Matthew Burke

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Education

Macquarie University, Sydney
Doctor of Philosophy in Mathematics 2011-2015

Christ's College, University of Cambridge
Part III Mathematics (MMATH) 2010-2011
Bachelor's Degree in Mathematics (BA) 2007-2010

Selected Work Experience

University of Calgary Sep 2017 - Present

Postdoctoral scholar

- Designed and completed projects in pure mathematics and computer science leading to one publication in a peer-reviewed journal and another submitted.
- Mentored two PhD students. Reviewed two papers for mathematics journals.
- Organised the University of Calgary Peripatetic Seminar (Dec 2017-Present) and chaired a session of the Alberta Mathematics Dialogue 2018.
- Used Jupyter notebooks to lecture 4 classes of around 230 students each.

MathSpire Ltd. Nov 2016 - Aug 2017

Software engineer (5 months); Chief technology officer (9 months)

- Developed a cross-platform mobile and desktop application to teach A-level mathematics using interactive graphs, videos and integrated testing. Used F#, .NET and Xamarin.
- Created a web front-end and API for teachers to track student progress.
- Showcased application at the BETT eduction technology conference.

Academic papers

- Involution algebroids: a generalisation of Lie algebroids for tangent categories, *In preparation*. Available at https://mwpb.uk/static/pdfs/involution-algebroids.pdf.
- A Synthetic Version of Lie's Second Theorem, *Applied Categorical Structures*, 2018.02.06. Available at https://doi.org/10.1007/s10485-018-9518-2.
- Connected Lie Groupoids are Internally Connected and Integral Complete in Synthetic Differential Geometry, *Symmetry, Integrability and Geometry: Methods and Applications*, 2016.06.29. Available at http://www.emis.de/journals/SIGMA/2017/007/.

Selected Projects

- **Kaggle Box Office Predictions:** (https://github.com/mwpb/kaggle-projects)
  Competition to predict the revenue of films. Uses IPython in Google Colab.
- **Cryptopals Challenges:** (https://github.com/mwpb/matasano-go)
  Solutions written in Go. Work in progress: currently first three sets completed.
- **ChessLogBook** (https://mwpb.uk/ChessLogBook)
  MacOS app written using Qt to play games on freechess.org and annotate them offline.
- **Colimits in Coq:** (https://github.com/mwpb/postulated-colimits-in-coq)
  Computer verification of a key result in category theory using the Coq proof assistant.