Fintan Hegarty

Production Editor
Mathematical Sciences Publishers
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Employment

Production Editor at Mathematical Sciences Publishers, University of California, Berkeley *2016-present*
Editing and typesetting mathematical articles for clarity of exposition, consistency, and grammar. Monitoring metadata and bibliographic content.

Lecturer for Professional Diploma in Mathematics Teaching, University of Limerick *2016*
Lecturing mathematics to secondary school teachers as part of a diploma which qualifies them to teach mathematics at secondary level.

Postdoctoral Research Fellow at the Theoretical and Computational Optimization Research Group at the University of Birmingham *2013-2015*
Responsibilities included development of research objectives of the group, implementation of new theory and techniques, collection and analysis of research data, presentation and publication of research outputs, relevant administerial duties.

Tutor at National University of Ireland, Galway *2008-2011*
Mathematics and Statistics for Business for Commerce
Mathematics for Science
Quantitative Techniques for Business for Business Information Students

Covered a broad range of topics as detailed on my website. Responsible for teaching class sizes of up to sixty students, online course component administration for four hundred undergraduates, supplementary support for struggling students, exam invigilation and marking.

Education

Ph.D. Mathematics, National University of Ireland, Galway *2008-2013*
Computational Homology of Cubical and Permutahedral Complexes: Developed theory for a novel computational homology method of analysing digital images based on up to four-dimensional analogues of hexagonal pixels as well as the creation of an open-source software package (using the GAP system for discrete computational algebra) for the analysis of data based on this method.

B.Sc. Financial Mathematics and Economics, National University of Ireland, Galway *2004-2008*
Final Year Project: *Understanding the Riemann Hypothesis:* A layman's explanation of (but unfortunately no solution to) possibly the most important unresolved problem in pure mathematics.

Dioplóma sa Ghaeilge, Ollscoil na hÉireann, Gailleamh *2004-2006*
ECDL Certificate, Magh Ene College, Donegal *2003-2004*
Leaving Certificate, Magh Ene College, Donegal (highest mark in the college that year) *2001-2003*

Publications

Sparsification of matrices and compressed sensing, F. Hegarty, P. Ó Catháin, Y. Zhao, preprint.

Computational homotopy of finite regular CW-spaces, G. Ellis and F. Hegarty, Journal of Homotopy and Related Structures, May 2013

Computational homology of cubical and permutahedral complexes, Ph.D Thesis, submitted September 2012, supervised by Prof. Graham Ellis.

Links to my publications are available on my website. Also available are further details on the *Matlab* algorithms designed as part of my current research, and a selection of the experimental data used to produce the graphs which feature in the current research paper. Further information on the GAP package I created as part of my doctoral thesis is also available, along with some real-world toy examples.

Research Interests

Compressed sensing: Compressed sensing is a signal processing technique for efficiently acquiring and reconstructing a signal, and has applications in data compression and conversion, image reconstruction, medical imaging, geophysics, computational biology, communications, optics, and more. As part of the research group, I worked on the construction and manipulation of deterministic and structured compressed sensing matrices and algorithms to compress and recover data efficiently, focusing on the removal of superfluous data, and inference from incomplete data sets.

Computational homology: The GAP package developed as part of my PhD research can be used to analyse the homological properties of data sets and perturbations thereof in up to four dimensions. A couple of toy examples can be found on my website. The process we used for converting images into useable data sets was basic. However, a substantial component of compressed sensing revolves around image reconstruction and noise delimitation, and I intend to incorporate the new techniques I have learned over the course of the postdoc into my original software package, theoretically enabling analysis of medical images such as MRI and CAT-scans. This could lead to the automation of several tasks in, for example, cancer treatment, such as tracking spread of disease or allowing for a more accurate set-up for localised treatments like radiation therapy.

Skills and Experience

Proficient in Latex, Vim, Matlab, GAP, Linux, Microsoft Office.

Some experience with Python, HTML, C, Javascript.

Working knowledge of Irish, French and German.

Some pro bono math and computing consulting. *2015-2016*

Founder, editor and writer for a monthly university newsletter featuring fun mathematics and science articles and related puzzles. *2011-2015*

Organiser of a series of free open-air scientific talks for the general public, given around Galway by postgraduate researchers of NUIG in topics ranging from juggling to pure mathematics. *2011*

Chess teacher in a number of clubs; Galway Juniors (ages 5-15), and the NUIG and University of Birmingham chess clubs. *2004-2015*

Various positions on a number of NUIG Society committees, including a year as a member of the University Societies Coordination Group. *2004-2013*

Underwater chess enthusiast *2009-present*

Private tutor of Mathematics to Leaving Certificate students, and Commerce, Science, I.T., Mechanical Engineering and Electrical Engineering undergraduates. *2004-2013*