Conrado da Costa

Assistant professor (research) in probability

Personal Data

Date of birth:	12 March 1987
Nationality:	Brazilian
Languages:	**Native**: Portuguese; **Fluent**: English, French; **Basic**: Dutch, Spanish, Italian
Work address:	Upper Mountjoy, Stockton Rd Durham; DH1 3LE, United Kingdom
email:	conrado.da-costa@durham.ac.uk
Homepage:	http://www.maths.dur.ac.uk/users/conrado.da-costa/
MR auth. ID:	1317657
Orcid:	0000-0003-3466-6751

Education

2012-2016 **Mathematics**, *IMPA*, Rio de Janeiro, Brazil, *PhD*.
Thesis: From Reaction-Diffusion models to the study of Stochastic Differential Equations
Advisor: Milton Jara.

2010-2012 **Mathematics**, *IMPA*, Rio de Janeiro, Brazil, *MSc*.
Advisors: Claudio Landim & Milton Jara.

2005-2010 **Economics**, *UFRJ*, Rio de Janeiro, Brazil, *BSc*.
Thesis: Elements to reading Sraffa's "Production of Commodities by Means of Commodities" (in Portuguese)
Advisor: Fabio Neves Perácio de Freitas.

Positions

≥ Sep. 2022 **Durham University, Department of Mathematical Sciences**, Durham, UK, *Assistant professor (research) in probability*.
Researcher co-investigator in the project "Anomalous diffusion via self-interaction and reflection", EPSRC Reference: EP/W00657X/1

Sep. 2019 – Aug. 2022 **Durham University, Department of Mathematical Sciences**, Durham, UK, *Willmore Fellow in Probability*.

Sep. 2016 – Aug. 2019 **Leiden University Mathematical Institute**, Leiden, Netherlands, *Post doc researcher*.
Supervisors: Luca Avena and Frank den Hollander.

Jun. 2016 - Aug. 2016 **IMPA**, *Rio de Janeiro, Brazil*, ,
Post doc researcher.
Supervisor: Roberto Oliveira.

Research Interests

- Probability theory, Markov chains, random walks, scaling limits of discrete stochastic processes, near-critical ergodic processes, semi-martingales, stochastic differential equations, statistical physics.

Scientific production

Publications:

- L. Avena, C. da Costa, J. Peterson, *Gaussian, stable, tempered stable and mixed limit laws for random walks in cooling random environments* To appear in Ann. Inst. H. Poincaré Probab. Statist. - 2024+;

- C. da Costa, M. Menshikov, Vadim Shcherbakov, A. Wade, *Superdiffusive planar random walks with polynomial space-time drifts* https://doi.org/10.1016/j.spa.2024.104420;

- C. da Costa, M. Menshikov, A. Wade, *Stochastic billiards with Markovian reflections in generalized parabolic domains* Ann. Appl. Probab. - 2023, https://doi.org/10.1214/23-AAP1952;

- L. Avena, C. da Costa, *Laws of large numbers for weighted sums of independent random variables: a game of mass* J. Theor. Probab. - 2023, https://doi.org/10.1007/s10959-023-01296-z;

- C. da Costa, B. Freitas Paulo da Costa, D. Valesin, *Reaction–Diffusion Models for a Class of Infinite-Dimensional Nonlinear Stochastic Differential Equations*, J. Theor. Probab. - 2023, https://doi.org/10.1007/s10959-022-01187-9;

- L. Avena, Y. Chino, C. da Costa, F. den Hollander, *Random walk in cooling random environment: recurrence versus transience and mixed fluctuations* Ann. Inst. H. Poincaré Probab. Statist. - 2022, https://doi.org/10.1214/21-aihp1184;

- L. Avena, Y. Chino, C. da Costa, F. den Hollander, *Random walk in cooling random environment: ergodic limits and concentration inequalities*, Electron. J. Probab. - 2019, https://doi.org/10.1214/19-ejp296;

- C. da Costa, B. Freitas Paulo da Costa, M. Jara, *Reaction-Diffusion models: From Particle Systems to SDE's*, Stochastic Processes and their Applications - 2019, https://doi.org/10.1016/j.spa.2018.12.004.

Preprints:

- M Brešar, C. da Costa, A. Mijatović, A. Wade *Superdiffusive limits for Bessel-driven stochastic kinetics* https://arxiv.org/abs/2401.11863;

- C. da Costa, M. Menshikov, A. Wade, *Passage-times for partially-homogeneous reflected random walks on the quadrant* https://arxiv.org/abs/2307.07458;

- C. da Costa, J. Peterson, J. Xie *Limiting distributions for RWCRE in the sub-ballistic regime and in the critical Gaussian regime* https://arxiv.org/abs/2307.07622;

- G. Barrera, C. da Costa, M. Jara, *Sharp convergence for degenerate Langevin dynamics* https://arxiv.org/abs/2209.11026;

Lecture notes:

- L. Avena, C. da Costa, F. den Hollander, *Stochastic models for genetic evolution*, Lecture notes for a course in Leiden University, available online, http://websites.math.leidenuniv.nl/lecturenotes/BioStoch.pdf.

Co-organization of scientific events

- Contributed session: CS42 - Constrained and interacting stochastic dynamics II, SPA 2023, Lisbon, PT, 24 Jul. 2023
- YEP XVII on interacting particle systems - Workshop series for Young (European) Probabilists, EURANDOM, TU Eindhoven, Eindhoven, NL, 30 Aug. − 03 Sep. 2021 (online);
- i-POD (MIPS) - weekly probability seminar, Leiden University, Leiden, NL, 2017–2019;

Scientific communications

Lecture series

- **LMS PiNE Lectures** on Interacting particle systems and martingales - Lecture series organized by the Probability group in the North East (PiNE) and sponsored by the London Mathematical Society (LMS)
    - The mean-field opinion model, 11 Sep. 2020;
    - Martingale problems and scaling limits, 11 Sep. 2020;
    - Construction of infinite particle systems, 10 Sep. 2020.

Invited Talks

Talks are organised according to corresponding papers, specific titles may change.

- Superdiffusive planar random walks with polynomial space-time drifts:
    - Math-phys Seminar, University of Helsinki, Helsinki, FI, 12 Jun. 2024;
    - Mathematical Ph.D. Seminar, Università degli Studi di Firenze, Florence, IT, 15 Apr. 2024.

- Passage times for partially homogeneous reflected random walks on the quadrant:
    - Applied Probability Seminars, The University of Warwick, UK, 27 Oct. 2023;
    - Durham Probability Afternoon, Durham University, UK, 06 Sep. 2023;
    - Probability Seminar, UFMG, Belo Horizonte, BR, 21 Ago. 2023;
    - Probability Seminar, UFBA, Salvador, BR, 17 Ago. 2023;
    - Probability Seminar, UFRGS, Rio Grande do Sul, BR, 11 Ago. 2023;
    - Probability Seminar, IME-USP, São Paulo, BR, 07 Ago. 2023.

- Stochastic billiards in generalized parabolic domains, recurrence versus transience:
  - Contributed talk for SPA 2023, Lisbon, PT, 24 Jul. 2023;
  - The Lorentz Gas, Lorentz Center@Oort, Leiden, NL, 20 Dec. 2022;
  - MI-iPOD seminar, Leiden University, Leiden, NL, 22 Jun. 2022;
  - Math-phys Seminar, University of Helsinki, Helsinki, FI, 15 Jun. 2022;
  - Probability Seminar, IST, Lisbon, PT, 09 Jun. 2022;
  - Probability Seminar, IME-USP, São Paulo, BR, 27 Mai 2022;
  - Probability Seminar, UFRGS, Rio Grande do Sul, BR, 12 Mai 2022;
  - Probability Seminar, UFBA, Salvador, BR, 09 Mai 2022;
  - Math-phys Seminar, UC Davis, California, USA, online, 28 Apr. 2022;
  - British Early Career Mathematicians' Colloquium, University of Birmingham, UK, online, 15 Jul. 2021;
  - Probability in the North East workshop, Leeds University, UK, online, 21 Jan. 2021.

- Random walks in cooling random environment: recurrence and fluctuations:
  - Math-phys seminar, Helsinki University, FI, online, 25 Nov. 2020.

- The mean field opinion model:
  - SEMAP, UFRJ, Rio de Janeiro, BR, online, 30 Jul. 2020;
  - Analysis seminar, Durham University, Durham, UK, online, 08 Jul. 2020;

- Reaction-Diffusion models on an infinite graph:
  - Statistics Seminars, Durham University, Durham, UK, 17 Feb. 2020;
  - Probability Seminar, UBA, Buenos Aires, AR, 18 Dec. 2019;
  - 10th Networks day, PSV, Eindhoven, NL, 15 Mar. 2019;
  - 7th Networks Training Week, Asperen, NL, 01 Nov. 2018.

- Laws of large numbers for weighted sums of independent random variables: a game of mass
  - Probability Seminar, UBA, Buenos Aires, AR, 22 Aug. 2018;

- Random walks in cooling random environment: ergodic limits and concentration inequalities:
  - Probability Seminar, IST, Lisbon, PT, 14 May 2019;
  - Probability Seminar, IMPA, Rio de Janeiro, BR, 29 Aug. 2018;
  - Probability Seminar, UBA, Buenos Aires, AR, 22 Aug. 2018;
  - Probability Seminar, KdVI, Amsterdam, NL, 07 Jun. 2018;
  - Probability Seminar, RUG, Groningen, NL, 01 Feb. 2018;
  - Marc Kac Seminar, Utrecht, NL, 06 Oct. 2017.

- From Reaction-Diffusion models to the study of Stochastic Differential equations:
  - Probability Seminar, UBA, Buenos Aires, AR, 12 Dec. 2018;
  - Probability Seminar, UFBA, Salvador, BR, 15 Aug. 2018;
  - Analysis seminar, Leiden University, Leiden, NL, 21 Mar. 2018;
  - Probability Seminar, Delft University, NL, 18 Sep. 2017;
  - Probability Seminar, Groningen University, Groningen, NL, 02 Mar. 2017;
  - PSPDEs V, Braga University , PT, 28 Nov. 2016;
  - XX Brazilian School of Probability, USC, São Carlos, BR, 09 Jul. 2016;
  - Probability Seminar, UFRJ, Rio de Janeiro, Brazil, 04 Apr. 2016;
  - Probability Seminar, Leiden University, Leiden, NL, 12 Jan. 2016.

- The two faces of value:
  - Critique of political economics seminar, SEP, Teófilo Otoni, BR, 30 Mar. 2012.

Posters

- Superdiffusive planar random walks with polynomial space–time drifts
  - Self-interacting processes, SSDW01, INI, Cambridge, Uk 8 July 2024.

- From Particle Systems to the solution of a Stochastic Differential Equation,
  - Stochastic Dynamics out of Equilibrium, CIRM, Marseille, FR, 05 Apr. 2017;
  - Stochastic Meeting, Lunteren, NL, 15 Nov. 2016;
  - XIX Brazilian School of Probability, Maresias, BR, 03-08 Aug. 2015.

- When Gronwall inequality is not enough: Some techniques involving the limit behaviour of a particle system, 2014 XVIII Brazilian School of Probability, IMPA, Mambucaba, BR, 04-09 Aug. 2014.

Teaching

Bachelor courses – Durham University

- Discrete Maths - Graph theory part, Jan. 2024.
- Discrete Maths - Graph theory part, Jan. 2023.

Supervision – Durham University

- Mae Phillips, Project III, Bachelor thesis, *An introduction to renewal theory*, Apr. 2024;
- Yijun Xie, Project III, Bachelor thesis, *An introduction to renewal theory*, Apr. 2024;
- Liangyuan Cui, Project III, Bachelor thesis, *An introduction to renewal theory*, Apr. 2024;
- Hazel Minty, Project III, Bachelor thesis, *Diffusion Limited Aggregation and the Spiders from Mars*, Apr. 2023;
- Matthew Clough, Project III, Bachelor thesis, *Derivation and Application of a Probability Distribution for Diffusion Limited Aggregation Cluster Growth*, Apr. 2023;

- Ryan Murphy, Project III, Bachelor thesis, *Supercool transitions - Large deviations and metastability*, Apr. 2021;
- Lowenna Hooper, Project III, Bachelor thesis, *Opinion Polls*, with P. Craig, Apr. 2020;
- Christopher Broadley, Project III, Bachelor thesis, *Opinion Polling Using Cluster Sampling*, with P. Craig, Apr. 2020;
- Lydia Keough, Project III, Bachelor thesis, *Opinion Polls: Techniques to Correct for Survey Errors in Opinion Polls*, with P. Craig, Apr. 2020.

Supervision – Leiden University

- Vittorio Magrini, Master thesis, *Local limits of random rooted spanning trees and forests on dense geometries*, with L. Avena, Jul. 2021;
- Pim Overmars, Bachelor thesis, *Random Walks in Dynamic Random Environments: random resampling times*, with F. den Hollander, Oct. 2018.

Mini-Course

- IMPA, An introduction to rough path theory , 16 hours, Rio de Janeiro, BR, May-Jun. 2013;
- UFRJ, An introduction to real analysis, 8 hours, Rio de Janeiro, BR, Jun.-Jul. 2009.

Teaching assistant – Durham University

- Discrete Mathematics (BSc), Jan. 2024;
- Disc. Maths. Seminars (BSc), Feb.-Mar. 2023;
- Discrete Mathematics (BSc), Jan. 2023;
- Disc. Maths. Seminars (BSc), Feb.-Mar. 2022;
- Discrete Mathematics (BSc), Jan. 2022;
- Linear algebra (BSc), Oct.-Dec. 2021;
- Probability I (BSc), Oct.-Dec. 2021;
- Calculus I (BSc), Jan.-Mar. 2021;
- Probability I (BSc), Oct.-Dec. 2020;
- Discrete Mathematics (BSc), Oct.-Dec. 2020;
- Probability I (BSc), Oct.-Dec. 2019;
- Probability II (BSc), Oct.-Dec. 2019.

Teaching assistant – Leiden University

- Random Walks (BSc), Sep.-Nov. 2018;
- Stochastic Models for Genetic Evolution (BSc), Mar.-Jun. 2018.
- Random Walks (BSc), Sep.-Nov. 2017;

Teaching assistant – IMPA

- Stochastic Processes (PhD), Mar.-Jun. 2015;
- Probability II (PhD), Aug.-Nov. 2014;
- Mathematical Methods in Finance (MSc), Mar.-Jun. 2014;
- Real Analysis (MSc), Jan.-Mar. 2014;

- Probability II (PhD), Aug.-Nov. 2013;
- Probability I (MSc), Mar.-Jun. 2013;
- Analysis on $\mathbb{R}^n$ (MSc), Mar.-Jun. 2012;
- Complex Analysis (MSc), Aug.-Nov. 2010.

Teaching assistant – UFRJ

- Microeconomics (MSc), Mar.-Jun. 2009;
- Statistics I (BSc), Aug.-Nov. 2007.
- Linear Algebra (BSc), Mar.-Jun. 2006;

Events attended

Seminars

$\geq$2020	Probability seminar, Durham, UK (weekly) ;
2019–2020	Statistics seminar, Durham, UK (weekly);
2016–2019	MIPS, Leiden, NL (weekly);
2016–2019	Mark Kac Seminar, Utrecht, NL (monthly);
2013–2015	IMPA Probability Seminar, Rio de Janeiro, BR (weekly).

Conferences and Workshops

- Self-interacting processes (SSDW02), Churchill College, Cambridge, UK, 5-9 Aug. 2024;
- Self-interacting processes (SSDW01), INI, Cambridge, UK, 8-12 Jul. 2024;
- Self-interacting processes, INI, Cambridge, UK, 8-12 Jul. 2024;
- Probability in the North East workshop, Durham University, Durham, UK, 24 Jun. 2024;
- New Frontiers in Probability, Leiden University, Leiden, NL, 28-29 Sep. 2023;
- 43rd Conference on Stochastic Processes and their Applications, SPA2023, Lisbon, PT, 24-28 July 2023;
- UK Easter Probability Meeting: Stochastic modelling of complex systems, The University of Manchester, Manchester, UK, 27-31 March 2023;
- Scaling limits: from statistical mechanics to manifolds, A workshop in honour of James Norris' 60th birthday, Centre for Mathematical Sciences, Cambridge, UK, 05-07 Sep. 2022;
- Lévy processes and random walks, A workshop in celebration of Ron Doney's 80th birthday, The University of Manchester, Manchester, UK, 26-28 Jul. 2022;
- 50 years of Random Cluster Model, Lorentz center, Leiden, NL, 11-14 Jun. 2019;
- Networks Training Week, Doorn, NL, 06-10 May 2019;
- Networks Training Week, Asperen, NL, 29 Oct.-02 Nov. 2018;
- Franco-Dutch YEP Workshop, Eindhoven, NL, 28 May-01 Jun. 2018;
- Networks Training week, Doorn, NL, 09-13 Apr. 2018;
- Dutch Mathematical Congress, Utrecht, NL, 03-04 Apr. 2018;

- PSPDEs VI, Univ. Nice Sophia Antipolis, Nice, FR, 27 Nov.-01 Dec. 2017;
- Stochastic Meeting, Lunteren, NL, 13-15 Nov. 2017
- YEP XIV Networks: Probability, Combinatorics and Algorithms, Eindhoven, NL, 04-08 Sep. 2017;
- Stochastic Dynamics out of Equilibrium, IHP, Paris, FR, 12-16 Jun. 2017;
- NETWORKS 2017, Amsterdam, NL, 07-09 Jun. 2017;
- ISI-NETWORKS, Leiden, NL, 23 Jun. 2017;
- Numerical Aspects of Nonequilibrium Dynamics, IHP, Paris, FR, 25-27 Apr. 2017;
- Dutch Mathematical Congress, Utrecht, NL, 11-12 Apr. 2017;
- Stochastic Dynamics out of Equilibrium, CIRM, Marseille, FR, 03-07 Apr. 2017;
- A Guided Tour through Random Media, Eindhoven, NL, 12-16 Dec. 2016;
- PSPDEs V, Univ. Minho, Braga, PT, 28-30 Nov. 2016;
- Stochastic Meeting, Lunteren, NL, 14-16 Nov. 2016;
- XX Brazilian School of Probability, USC, São Carlos, BR, 04-09 Jul. 2016;
- XIX Brazilian School of Probability, USC, Maresias, BR, 03-09 Aug. 2015;
- XVIII Brazilian School of Probability, IMPA, Mambucaba, BR, 03-09 Aug. 2014;
- 37th Conference on Stochastic Processes and their Applications, SPA, Buenos Aires, AR, 28 Jul.-01 Aug. 2014;
- Topics in Random Media, PUC-Chile, Santiago, CI, 24-25 Jul. 2014;
- XVII Brazilian School of Probability, IMPA, Mambucaba, BR, 04-10 Aug. 2013;
- XXVIII Brazilian Mathematical Colloquium, IMPA, Rio de Janeiro, BR, Jul. 18-29 2011;
- XXVII Brazilian Mathematical Colloquium, IMPA, Rio de Janeiro, BR, Aug. 27-31 2009;
- XXVI Brazilian Mathematical Colloquium, IMPA, Rio de Janeiro, BR, 29 Jul.-03 Ago. 2007;
- XXV Brazilian Mathematical Colloquium, IMPA, Rio de Janeiro, BR, 24-29 Jul. 2005;
- Olympiad Math Camp, OBM, Piracicaba, BR, 2000.

Peer review activities

- Mathematical Reviews;
- ALEA, Latin American Journal of Probability and Mathematical Statistics;
- Springer Proceedings in Mathematics and Statistics;
- ECP, Electronic Communications in Probability;
- EJP, Electronic Jornal of Probability;
- Ensaios Matemáticos - Brazilian Society of Mathematics.

Outreach

Durham University

- Sutton Trust mathematics summer school, Durham University , Durham, UK, 1-4 Ago. 2022, with Ostap Hryniv, 12 hours;
- Sutton Trust mathematics summer school, online delivery, via Durham University teams, 9-13 Ago. 2021, with Ostap Hryniv, 12 hours;
- Supported Progression mathematics summer school, online delivery, via Durham University teams, 26-30 Jul. 2021, with Ostap Hryniv, 12 hours;
- Sutton Trust mathematics summer school, online delivery, via Durham University teams, 3-7 Ago. 2020, with Ostap Hryniv, 12 hours;
- Supported Progression mathematics summer school, online delivery, via Durham University teams, 27-31 Jul. 2020, with Ostap Hryniv, 12 hours;

Volunteer work

$\geq$ 2015   Paideia - Introduction to Mathematics; educational project for young students coming from disadvantaged socio-economical background - primary level.

2005–2014   Invest, Santo Inácio College (RJ-BR) - community school for young adults coming from disadvantaged socio-economical background - secondary level.