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# Francisco Pinto Berkemeier

Curriculum Vitae

## Research & Education

Sep 2022 – Present **Postdoctoral Researcher**, University of Cambridge.
Department of Pathology and Department of Genetics
Research Associateship at the University of Cambridge, in the Boemo Group. Main research: mathematical modelling of chemotherapy effects on genome-wide replication dynamics. Supervisor: Michael A. Boemo.

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

Aug 2016 – Jun 2018 **Master of Science**, King Abdullah University of Science and Technology, KSA.
Master's degree in Applied Mathematics and Computer Science. Thesis title: *A priori regularity of parabolic partial differential equations*. Defense date: April 10, 2018. Advisor: Diogo A. Gomes. Final Cumulative GPA: 3.71/4.00.

Sep 2012 – Jun 2016 **Bachelor of Science**, Instituto Superior Técnico, University of Lisbon.
Bachelor's degree in Applied Mathematics and Computer Science.

## Work & Teaching Experience

Oct 2023 – Present **Postdoctoral Research Associate**, Queens' College, University of Cambridge.
Rokos PDRA at Queens' College, University of Cambridge.

Oct 2023 – Present **College Supervision**, Queens' College, University of Cambridge.
Supervision of multiple undergraduate modules in Mathematics and Natural Sciences.

Jun 2023 – Jun 2024 **Master's Project Supervision**, Department of Pathology, University of Cambridge.
Supervision and mentorship of a master's student through their year-long placement research project on modelling DNA replication, as part of their integrated master's in Biochemistry (University of St. Andrews).

Aug 2020 – Jan 2021 **Lecturer**, Applied Mathematics, University College London.
Lecturer of an undergraduate mathematics course (Mathematics for Engineers 1), covering introductory topics on differentiation, integration, differential equations, vectors, probability and statistics and numerical methods. Other duties included homework/exam structuring, marking and office hours.

Sep 2017 – Sep 2022 **Teaching Assistant**, Applied Mathematics, UCL & KAUST.
Teaching assistance at undergraduate and Master's levels: tutorial classes, exam/homework marking and office hours. Covered topics: calculus, linear algebra, complex analysis, mechanics and numerical analysis.

Sep 2015 – May 2016 **University-level Tutoring**, Pure and Applied Mathematics, Lisbon, Portugal.
Working in several tutoring centers and collaborating with the student math association at IST.

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.

## Publications

2025 Bekemeier, F., Cook, Peter R., and Boemo, Michael A. *DNA replication timing reveals genome-wide features of transcription and fragility*. Nature Communications. doi.org/10.1038/s41467-025-59991-w.

2025 Berners-Lee, R., Gilmore, E., Berkemeier, F., and Boemo, M. A. *Regulation of replication timing in Saccharomyces cerevisiae*. PLOS Computational Biology. doi.org/10.1371/journal.pcbi.1013066.

2023 Berkemeier, Francisco, and Page, Karen. *Unifying evolutionary dynamics: a set theory exploration of symmetry and interaction*. bioRxiv preprint. doi.org/10.1101/2023.09.27.559729.

2023 Berkemeier, Francisco, and Page, Karen. *Coupling dynamics of 2D Notch-Delta signalling*. Mathematical Biosciences. doi.org/10.1016/j.mbs.2023.109012.

2020 Berkemeier, Francisco, and Gomes, Diogo. *A Priori Regularity of Parabolic Partial Differential Equations*. Chapter in *New Trends in Analysis and Geometry, Cambridge Scholars Publishing*.

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

## Software

2025 Berkemeier, Francisco. *FNO-replication: A Physics-Informed Fourier Neural Operator (FNO) for learning and predicting DNA replication kinetics*. github.com/fberkemeier/FNO-replication.git.

2025 Berkemeier, Francisco. *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.git.

2022 Berkemeier, Francisco. *Interactive Epithelium: a Mathematica tool for Notch-Delta epithelial signalling simulations* (Version 1.0.0). github.com/fberkemeier/Notch-Delta-Coupling.git.

## Talks, Workshops & Projects

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.

Nov 2024 **Research in Genetics Day 2024**, Poster Session, Department of Genetics, University of Cambridge.
Presentation of the poster *DNA replication timing reveals features of transcription and fragility*.

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), King Abdullah University of Science and Technology.

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.

Mar 2024 **Research Seminar**, Genetics Internal Seminars, Department of Genetics, University of Cambridge.

Jan 2024 **UCL Talk**, Mathematical Biology Seminar, Department of Mathematics, University College London.
Talk on current research, specifically on the development of a whole-genome mathematical model of DNA replication in human cells.

Nov 2023 **Research in Genetics Day 2023**, Poster Session, Department of Genetics, University of Cambridge.
Presentation of the poster *A Whole-Genome Mathematical Model of DNA Replication*.

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, geometrical DL, among other topics.

Jun 2023 **Journal Club**, Bioinformatics Journal Club, University of Cambridge.
Presentation and discussion of a research paper on the mathematical modelling of the mammalian cell cycle.

Oct 2022 **CMP Seminar**, Cellular and Molecular Pathology Seminar Series, University of Cambridge.
Talk on Notch-Delta long-range signalling dynamics via cell protrusions.

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 research group meeting on PhD research, 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*.

Nov 2021 **Math Bio Talk**, Departmental Computational Biology Group, UCL.
Presentation at the multi-disciplinary computational biology group meeting on the mathematical analysis of long-range signalling systems, including linear and stochastic stability analysis and applications. Supervised by Philip Pearce.

Oct 2021 – Present **Co-Founder of *Live StackOverflow***, Postgraduate Research Group, UCL/LMCB.
Co-founder and organiser of *Live StackOverflow*, a weekly meeting group for PhD and Postdoc students working in applied mathematics in physics and computational biology at UCL, with the aim of providing a friendly and non-formal platform for open discussion on ways to improve social, presentation and research skills among new postgraduate students.

Oct 2020 & Oct 2021 **Poster Competition Panel Member**, Pure and Applied Mathematics Undergraduate Projects, UCL.
Supervision of the annual UCL mathematics undergraduate poster competition, where students present their second-year projects on topics ranging from theoretical exercises on differential geometry to dynamical systems applied in studying the evolution of pandemics.

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

April 2019 **Cambridge Conference**, Evolution Evolving Conference, University of Cambridge.
Participation in the conference *Evolution Evolving*, at Churchill College, University of Cambridge. Topics included evolutionary causes and consequences of developmental bias, plasticity, niche construction and extra-genetic inheritance, approached from mathematical, biological and philosophical perspectives.

Sep 2018 – Dec 2018 **Teaching Training**, Institute of Education (IOE), UCL.
Three-month undergraduate teaching and tutoring training for postgraduate students, as part of the PhD teaching assistant training program *Teaching Undergraduates Mathematics or Statistics* (TUMIPS).

Feb 2017 – May 2017 **Python project**, Numerical Analysis of Differential Equations, KAUST.
Implementation of a 9-point compact finite difference method for the Helmholtz equation.

Jan 2017 **Steam Challenge**, Winter Enrichment Program, KAUST.
Participation in the Steam Challenge entrepreneurship workshop at WEP 2017. Main topic: energy conservation of photo-voltaic power stations in desert environments.

Nov 2016 **MLaTeX**, Collaboration with Master's advisor, KAUST.
*Windows* implementation of the saving directories of MLaTeX, a set of tools simplifying the interface between LaTeXand *Mathematica*.

## 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 or Statistics* (TUMIPS) program at the Institute of Education, UCL.

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

Oct 2017 **General GRE**, Scores: Analytical Writing: 3.5/6.0, Verbal: 152/170, Quantitative: 164/170.

## Skills & Abilities

Programming Python, PyTorch, MatLab, R, Wolfram Mathematica, C, C#, C++, bcs.

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

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

## Extracurricular Activities

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

2023–Present **Presidency & Vice-presidency, Cambridge University Portuguese Society**.
As former president and now vice-president of the Cambridge University Portuguese Society (CUPor), I lead 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.

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

2005–Present **Classical Guitar**.
Experienced in playing various styles including Classical, Jazz, and Bossa Nova in a range of events. Contributed to group musical arrangements and participated actively in 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.