Nicholas Sale

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Citizenship: British

Address: Computational Foundry, Bay Campus
Swansea University, Wales. SA1 8EN

Research interests	Topological Data Analysis, Data Science, Phase Transitions, Statistical Physics, Lattice Field Theory, Complex Systems, Machine Learning

Education

Swansea University Swansea, UK
PhD in Mathematics Oct 2019 – Present
Supervisors: Prof. Jeff Giansiracusa, Prof. Biagio Lucini
Current Title: Applications of Topological Data Analysis to Statistical Physics
Expected Completion: Autumn 2022

University of Oxford New College, Oxford, UK
MMathCompsci Mathematics & Computer Science Oct 2015 – Jul 2019
Parts A & B: First Class; Part C: First Class

Scholarships

Swansea University Research Excellence Scholarship	2019-2022
Undergradute Scholarship (New College, Oxford)	2016-2019
CyberFirst Bursary (UK Civil Service)	2015-2019
Arkwright Engineering Scholarship (Arkwright Foundation)	2013-2015

Prizes and awards

Swansea University Rowland Wilson Prize for best PhD paper	Jul 2022
SIAM Student Travel Award (to attend SIAM AG21)	Aug 2021
Winner of TopFlavours Gongshow	Jun 2021
2nd place in Welsh Mathematics 3-Minute Thesis Competition	Mar 2021

Publications

Quantitative analysis of phase transitions in two-dimensional XY models using persistent homology
Nicholas Sale, Jeffrey Giansiracusa, Biagio Lucini.
Phys. Rev. E 105, 024121 – Published 14 February 2022

Preprints

Probing center vortices and deconfinement in $SU(2)$ lattice gauge theory with persistent homology
Nicholas Sale, Biagio Lucini, Jeffrey Giansiracusa.
arXiv:2207.13392 – Submitted 27 July 2022

Invited Talks

Applications of topological data analysis to condensed matter and high energy physics May 2022
aQa Seminar, Leiden University

	Detecting vortices with persistent homology	Feb 2022
	UK Centre for TDA, University of Oxford (hybrid)	
	Quantitative analysis of phase transitions in	Sep 2021
	two-dimensional XY models using persistent homology	
	Machine Learning for High Energy Physics, On and Off the Lattice	
	ECT* Trento (hybrid)	
	Persistent homology for phase transitions	Nov 2020
	UK Centre for TDA, University of Oxford (online)	

Contributed Talks	**Detecting vortices with persistent homology**	Jul 2022
	Young Topologists Meeting 2022, Copenhagen University	
	Quantitative analysis of phase transitions in	Aug 2021
	two-dimensional XY models using persistent homology	
	SIAM Conference on Applied Algebraic Geometry 2021 (online)	
	Persistent homology and phase transitions	Jun 2021
	TopFlavours 2021, University of Warwick (online)	

Teaching experience	**Teaching assistant, Department of Mathematics (Swansea University)**	
	MA-282: Game Theory and Optimization	Lent Term 2022
	MA-006: Fundamental Mathematics	Michaelmas Term 2021
	MA-308: Machine Learning	Lent Term 2021
	MA-131: Geometry, Logic, and Communication	Michaelmas Term 2020
	MA-262: Numerical Methods	Lent Term 2020
	MA-121 Methods of Algebra and Calculus	Michaelmas Term 2019

Other Service	**Organiser of Swansea Maths PhD Seminar**	Jun 2021 - Jun 2022
	Co-organised minisymposium for SIAM AG21	Aug 2021
	Invited speakers for and hosted a 7-speaker minisymposium on Persistent Homology for Phase Transitions, co-organised with Quoc Hoan Tran.	
	Assisted with the LMS Undergraduate Summer School	Jul 2021

Research experience	**Applied Research Summer Placement**	
	UK Civil Service	Jul 2018 – Sep 2018
	An 11-week placement researching how machine learning and other data science techniques could be applied to aid my team with data annotation.	
	Applied Research Summer Placement	
	UK Civil Service	Jul 2017 – Sep 2017
	An 11-week placement researching the feasibility of using data science techniques to identify certain types of network devices based on limited information about their traffic.	

Technical skills	**Programming**	
	Python (numpy, scipy, sci-kit learn, pandas), Java, $C^{\sharp}$, C(++), Javascript	
	Cluster Computing	

	New College Boat Club Committee	New College, Oxford
	President	2018-2019
	Secretary	2017-2018
	Lower Boats Captain	2016-2017
	Women's 3rd Boat Coach	2018-2019