Richard Creswell

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Oxford, England

Academic Positions

Associate Research Fellow *2023 July–*
Reuben College, University of Oxford, Oxford, England

EPSRC Doctoral Prize Researcher / Eric and Wendy Schmidt AI in Science Postdoctoral Fellow *2023 July–*
Department of Computer Science, University of Oxford, Oxford, England

Doctoral Student *2019 Oct.–2023 July*
Department of Computer Science, University of Oxford, Oxford, England

IS Programmer Analyst II / Research Associate *2017 July–2019 Sep.*
Gerber Lab, Brigham & Women's Hospital, Harvard Medical School, Boston, Massachusetts

Undergraduate Research Assistant *2014 May–2015 Jan.*
Herman Group, Columbia University, New York, New York

Education

D.Phil. (Ph.D.) Computer Science, University of Oxford, Oxford, England *2023*

- Supervisors: Prof. David Gavaghan, Dr. Ben Lambert; Thesis examiners: Prof. Ruth Baker, Dr. Louise Dyson

M.Sc. Applied Mathematics, Columbia University, New York, New York (GPA: 4.0/4.0) *2017*

B.Sc. Applied Physics *summa cum laude*, Columbia University, New York, New York (GPA: 4.0/4.0) *2016*

Teaching

Co-teacher *2024 Mar. (upcoming)*
Bioscience Doctoral Training Partnership, University of Oxford, Oxford, England

- I am preparing and delivering several lectures on Bayesian Inference as part of the upcoming AI and Machine Learning Training Week.

Demonstrator (Teaching Assistant) *2020 Oct.–*
University of Oxford, Oxford, England

- Mathematical, Physical, and Life Sciences (MPLS)
  - Bayesian Inference (2024)
- Sustainable Approaches to Biomedical Science (SABS)
  - Software engineering (2020–2021, 2021–2022, 2022–2023, 2023–2024)
  - Mathematical modelling (Michaelmas 2020)
  - Scientific computing (Hilary 2021)
  - Simulated data and reproducible data analysis (Summer 2021)
- UNIQ+ Graduate Access Programme
  - Machine Learning and Bayesian Inference training session (Summer 2021)

Supervision

College Advisor *2023 Oct.–*
Reuben College, University of Oxford, Oxford, England

- College advisor to four M.Sc. students.

Co-Supervisor *2021 June–*
Department of Computer Science, University of Oxford, Oxford, England

- I contributed to supervision of research work for the following students:
  - Kit Gallagher (rotation and subsequent research collaborations, 2022–).
  - Katherine Shepherd (rotation and PhD, 2022–).
  - Ioana Bouros (rotation and PhD, 2021–2023).
  - Kamil Ebanks (UNIQ+ research internship, 2023).
  - Talal Ali (UNIQ+ research internship, 2023).

OTHER ACTIVITIES

Guest Editor *2023 Nov.–*
Journal of Theoretical Biology
- I am working as a guest editor for the upcoming special issue "Bioinference: Trends and Reproducibility" of *Journal of Theoretical Biology.*

Statistical Consultant *2022 Aug.–2023 Mar.*
EY-Oxford Health Analytics Consortium UKHSA COVID-19 testing evaluation
- I was subcontracted by Oxford University Innovation (OUI) to provide statistical and software consultancy for a retrospective analysis of the COVID-19 testing program in England commissioned by the UK Health Security Agency (UKHSA).

Member of Organizing Committee *2021 Sep.–2023 May*
Bioinference Conference
- I worked on the organizing committees for the Bioinference 2022 and Bioinference 2023 conferences, and helped to raise funding for the conferences from the London Mathematical Society, the Heilbronn Institute, and the Oxford Computer Science department.

Member of Organizing Team *2020 Oct.–2022 Mar.*
CoMo-DTC COVID-19 Collaboration
- I joined the organizing team for the collaboration between the Doctoral Training Centre (DTC) at Oxford and Oxford's and Cornell's COVID-19 International Modelling Consortium (CoMo). Our work included investigating the development of high-quality software for CoMo's model of COVID-19 transmission, and implementing a hierarchy of compartmental transmission models for purposes of model comparison. A particular focus of our work was developing software, a web app, and pedagogical notebooks to help introduce newcomers to the field of epidemiological modelling.

Co-founder *2022 Oct.–2023 Mar.; 2023 Nov.–2023 Dec.*
Oxford Statistical Epidemiology Reading Group
- I co-founded and co-organized a journal club and series of informal seminars covering epidemiology, statistics, mathematical modelling, and related subjects.

Member of Development Team *2019 Oct.–*
PINTS (Probabilistic Inference for Noisy Time Series)
- I am one of the developers contributing to the PINTS Python library, which enables the convenient application of optimization, Bayesian inference, and machine learning techniques to fit time series models to data. I have also worked to increase adoption of the software and teach new users how to use it.

SKILLS

Programming: Python, C, C++, R, MATLAB, Stan.
Other computing: MPI, Unix/Linux, SQL, Git, GitHub, GitHub Actions, LSF, Slurm, AWS EC2, object-oriented programming, software testing, continuous integration, cloud computing.
Design and web: LaTeX, Blender, Adobe Illustrator, Inkscape, matplotlib, Plotly Dash, Flask.
Other: Office for National Statistics (ONS) Full accredited researcher.

Honors, Awards, and Funding

- Schmidt AI in Science Fellowship (2023)—**£70,594** funding to conduct research on machine learning for epidemiological time series.
- EPSRC Doctoral Prize (2022)—**£27,221** funding to continue research at Oxford after finishing my DPhil.
- Invited one-week research visit to Colorado State University, Fort Collins (2022).
- Computer Science Scholarship (Oxford Department of Computer Science, 2019).
- EPSRC Doctoral Training Partnership (2019).
- Applied Physics Faculty Award (Columbia University, 2016).
- C. Prescott Davis Scholar (Columbia University, 2016).

Publications and Presentations

Journal papers

- B. Lambert, C. L. Lei, M. Robinson, M. Clerx, **R. Creswell,** S. Ghosh, S. Tavener, and D. J. Gavaghan: "Autocorrelated measurement processes and inference for ordinary differential equation models of biological systems," *Journal of the Royal Society Interface*, vol. 20 (2023).
- **R. Creswell,** M. Robinson, D. Gavaghan, K. V. Parag, C. L. Lei, and B. Lambert: "A Bayesian nonparametric method for detecting rapid changes in disease transmission," *Journal of Theoretical Biology*, vol. 558 (2023).
- **R. Creswell,†** D. Augustin,† I. Bouros,† H. J. Farm,† S. Miao,† A. Ahern,† M. Robinson, A. Lemenuel-Diot, D. Gavaghan, B. Lambert, and R. N. Thompson: "Heterogeneity in the onwards transmission risk between local and imported cases affects practical estimates of the time-dependent reproduction number," *Philosophical Transactions of the Royal Society, A*, vol. 380 (2022).
- S. A. van der Vegt,† L. Dai,† I. Bouros,† H. J. Farm,† **R. Creswell,†** O. Dimdore-Miles,† I. Cazimoglu, S. Bajaj, L. Hopkins, D. Seiferth, F. Cooper, C. L. Lei, D. Gavaghan, and B. Lambert: "Learning transmission dynamics modelling of COVID-19 using comomodels," *Mathematical Biosciences*, vol. 349 (2022).
- **R. Creswell,†** J. Tan,† J. W. Leff, B. Brooks, M. A. Mahowald, R. Thieroff-Ekerdt, and G. K. Gerber: "High resolution temporal profiling of the human gut microbiome reveals consistent and cascading alterations in response to dietary glycans," *Genome Medicine*, vol. 12 (2020).
- E. Bogart, **R. Creswell,** and G. K. Gerber: "MITRE: inferring features from microbiota time-series data linked to host status," *Genome Biology*, vol. 20 (2019).
- D. Zhang, D. Z.-R. Wang, **R. Creswell,** C. Lu, J. Liou, and I. P. Herman: "Passivation of CdSe Quantum Dots by Graphene and MoS_2 Monolayer Encapsulation," *Chemistry of Materials*, vol. 27, no. 14, pp. 5032–5039 (2015).

(†= joint first authorship.)

Preprints

- S. Bajaj,† S. Chen,† **R. Creswell,†** R. Naidoo,† J. L.-H. Tsui,† O. Kolade, G. Nicholson, B. Lehmann, J. A. Hay, M. UG Kraemer, R. Aguas, C. A. Donnelly, T. Fowler, S. Hopkins, L. Cantrell, P. Dahal, L. J. White, K. Stepniewska, M. Voysey, B. Lambert, and EY-Oxford Health Analytics Consortium: "Understanding COVID-19 testing behaviour in England through a sociodemographic lens," medRxiv:2023.10.26.23297608 (2023).
- L. Herriott,† H. L. Capel,† I. Ellmen,† N. Schofield,† J. Zhu,† B. Lambert, D. Gavaghan, I. Bouros, **R. Creswell,** and K. Gallagher: "EpiGeoPop: A Tool for Developing Spatially Accurate Country-level Epidemiological Models," arXiv:2310.13468 (2023).
- **R. Creswell,** K. M. Shepherd, B. Lambert, G. R. Mirams, C. L. Lei, S. Tavener, M. Robinson, and D. J. Gavaghan: "Understanding the impact of numerical solvers on inference for differential equation models," arXiv:2307.00749 (2023).
- K. Gallagher, **R. Creswell,** D. Gavaghan, and B. Lambert: "Identification and Attribution of Weekly Periodic Trends in Epidemiological Time Series Data," medRxiv:2023.06.13.23290903 (2023).
- R. Naidoo, B. Andersen-Waine, P. Dahal, S. Dickinson, B. Lambert, M. C. Mills, C. Molyneux, E. Rowe, S. Pinto-Duschinsky, K. Stepniewska, R. Shretta, M. Voysey, M. Wanat, G. Yenidogan, L. J. White, **and EY-Oxford Health Analytics Consortium:** "A multistage mixed-methods evaluation of the UKHSA testing response during the COVID-19 pandemic in England," medRxiv:2022.10.27.22281604 (2022).
- K. Gallagher,† I. Bouros,† N. Fan,† E. Hayman,† L. Heirene,† P. Lamirande,† A. Lemenuel-Diot, B. Lambert, D. J. Gavaghan, **and R. Creswell:** "Epidemiological Agent-Based Modelling Software (Epiabm)," arXiv:2212.04937 (2022).

- **R. Creswell,** B. Lambert, C. L. Lei, M. Robinson, and D. Gavaghan: "Using flexible noise models to avoid noise model misspecification in inference of differential equation time series models," arXiv:1410.5093 (2020).

(†= joint first authorship.)

Conference workshop papers (refereed)

- **R. Creswell,** M. K. Gibson, T. E. Gibson, J. W. Leff, and G. K. Gerber: "A multi-level Bayesian nonparametric model of longitudinal responses of the human microbiota to dietary interventions," *ICML and IJCAI Workshop on Computational Biology*, Stockholm, Sweden (2018).

Other publications

- **R. Creswell:** *Bayesian inference for biological time series*, University of Oxford Doctoral thesis (2023).
- L. White, R. Naidoo, B. Andersen-Waine, B. Lambert, S. Pinto-Duschinsky, E. Rowe, R. Shretta, K. Stepniewska, M. Voysey, G. Yenidogan, **and EY–Oxford Health Analytics Consortium:** *Evaluation of the national COVID-19 testing programme in England between October 2020 and March 2022* (2023).

Talks

- AI in Science Colloquium, Reuben College, Oxford, England *(2024, upcoming).*
- Inference for Expensive Systems in Mathematical Biology, Oxford, England (2022).
- Microbiome Mini-Symposium (on the event of the visit of the Wageningen University Microbiology Laboratory to Harvard Medical School), Boston, Massachusetts (2019).
- Forum for Advanced Biomedical Computation, Boston, Massachusetts (2018).
- MIT-Harvard Microbiome Symposium, Cambridge, Massachusetts (2018).

Poster presentations

- Epidemics, Bologna, Italy (2023).
- Eric and Wendy Schmidt AI in Science Postdoctoral Fellows Convening, Toronto, Canada (2023).
- The Royal Society, Modelling the Covid-19 Pandemic: Achievements and Lessons, London, England (2022).
- Brigham & Women's Hospital Pathology Research Celebration, Boston, Massachusetts (2019).
- MIT-Harvard Microbiome Symposium, Cambridge, Massachusetts (2019).
- ICML and IJCAI Workshop on Computational Biology, Stockholm, Sweden (2018).
- Harvard Medical School Pathology Research Retreat, Boston, Massachusetts (2018).
- MIT-Harvard Microbiome Symposium, Cambridge, Massachusetts (2018).
- Computational Aspects of Biological Information, Microsoft Research New England, Cambridge, Massachusetts (2018).