Oulu
- *2019*: **Postgraduate Gray Prize** for the best MSc student in the Faculty of Science and Medicine at the University of St Andrews.

TALKS

I have given at least 40 talks (see <u>https://amlan-banaji.github.io/files/BanajiTalks.pdf</u>) at conferences and seminar series including:
- <u>Fractal Geometry and Stochastics 7</u> (Chemnitz, 26/9/24)
- <u>Afternoon workshop on Fourier analysis, fractals, and finite fields</u> (invited talk, St Andrews, 18/9/24)
- <u>Geometry and fractals under the midnight Sun</u> (Oulu, 27/6/24)
- <u>British Early Career Mathematicians' Colloquium</u> (keynote talk, Birmingham, 14/6/24)
- <u>British Mathematical Colloquium (BMC)</u> (Manchester, 19/6/24)
- <u>Geometric Analysis Seminar</u> (Jyväskylä, 1/2/24)
- <u>Fractal Geometry</u> (celebrating Prof. Kenneth Falconer's 70th birthday, ICMS, Edinburgh, 4/7/23)
- <u>Multifractal analysis and self-similarity</u> (CIRM, Marseille, 30/6/23)
- <u>Diophantine Approximation, Dynamics, and Fractals</u> (Exeter, 22/6/23)
- <u>Thermodynamic Formalism: Non-additive Aspects and Related Topics</u> (Będlewo, 16/5/23)
- <u>One World Fractals</u> (online, 18/1/23)
- <u>Szenzhen Technology University Mathematics Colloquium</u> (inaugural talk, China (online), 22/10/22)
- <u>Fractals and Related Fields IV</u> (Porquerolles, 5/9/22)
- <u>Geometry of Deterministic and Random Fractals</u> (Budapest, 30/6/22 and 2/9/24)

EXPERIENCE

- March–May 2024: **lectured** second-year course "Elements of Topology" at Loughborough to 90 students
- Teaching undergraduate **tutorials** at the University of St Andrews:
  Most recent student feedback score: 1.5 on a scale from 1 to 5 (where 1 is highest).
  2019–2022: MT2502 Analysis (10 groups total)
  2021: MT2505 Abstract Algebra (2 groups)
  2020: MT1003 Pure and Applied Mathematics (2 groups)

- *2018–2022:* **Tutoring** mathematics (undergraduate, A level and STEP) with G5 Education, Oxford Exclusif Tutorial Agency, PhD Tutors, Sishu Chinese School, and privately.

- *2018*: LMS-funded **Cambridge Summer Research in Mathematics (SRIM) project** on Leray-Schauder Topological Degree Theory and its applications to Partial Differential Equations.

SERVICE AND MEMBERSHIPS

- *2023–present:* **Co-organiser** of the <u>Loughborough University Dynamical Systems Seminar</u>
- *2022–present*: **Referee** for *Math. Ann.; Adv. Math.; Ergodic Theory Dynam. Systems; Proc. Roy. Soc. Edinburgh Sect. A; Colloq. Math.; Amer. Math. Monthly; J. Math. Anal. Appl.; Real Anal. Exchange; MathSciNet*
- *2024:* **Co-organiser** of <u>Workshop on Ergodic Theory and Fractal Geometry</u> at Loughborough University
- *2022:* **Organiser** of St Andrews Analysis Reading Group
- *2021*: **Co-organiser** of the Postgraduate Interdisciplinary Mathematics Symposium (PIMS), St Andrews.
- Member of <u>London Mathematical Society</u>, <u>Institute of Mathematics and its Applications</u>