

CV

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Research area

Fractal Geometry, Dynamical Systems, Ergodic Theory, Number Theory, Additive Combinatorics, Harmonic Analysis, Probability Theory

Current position

2019- I am a research associate at DPMMS, University of Cambridge and a research fellow at Corpus Christi College, Cambridge

Fellowship/Award

2021 Certificates of Commendation: EMS PhD Thesis Prizes
2019- College Research Fellow, Corpus Christi College, Cambridge, UK
2017.11 Research Fellow, Mittag-Leffler Institut, Sweden

Education

2016- PHD in Pure Mathematics, University of St Andrews, UK
2019 Thesis title: Assouad type dimensions and dimension spectra
Supervisors: Jonathan Fraser and Mike Todd
2015 PhD Candidate in Pure Mathematics, University of Manchester, UK
2012- MSc in Theoretical and Mathematical Physics, Ludwig-Maximillan University, Munich,
2014 Germany
2008- UNDERGRADUATE DEGREE in Optical Engineering, Zhejiang University, China
2012

Preprints and Publications

A more recent version of the list and downloadable files can be found in <http://www.dpmms.cam.ac.uk/~hy351/>

Publications (accepted):

- 27 (with J. Fraser, L. Lee and I. Morris) L^q -spectra of self-affine measures: closed forms, counterexamples, and split binomial sums, **Nonlinearity** (2021) 34, 6331.
- 26 (with H-P Chen and J. Fraser) Dimensions of the popcorn graph, (To appear), **Proceedings of the American Mathematical Society**, arXiv:2007.08407
- 25 (With J. Fraser) Approximate arithmetic structure in large sets of integers (To appear) **Real Analysis Exchange**, arxiv:arXiv:1905.05034
- 24 (With Pablo Shmerkin) On sets containing a unit distance in every direction, (To appear), **Discrete Analysis**, arxiv:1912.01523
- 23 An improvement on Furstenberg's intersection problem, (To appear), **Transactions of the American mathematical Society**, arXiv:1811.11073
- 22 (With S. Burrell) Digit expansions of numbers in different bases, **Journal of Number theory**, 226, (2021), 284-306.
- 21 On the metric theory of inhomogeneous Diophantine approximation: An Erdős-Vaaler type result, **Journal of Number Theory**, 224, 2021, 243-273.
- 20 Additive properties of numbers with restricted digits, (To appear), **Algebra and Number Theory**, arXiv:2004.05926
- 19 (with P. Varjú) Fourier decay of self-similar measures and self-similar sets of uniqueness, (To appear), **Analysis and PDE**, arXiv:2004:09358
- 18 Bernoulli decomposition and arithmetical independence between sequences, **Ergodic Theory and Dynamical Systems**, 41(5), 2021, 1590-1600
- 17 Weak tangents and level sets of Takagi functions, **Monatshefte für Mathematik**, 192, (2020), 249-264.
- 16 (with J. Fraser, D. Howroyd and A. Käenmäki) On the Hausdorff dimension of microsets, **Proceedings of the American Mathematical Society**, 147(11), (2019), 4921-4936.
- 15 Multi-rotations on the unit circle, **Journal of Number Theory**, 200, (2019), 316-328.
- 14 On GILP's group theoretic approach to Falconer's distance problem, **Glasgow Journal of Mathematics**, doi.org/10.1017/S0017089520000373
- 13 Cube packings in Euclidean spaces, **Mathematika**, 67(2), (2021), 288-295.

- 12 (with J. Fraser and D. Howroyd) Dimension growth for iterated sumsets, **Mathematische Zeitschrift**, 293, (2019), 1015–1042.
- 11 Dimensions of triangle sets, **Mathematika**, 65(2), (2019), 311–332.
- 10 A Fourier analytic approach to inhomogeneous Diophantine approximation, **Acta Arithmetica**, 190, (2019), 263–292.
- 9 (With J. Fraser, K.E.Hare, K.G.Hare and S.Troscheit) The Assouad spectrum and the quasi-Assouad dimension: a tale of two spectra, **Annales Academiæ Scientiarum Fennicæ Mathematica**, 44, (2019), 379–387.
- 8 Erdős Semi-groups, arithmetic progressions and Szemerédi’s theorem, (To appear) **Real Analysis Exchange**, arXiv:1802.04137
- 7 (with J. Fraser) Assouad type spectra for some fractal families, **Indiana University Mathematics Journal**, 67(5), 2018, 2005–2043.
- 6 (with J. Fraser) New dimension spectra: finer information on scaling and homogeneity, **Advances in Mathematics**, 329, (2018), 273–328.
- 5 (with D. Howroyd) Assouad dimension of random processes, **Proceedings of the Edinburgh Mathematical Society**, 62(1), (2019), 281–290.
- 4 (with J. Fraser and K. Saito) Dimensions of sets which uniformly avoid arithmetic progressions, **International Mathematics Research Notices**, 2019(14), (2019), 4419–4430.
- 3 (with S. Baker) Root sets of polynomials and power series with finite choices of coefficients, **Computational methods and Function theory**, 18, (2017), 89–97
- 2 (with J. Fraser) Arithmetic patches, weak tangents, and dimension, **Bulletin of the London Mathematical Society**, 50, (2018), 85–95.
- 1 On generalized trigonometric functions and series of rational functions, **Journal of Number Theory**, 180, (2017), 512–532.

Preprints: available on arXiv

- 8 (With K.Hambrook) Non-Salem sets in metric Diophantine approximation, arXiv:2109.11332
- 7 Bernoulli convolutions with Garsia parameters in $(1, \sqrt{2}]$ have continuous density functions, arXiv:2108.01008
- 6 (With B. Bárány and A. Käenmäki) Finer geometry of planar self-affine sets, arXiv:2107.00983
- 5 Rational points near self-similar sets, arXiv:2101.05910
- 4 On the metric theory of multiplicative Diophantine approximation, arXiv:2010.09004
- 3 Times two, three, five orbits on T^2 , arXiv:2009.00441
- 2 (with D. Allen and S. Chow) Dyadic Approximation in the Middle-Third Cantor Set, arXiv:2005.09300
- 1 Fractal projections with an application in number theory, arXiv:2004.05924

Teaching Experience

Courses

Graduate course: Fractal Geometry, University of Cambridge, Lent Term 2021

Corpus Bridging Course in mathematics, 2021

LMS scheme 3 online lecture series: Ergodic Theory, 2020

Small group example classes

I have supervised several example classes (Calculus, Analysis, Topology) since 2016 for University of St Andrews and University of Cambridge.

Supervision

Summer research project (self-similar measures and additive combinatorics), University of Cambridge, 2021

Conferences/Talks

- 2021.10 University of St Andrews, Analysis Seminar.
- 2021.05 University of Vienna, Dynamics Seminar.
- 2021.04 New England Dynamics and Number Theory Seminar (online)
- 2020.11 Diophantine approximation and dynamics on homogeneous spaces webinar(online).
- 2020.05 Ergodic Theory and Dynamical Systems Seminar, University of Warwick
- 2020.05 One day ergodic meeting(online), UK
- 2020.04 The Centre de recherches mathématiques, research seminar, Canada.
- 2019.10 Analysis Seminar, University of Manchester
- 2018.09 Fractal Geometry and Stochastics 6, international conference, Germany
- 2017.10 Mittag-Leffler Institut, research program, Sweden - Invited research presentation

Funding

My research was/is supported by:

- 2015-2016 University of Manchester, PhD scholarship. ($\sim 20,000$ GBP)
- 2016-2019 University of St Andrews, PhD scholarship (also with UKRI stipend).($\sim (16,000+14000)*3 = 90,000$ GBP)
- 2017 Institut Mittag-Leffler(Sweden), research fellowship (~ 3000 GBP)
- 2019- Corpus Christi College(Cambridge), early career research fellowship (~ 3000 GBP research allowance +college benefits)
- 2019- ECH2020 EUROPEAN RESEARCH COUNCIL (ERC), research associate.
- 2020 LMS scheme 3 online lectures grant. (= 999GBP)
for which I will be forever grateful.