

Joshua Burton

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🌐 burtonjosh

🌐 <https://burtonjosh.github.io/>

Education

- 2018 – 2023 ◇ **Ph.D., University of Manchester** Quantitative and Biophysical Biology.
Thesis title: *Bayesian inference and modelling of gene expression dynamics.*
- Derived a novel Kalman filtering algorithm for a delay differential equation model of gene expression
 - Developed Python and Julia packages `hesdynamics` and `DelayedKalmanFilter.jl` to enable Bayesian inference on stochastic delay differential equation models
 - Contributed bug fixes and documentation to open-source Julia packages `Pathfinder.jl` and `TuringGLM.jl`
 - Learnt how to effectively communicate difficult mathematical concepts to biologists
- 2014 – 2018 ◇ **MMath (Hons), 1st Class** in Mathematics.
Thesis title: *An exploration of multistationarity in chemical reaction networks.*
- Overall average above 80%
 - Had a lead supervisor teaching role in my final year, teaching over 20 first-year students

Skills

- Maths ◇ Bayesian inference, MCMC, dynamical systems, SDEs
- Computing ◇ Julia, Python, R, \LaTeX , Linux, Git, Excel
- Other technical skills ◇ Academic research and teaching, writing publications, public speaking, independent remote working, strong organisational skills
- Interests ◇ Drumming, jazz, volleyball, films

Awards and Achievements

- 2022 ◇ **Research visit** to Aalto University. I was funded by the ELLIS Unit Helsinki to support a 2-month research visit to Dr Arno Solin's group. I gave a talk to the computer science department about my research in Kalman filters and learnt about the state-of-the-art in inference methods for stochastic differential equations.
- ◇ **Invited speaker** at the Royal Statistical Society Invited Session: Statistical inference in stochastic biological systems with complex dynamics. Institute of Mathematical Statistics Annual Meeting (London, June)
- ◇ **Poster presentation** at the EMBO | EMBL Symposium: Biological oscillators: Design, mechanism, function (Heidelberg, March)
- ◇ **Speaker** at the Centre for Biological Timing Winter Symposium (Manchester, February)
- 2017 ◇ **Huawei Seeds for the Future** programme candidate. As a successful applicant to their programme, I spent 4 weeks in China with 59 other top UK and Ireland STEM students, to learn about the Chinese language, business culture, and attitudes to technology.

Work Experience

- 2023 – Present ◊ **Julia software developer and Bayesian inference researcher**, PlantingSpace.
- Contributed to building a general knowledge system which is transparent, and incorporates uncertainty
 - Research at the intersection of Bayesian statistics and Category theory
 - Involved in multiple aspects of an early stage start up, including backend development (Julia), deployment and infrastructure (AWS, docker)
 - Highly collaborative environment with a flat structure, which allowed for experience as both a team member and a team leader
- 2017 – 2019 ◊ **Graduate teaching assistant**, University of Manchester Mathematics department.
- Taught foundational mathematical concepts to first-year university students
 - Took a lead supervisor role and provided letters of reference for students
- 2017 ◊ **Intern**, Wellcome Trust summer studentship scheme.
- Worked with large data sets of high-throughput single-cell sequencing data
 - Gained a mathematical understanding of multiple ML algorithms

Research Publications

Journal Articles

- 1 C. E. Overton, L. Pellis, H. B. Stage, *et al.*, “EpiBeds: Data informed modelling of the COVID-19 hospital burden in England,” *PLOS Computational Biology*, vol. 18, no. 9, e1010406, Sep. 2022, Publisher: Public Library of Science, ISSN: 1553-7358. [DOI: 10.1371/journal.pcbi.1010406](#).
- 2 X. Soto, **J. Burton**, C. S. Manning, *et al.*, “Sequential and additive expression of miR-9 precursors control timing of neurogenesis,” *Development*, vol. 149, no. 19, Oct. 2022, ISSN: 0950-1991. [DOI: 10.1242/dev.200474](#).
- 3 **J. Burton**, C. S. Manning, M. Rattray, N. Papalopulu, and J. Kursawe, “Inferring kinetic parameters of oscillatory gene regulation from single cell time-series data,” *Journal of The Royal Society Interface*, vol. 18, no. 182, Sep. 2021, ISSN: 1742-5662. [DOI: 10.1098/rsif.2021.0393](#).

Pre-prints

- 1 S. Funk, S. Abbott, B. D. Atkins, *et al.*, *Short-term forecasts to inform the response to the Covid-19 epidemic in the UK*, Dec. 2020. [DOI: 10.1101/2020.11.11.20220962](#).

In preparation

- 1 **J. Burton**, M. Rattray, N. Papalopulu, and J. Kursawe, *Continuous time filtering and variational inference of combined single cell time-series data*, 2023.