

Amlan Banaji

Curriculum Vitae

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Marie Skłodowska-Curie Actions (MSCA) postdoctoral fellow in mathematics at the University of Jyväskylä, Finland

Nationality: UK

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, and my MSCA fellowship is titled ‘Fourier decay for nonlinear fractal measures.’ 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:

13. S. Baker, A. Banaji, D.-J. Feng, C.-K. Lai and Y. Xiong, *Distinct dimensions for attractors of bi-Lipschitz iterated function systems*, [arXiv](#)
12. A. Banaji and H. Yu. *Fourier transform of nonlinear images of self-similar measures: quantitative aspects*, [arXiv](#)
11. A. Banaji and A. Rutar. *Lower box dimension of infinitely generated self-conformal sets*, [arXiv](#)

Accepted:

10. A. Banaji, J. M. Fraser, I. Kolossváry and A. Rutar. *Assouad spectrum of Gatzouras–Lalley carpets*, [arXiv](#)
To appear in **Advances in Mathematics**.

Published:

9. S. Baker and A. Banaji. *Polynomial Fourier decay for fractal measures and their pushforwards*, **Mathematische Annalen** 392 (2025), 209–261. [arXiv](#)
8. A. Banaji, A. Rutar and S. Troscheit. *Interpolating with generalized Assouad dimensions*, **Journal of Geometric Analysis** 35 (2025), no. 270, 57pp. [arXiv](#)
7. A. Banaji and I. Kolossváry. *Intermediate dimensions of Bedford–McMullen carpets with applications to Lipschitz equivalence*, **Advances in Mathematics** 449 (2024), no. 109735, 69pp [arXiv](#)
6. A. Banaji and J. M. Fraser. *Assouad type dimensions of infinitely generated self-conformal sets*, **Nonlinearity** 37 (2024), no. 045004, 31pp. [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](#)

EMPLOYMENT HISTORY AND EDUCATION

University of Jyväskylä
2025–present

Postdoctoral Researcher in Mathematics

Working with Tuomas Orponen, on fractal geometry and Fourier decay, with an MSCA postdoctoral fellowship since September 2025

Loughborough University
2023–2025

University of St Andrews
2019–2023

University of St Andrews
2018–2019

University of Cambridge,
King's College
2015–2018

Research Associate in Mathematics

Working with Simon Baker, on fractal geometry and Fourier decay

PhD Mathematics

Thesis: “Interpolating between Hausdorff and box dimension” (defended May 2023)

Topic: Fractal geometry and dimension theory, with the Analysis Research Group

Supervisors: Jonathan Fraser (primary), Kenneth Falconer

MSc Mathematics, Distinction

GPA: 19.5/20. Ranked 1st in the Faculty of Science and Medicine

Dissertation: Solvability of Partial Differential Equations on Fractal Domains

(Score: 19.1/20, supervised by Professor Kenneth Falconer)

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

- 2025: Awarded **€226,000 Marie Skłodowska-Curie Actions Postdoctoral Fellowship** with 100% score, titled "Fourier decay for nonlinear fractal measures," University of Jyväskylä.
- 2023–4: Awarded **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 AND MINICOURSES

I have given more than 50 talks (see <https://amlan-banaji.github.io/files/BanajiTalks.pdf>) at conferences and seminar series including:

- Invited minicourse, Shenzhen Technology University, China, 25/6/25–27/6/25
- Invited minicourse, Focused workshop on Harmonic analysis methods in fractal geometry, Budapest, 4/11/24–8/11/24
- Fractal Geometry and Stochastics 7 (Chemnitz, 26/9/24)
- British Early Career Mathematicians' Colloquium (keynote talk, Birmingham, 14/6/24)
- British Mathematical Colloquium (BMC) (Manchester, 19/6/24)
- Fractal Geometry (celebrating Prof. Kenneth Falconer's 70th birthday, ICMS, Edinburgh, 4/7/23)
- Multifractal analysis and self-similarity (CIRM, Marseille, 30/6/23)
- Thermodynamic Formalism: Non-additive Aspects and Related Topics (Będlewo, 16/5/23)
- One World Fractals (online talks by myself and Hong Wang, 18/1/23)
- Shenzhen Technology University Mathematics Colloquium (inaugural talk, China (online), 22/10/22)
- Fractals and Related Fields IV (Porquerolles, 5/9/22)
- Geometry of Deterministic and Random Fractals (Budapest, 30/6/22 and 2/9/24)

TEACHING 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.

SERVICE AND MEMBERSHIPS

- 2022–present: **Referee** for *Math. Ann.*; *Int. Math. Res. Not. IMRN*; *Adv. Math.*; *J. Lond. Math. Soc.*; *Ergodic Theory Dynam. Systems*; *Proc. Roy. Soc. Edinburgh Sect. A*; *Nonlinearity*; *Colloq. Math.*; *Amer. Math. Monthly*; *J. Math. Anal. Appl.*; *Real Anal. Exchange*; *MathSciNet*
- 2023–2025: **Co-organiser** of the Loughborough University Dynamical Systems Seminar
- 2024: **Co-organiser** of Workshop on Ergodic Theory and Fractal Geometry 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 professional bodies: LMS, IMA, EMS.