# Francisco Pinto Berkemeier

Curriculum Vitae

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Cambridge, United Kingdom
Nationality: Portuguese
DPOB: Macau, July 22, 1993

## Research & Education

Sep 2022 – Present **Postdoctoral Researcher**, University of Cambridge, Departments of Pathology & Genetics.
Postdoctoral position in the Boemo Group, University of Cambridge. Supervisor: Prof. Michael A. Boemo.
Research topics: mathematical modelling and physics-informed machine learning to study genome-wide DNA replication dynamics, with a focus on replication stress, cancer-associated perturbations, and therapeutic response.

Sep 2018 – Nov 2022 **Doctor of Philosophy**, University College London, Department of Mathematics.
PhD in Mathematics. Supervisor: Prof. Karen M. Page. Second supervisor: Prof. Nadia Sidorova.
Research topics: mathematical modelling of the Notch-Delta signalling pathway and evolutionary dynamics.
Thesis title: *Cell-cell interactions in epithelial patterning: Notch-Delta signalling and evolutionary dynamics*.
Award date: 28 November 2022.

Aug 2016 – Jun 2018 **Master of Science**, King Abdullah University of Science and Technology, KSA.
MSc in Applied Mathematics and Computational Sciences. Supervisor: Prof. Diogo A. Gomes.
Thesis title: *A priori regularity of parabolic partial differential equations*.
Defense date: 10 April 2018. GPA: 3.71/4.00.

Sep 2012 – Jun 2016 **Bachelor of Science**, Instituto Superior Técnico, University of Lisbon.
BSc in Applied Mathematics and Computation (LMAC).

## Teaching & Supervision

Sep 2025 – Jan 2026 **Guest Lecturer and Examiner**, Departments of Pathology & Genetics, University of Cambridge.
Lecturer for Modelling with PDEs as part of the NST Part III Systems Biology course, introducing reaction-diffusion models in biology. The lectures cover the origin of the equations, analytical and numerical approaches to their solution, and key applications in population dynamics, pattern formation, and tissue modelling. In parallel, served as examiner for first-year PhD progression vivas, assessing research plans, methodology, and scientific development, and providing formal feedback to students and supervisory committees.

Oct 2023 – Oct 2025 **Postdoctoral Research Associate and College Supervisor**, Queens' College, University of Cambridge.
Rokos PDRA at Queens' College, with responsibility for supervisions in Part 1A of the Cambridge Computer Science Tripos and Natural Sciences Tripos, including the following modules and respective topics:
- Mathematical Methods I: Vector Calculus, Differential and Integral Calculus, Probability and Statistics
- Mathematical Methods II: Ordinary and Partial Differential Equations, Multivariable Calculus, Applications to Physical Systems

Jun 2023 – Jun 2024 **Master's Supervision**, Department of Pathology, University of Cambridge.
Supervised an integrated Master's student from the University of St Andrews on a year-long research project in DNA replication modelling at the Department of Pathology, University of Cambridge. The work resulted in a dissertation awarded the highest distinction (20/20) and led to a peer-reviewed publication [4].

Aug 2020 – Jan 2021 **Lecturer**, Applied Mathematics, University College London.
Lecturer for MATH0049 - Mathematics for Engineers 1, covering topics such as differentiation, integration, ordinary differential equations, vectors, probability, statistics, and numerical methods. Responsibilities included delivering lectures, preparing exams and homework assignments, and marking.

Sep 2018 – Sep 2022 **Teaching Assistant**, Applied Mathematics, University College London.
Provided tutorial support, exam/homework marking, and office hours for undergraduate modules:
- MATH0045: Calculus and Linear Algebra
- MATH0005: Algebra 1
- MATH0003, MATH0004: Analysis 1 & 2
- MATH0010, MATH0011, MATH0016: Mathematical Methods 1, 2 & 3
- MATH0009: Newtonian Mechanics

Sep 2017 – Jun 2018 **Teaching Assistant**, Applied Mathematics, King Abdullah University of Science and Technology.
Delivered tutorials, graded assignments, and supported Master's-level courses, including:
- AMCS 131: Vector Calculus and Differential Equations;
- AMCS 151: Linear Algebra
- AMCS 152: Applied Numerical Methods
- AMCS 101: Engineering Mathematics

## Publications

[1] Pfuderer, P.L., Berkemeier, F., Nassar, J., Crisp, A., Jaworski, J.J., Moore, J., Sale, J.E., and Boemo, M.A. (2026). A genome language model for mapping replication origins. *bioRxiv*. doi.org/10.64898/2026.01.29.702604.

[2] Berkemeier, F., Cook, Peter R., and Boemo, Michael A. (2025). DNA replication timing reveals genome-wide features of transcription and fragility. *Nature Communications*. doi:10.1038/s41467-025-59991-w.
★ *Selected for Nature Communications Editors' Highlights in Genetics, Genomics and Epigenetics, recognising the 50 most outstanding recent publications in the field.*

[3] Paci, Giulia*, Berkemeier, F.*, Baum, Buzz, Page, Karen M., Mao, Yanlan (2026). 3D epithelial cell topology tunes signalling range to promote precise patterning. *Under review at PNAS*. doi:10.1101/2025.08.08.668674.

[4] Berners-Lee, Rosie, Gilmore, Eamonn, Berkemeier, F.†, and Boemo, Michael A. (2025). Regulation of replication timing in *Saccharomyces cerevisiae*. *PLOS Computational Biology*. doi:10.1371/journal.pcbi.1013066.

[5] Berkemeier, F., and Page, Karen M. (2023). Coupling dynamics of 2D Notch-Delta signalling. *Mathematical Biosciences*. doi:10.1016/j.mbs.2023.109012.

[6] Berkemeier, F., and Page, Karen M. (2023). Unifying evolutionary dynamics: a set theory exploration of symmetry and interaction. *bioRxiv*. doi:10.1101/2023.09.27.559729.

[7] Berkemeier, F. Cell-cell interactions in epithelial patterning: Notch-Delta signalling and evolutionary dynamics. PhD Thesis, University College London (2022). discovery.ucl.ac.uk/id/eprint/10158781.

[8] Berkemeier, F., and Gomes, Diogo A. (2019). A Priori Regularity of Parabolic Partial Differential Equations. Chapter in *New Trends in Analysis and Geometry*, *Cambridge Scholars Publishing*. ISBN:978-1-5275-4563-2.

Legend **Joint first authorship* †*Corresponding author.*

Research IDs ORCID: 0000-0001-9850-3666; Google Scholar: cna5UaoAAAAJ; Scopus Author ID: 58080325200; Researcher ID: NAX-9108-2025; CiênciaVitae: E316-06AE-ABF0.

## Software

[S1] Berkemeier, F. (2026). *DNAscape: Software for simulating and mapping DNA replication kinetics*. https://github.com/fberkemeier/DNAscape.

[S2] Pfuderer, P. L., Berkemeier, F., and Boemo, M. A. (2026). *ORILINX: ORIgin of replication Language-model Inference via Nucleotide conteXt*. github.com/Pfuderer/ORILINX.

[S3] Berkemeier, F. (2026). *FNO-replication: A Physics-Informed Fourier Neural Operator (FNO) for learning and predicting DNA replication kinetics*. github.com/fberkemeier/FNO-replication.

[S4] Berkemeier, F. (2025). *Multi-layer Signalling Model (MSM): Simulations of Notch-Delta signalling in 3D epithelial tissues*. github.com/fberkemeier/MultiLayer-NotchDelta.

[S5] Berkemeier, F. (2025). *A toolkit for analyzing DNA replication timing, origin firing rates, and genomic stability across cell lines and genomic regions*. github.com/fberkemeier/DNA_replication_model.

[S6] Berkemeier, F. (2022). *Interactive Epithelium: a Mathematica tool for Notch-Delta 2D epithelial signalling simulations* (Version 1.0.0). github.com/fberkemeier/Notch-Delta-Coupling.

## Talks, Workshops & Internships

Dec 2025 **Research in Genetics Day 2025**, Poster Session, Department of Genetics, University of Cambridge.
Presentation of the poster *A computational framework for mapping DNA replication kinetics*.
★ *Awarded Best Poster Prize.*

Aug 2025 **Research Seminar**, Birmingham Medical School, University of Birmingham.

Mar 2025 **CONNECTS-UK**, Jury member in STEM contest, Corpus Christi College, Cambridge.
Participation in a research pitch competition featuring STEM researchers from the UK and EU.

Oct 2024 **Research Pitch**, LUSO 2024, PARSUK, London.
Presentation on current research at the Portuguese Association of Students and Researchers in the UK (PARSUK).

Sep 2024 **UK DNA Replication Meeting 2024**, Poster Session, Churchill College, University of Cambridge.
Presentation of the poster *A Whole-Genome Mathematical Model of DNA Replication*.

May 2024 **Invited Talk**, Mathematics and Applications Colloquium - AMCS (CEMSE), KAUST.

Mar 2024 **Plenary Talk**, Pathology Annual Symposium, Li Ka Shing Centre, Cancer Research UK Cambridge Institute.

Mar 2024 **SCR Talk**, MCR-SCR Research Talks, Queens' College, University of Cambridge.

Jul 2023 **OxML 2023**, Machine Learning Summer School, Mathematical Institute, Oxford.
Participation in the Oxford Machine Learning Summer School, organized by AI for Global Goals, with training focused on statistical/probabilistic ML, representation learning, reinforcement learning, causal inference, vision & NLP.

Sep 2022 **ECMTB 2022 Talk**, European Conference On Mathematical and Theoretical Biology, Heidelberg University.
Participation on the mini-symposium *Bistable genetic switches across time, space, and disciplines* at the ECMTB 2022. Title of talk: *The dynamics of long-range signalling via the Notch-Delta pathway*.

Apr 2022 **SLCU Talk**, Sainsbury Laboratory, University of Cambridge.
Invited talk at Dr Henrik Jönsson's group meeting, entitled *Long-range signalling and patterns in the fly wing*.

Nov 2021 **IPLS Talk**, Institute for the Physics of Living Systems, UCL.
Talk and discussion on mathematical models of signalling pathways vs stretch-induced deformations on the wing disc, entitled *How stretch affects patterning in the fly wing*.

Oct 2020 & Oct 2021 **Poster Competition Panel Member**, Pure and Applied Math Undergraduate Projects, UCL.
Supervision of a poster competition on differential geometry and dynamical systems applied in pandemic modelling.

April 2020 **Optimisation Article**, Chalkdust Magazine.
Published article on the inter-university mathematical journal *Chalkdust*, on a brief optimisation problem.

Mar 2014 – Jul 2014 **Internship**, Visiting Student Research Program, KAUST, Saudi Arabia.
Undergraduate internship and research project with a focus on Mean-Field Games, PDE and Functional Analysis. Supervised by Prof. Diogo A. Gomes.

## Tests & Certifications

Sep 2018 – May 2019 **London Mathematical Society Courses**, Attendance and completion of four mathematical courses as part of the London Taught Course Centre (LTCC), via the London Mathematical Society. These included: Dynamical Systems, Stochastic Processes, Models and Measure Theory.

Dec 2018 **Teaching Training**, Completion of the *Teaching Undergraduates Mathematics and Statistics* (TUMIPS) training program at the Institute of Education, University College London.

Oct 2017 **TOEFL**, Score: 108/120.

## Skills & Abilities

Programming Python, PyTorch, MatLab, R, Wolfram Mathematica, C, C#, C++, Beacon Calculus, DNAscent, Batch Programming.

Software Writing: LaTeX, MS Office. Teaching: Crowdmark, Blackboard Learn, STACK, WISEflow.

Languages Portuguese (Native Speaker), English (fluent), comfortable with Spanish and French.

## Extracurricular Activities

2025–Present **Ambassador, Portuguese Association of Students and Researchers in the UK (PARSUK)**.
PARSUK Ambassador, helping strengthen the network and activities of Portuguese researchers and students in the UK, fostering connections and supporting collaborative initiatives.

2023–Present **Presidency, Vice-presidency, and Affiliation, Cambridge University Portuguese Society**.
Former president and vice-president of the Cambridge University Portuguese Society (CUPor), leading a dynamic cultural community, coordinating a diverse range of events, managing an executive committee, organizing sociocultural events, and advocating for Portuguese students at the university and beyond. Now active as a regular member.

2024–Present **Affiliate Researcher, Cambridge-Africa Programme**.
Member of the Cambridge-Africa Researchers' Database, supporting equitable research collaborations and capacity building with African institutions, and engaged in mentoring opportunities with African students and researchers.

2018–2022 **Student Union, University College London**.
Member of the Classical Guitar, Chamber Music and Hiking Societies at UCL.

2005–Present **Classical Guitar**.
Experience in playing various styles including Classical, Jazz, and Bossa Nova. Contributed to group musical arrangements, teaching via the Art's Office (KAUST), and participated in solo and ensemble performances.

2005–2012 **Almada's Music Academy, Portugal**.
Completed undergraduate studies in classical guitar (8th degree). Participation in several guitar contests and talent shows, winning first and second prizes, as well as honorable mentions.

2012–2016 **Volunteering**.
Participation in several volunteering activities, such as elderly home visits, beach cleaning and organization of homeless dinners. Leadership in a non-governmental volunteering organization in workshops in Portugal and Germany.

2005–Present **Sports**.
Amateur level sports, including football, tennis, swimming and skiing. 2 years of football at federate level.