Nicholas Sale

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Citizenship: British

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Swansea University, Wales. SA1 8EN

Research interests

Topological Data Analysis, Data Science, Phase Transitions, Statistical Physics, 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

Honors and 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

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

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 two-dimensional XY models using persistent homology — Sep 2021
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

Quantitative analysis of phase transitions in two-dimensional XY models using persistent homology Aug 2021
SIAM Conference on Applied Algebraic Geometry 2021

Persistent Homology and Phase Transitions Jun 2021
TopFlavours, University of Warwick (online), June 18, 2021

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 - Present

Co-organised minisymposium for SIAM AG21 Aug 2021
Invited speakers for a 2-session minisymposium on Persistent Homology for Phase Transitions, co-organised with Quoc Hoan Tran.

Assisted with the LMS Undergraduate Summer School Jul 2021
Spoke to participants about my experience of doing a PhD during coffee breaks throughout the 2 week event hosted by Swansea University.

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

Non-academic positions

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