

Jason P. Smith

Curriculum vitae

Personal

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Phone: +447770390059 Citizenship: British

Education

2012 – 2015 PhD in Combinatorics
Topic: “The Möbius Function and Topology of the Permutation Poset”
Advisor: Prof. Einar Steingrímsson
Department of Computer and Information Sciences, University of Strathclyde, Glasgow, UK

2008 – 2012 Undergraduate and Masters Degree in Mathematics, MMath
First Class Honours. University of Bath, Bath, UK

Academic Positions

2020 – Lecturer in Mathematics
Department of Physics and Mathematics, Nottingham Trent University, Nottingham, UK

2018 – 2020 Research Fellow
Department of Mathematics, University of Aberdeen, Aberdeen, UK
Project: Topological Analysis of Neural Systems (PI: Ran Levi)

2015 – 2018 Research Associate
Department of Computer and Information Sciences, University of Strathclyde, Glasgow, UK
Project: The Möbius Function of the Poset of Permutations (PI: Einar Steingrímsson)

Research Interests

Applications of Combinatorics and Topology to Data Science. Applied Topology, Topological Data Analysis and Persistent Homology, focusing on problems from neuroscience. Poset topology, focusing on shellability, Cohen-Macaulayness, connectivity and poset fibrations. Other combinatorial problems such as permutation patterns, distance preserving graphs, and combinatorial tableaux and their connections to the physics models.

Teaching Duties

Lecturer	MATH10271: Introduction to Abstract Algebra	Nottingham Trent University
Lecturer	MA2010: Probability	University of Aberdeen
Lecturer	CS103: Machines, Languages and Computation	University of Strathclyde
Teaching Assistant	CS110: Combinatorics For Computer Science 1	University of Strathclyde
Teaching Assistant	CS208: Logic And Algorithms	University of Strathclyde
Teaching Assistant	CS212: Topics in Computing 2	University of Strathclyde
Teaching Assistant	CS215: Combinatorics for Computer Science 2	University of Strathclyde

Additional Duties and Skills

- Member of the organising committee of the British Combinatorial Conference 2017.
- Reviewed articles for the journals: Theoretical Computer Science, Tbilisi Mathematical Journal, Annals of Combinatorics, Discrete Applied Mathematics, Electronic Journal of Combinatorics and Journal of Combinatorial Theory, Series A.
- Member of the Edinburgh Mathematical Society and British Neuroscience Association.
- Proficient in C++, Python, Java, and \LaTeX .
- Author of a package in SageMath applying discrete Morse theory to posets.
- Experienced using High Performance Computing.

Grants

2017	\$560	MSRI Travel Fund to attend Geometric and Topological Combinatorics workshop.
2017	£3300	SICSA Postdoctoral and Early Career Researcher Exchange grant to visit Iceland.
2015	£220	Santander Universities Travel Award to attend Permutation Patterns 2015.
2014	\$1240	Clay Institute Travel Grant to attend FPSAC 2014.
2014	£700	Strathclyde Travel Fund to attend Permutation Patterns 2014.

Selected Presentations

Jul 2019	Talk	“Using topological data analysis to classify certain stimuli in the Blue Brain reconstruction”, SIAM Applied Algebraic Geometry, University of Bern.
Jun 2018	Talk	“A Poset of Graphs”, British Mathematics Colloquium, University of St Andrews.
Sep 2017	Talk	“Pattern Posets and Poset Fibrations”, Combinatorics Seminar, University of California, Berkeley.
Jul 2017	Poster	“Pattern Posets”, <i>Formal Power Series and Algebraic Combinatorics 2017</i> , Queen Mary University, London.
Apr 2017	Talk	“The Permutation Pattern Poset”, ICE-TCS Theory Day, Reykjavik University, Iceland.
Jul 2016	Poster	“On the Möbius Function and Topology of the Permutation Pattern Poset”, <i>Formal Power Series and Algebraic Combinatorics 2016</i> , Simon Fraser University, Vancouver.
Jun 2016	Talk	“Pattern Posets: Möbius Function and Topology”, <i>Permutation Patterns 2016</i> , Howard University, Washington DC.
Aug 2015	Talk	“Combinatorial Algebraic Topology and its Applications to Permutation Patterns”, <i>Manchester Discrete Mathematics Seminar</i> , University of Manchester.
Jul 2014	Talk	“Intervals of Permutations with a Fixed Number of Descents are Shellable”, <i>Permutation Patterns 2014</i> , East Tennessee State University.

Publication List

- 2021 “An application of neighbourhoods in digraphs to the classification of binary dynamics”, with Pedro Conceição, Dejan Govc, Jānis Lazovskis, Ran Levi, and Henri Riihimäki, preprint at *arXiv:2104.06519*.
- 2021 “Complexes of Tournaments, Directionality Filtrations and Persistent Homology”, with Dejan Govc and Ran Levi, *Journal of Applied and Computational Topology* 5
- 2020 “Asymptotic Behaviour of the Containment of Certain Mesh Patterns”, with Dejan Govc, preprint at *arXiv:2011.11382*.
- 2020 “Topology of synaptic connectivity constrains neuronal stimulus representation, predicting two complementary coding strategies”, with Michael W. Reimann, Henri Riihimäki, Jānis Lazovskis, Christoph Pokorny, and Ran Levi, preprint at *bioRxiv:2020.11.02.363929v1*.
- 2020 “The poset of mesh patterns”, with Henning Úlfarsson, *Discrete Mathematics*, 343(6).
- 2020 “Computing persistent homology of directed flag complexes”, with Daniel Luetgehetmann, Dejan Govc and Ran Levi, *Algorithms*, 13(1):19.
- 2019 “Permutation graphs and the Abelian sandpile model, tiered trees and non-ambiguous binary trees”, with Mark Dukes, Thomas Selig and Einar Steingrímsson, *The Electronic Journal of Combinatorics*, 26: 3.29.
- 2019 “The poset of graphs ordered by induced containment”, *Journal of Combinatorial Theory, Series A*, 168:348-373.
- 2019 “The Abelian sandpile model on Ferrers graphs – A classification of recurrent configurations”, with Mark Dukes, Thomas Selig and Einar Steingrímsson, *European Journal of Combinatorics*, 81:221-241.
- 2019 “On the Möbius function and topology of general pattern posets”, *The Electronic Journal of Combinatorics*, 26: 1.49.
- 2019 “Modular decomposition of graphs and the distance preserving property”, with Emad Zahedi, *Discrete Applied Mathematics*, 265:192-198.
- 2017 “EW-tableaux, Le-tableaux, tree-like tableaux and the Abelian sandpile model”, with Thomas Selig and Einar Steingrímsson, *The Electronic Journal of Combinatorics*, 25: 3.14.
- 2017 “On distance preserving and sequentially distance preserving graphs”, with Emad Zahedi, preprint at *arXiv:1701.06404*.
- 2017 “A formula for the Möbius function of the permutation poset based on a topological decomposition”, *Advances in Applied Mathematics*, 91:98-114.
- 2016 “Intervals of permutations with a fixed number of descents are shellable”, *Discrete Mathematics*, 339(1):118-126.
- 2014 “On the Möbius function of permutations with one descent”, *The Electronic Journal of Combinatorics*, 21: 2.11.