Joshua Burton

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https://burtonjosh.github.io/

Education

2018 – 2023 ◇ **Ph.D., University of Manchester** Quantitative and Biophysical Biology.
Thesis title: *Emergence and control 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

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.