

Zakhar Shumaylov

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[LinkedIn](#)
[Google Scholar](#)

Education

University of Cambridge

PhD in Mathematics of Information

Thesis: "Structure preserving physics informed neural networks for inverse problems"

Supervised by: Prof Carola-Bibiane Schönlieb

Awarded the *Trinity Henry Barlow Scholarship* (£81,000) at Christs College.

Funded by Christs College Bursary (£15,000) and CCIMI (£50,000).

CAMBRIDGE, UK

2022 – 2026

University of Cambridge

Mathematics BA/MMath (1st Class/Distinction)

Awarded the *Cambridge Trust Scholarship* (£40,000) to read Mathematics at Churchill College.

Courses included: Quantum Field Theory, General Relativity, Statistical Field Theory, Black Holes, Cosmology.

CAMBRIDGE, UK

2018 – 2022

Brighton College

A-Level(5A*) STEP 2,3 (S,S)

BRIGHTON, UK

2016 – 2018

Governor's Physics and Mathematics Lyceum 30

Year 9 - Year 11 (4.53/5)

ST-PETERSBURG, RUSSIA

2013 – 2016

Publications and Preprints

Z. Shumaylov, J. Budd, C. Schönlieb (2023).

Learned weakly convex regularizers in inverse problems.

In prep

I. Shumailov*, **Z. Shumaylov***, Y. Zhao, Y. Gal, N. Papernot, R. Anderson (2023).

The Curse Of Recursion: Generated Data Makes Models Forget.

Under review; arxiv

PUBLICITY: [NEW SCIENTIST](#); [INDEPENDENT](#); [THE ATLANTIC](#); [MIT TECH](#); [FINANCIAL TIMES](#); [NEW YORK TIMES](#); [WALL STREET JOURNAL](#);

M. Letey*, **Z. Shumaylov***, F. Agocs, W. Handley, M. Hobson, A. Lasenby (2022).

Quantum Initial Conditions for Curved Inflating Universes.

Under review; arxiv

Z. Shumaylov, W. Handley (2021).

Primordial power spectra from k -inflation with curvature.

Accepted to Physical Review D (2022); arxiv

I. Shumailov, **Z. Shumaylov**, D. Kazhdan, Y. Zhao, N. Papernot, M. A. Erdogdu, R. Anderson (2021).

Manipulating SGD with data ordering attacks.

Accepted to NeurIPS (2021); arxiv

S. Mukherjee, S. Dittmer, **Z. Shumaylov**, S. Lunz, O. Öktem, C. Schönlieb (2020).

Learned convex regularizers for inverse problems.

Under review; arxiv

Talks and Conferences

ICIAM 2023

Talk on "Learned weakly convex regularizers in inverse problems"

TOKYO, JAPAN

C.I.M.E. School on 'Machine Learning: From Data to Mathematical Understanding'

Received full grant and prepared lecture notes to be published in the **C.I.M.E. Springer series**.

CETRARO, ITALY

Work Experience

GSK

Project collaboration

Project collaboration on 'Self-discovery of mechanistic equations for a data-driven smart simulator' as part of CMI programme with Dr Matthieu Duvinage.

CAMBRIDGE, UK

June 2022 - Aug 2022

University of Cambridge

Supervisor for University of Cambridge Undergraduates

Supervising undergraduate students in a variety of courses.
(2022/2023): Part IA Vectors and Matrices (48h)

CAMBRIDGE, UK

Oct 2022 - Now

Ryff AI

Summer Research Intern

Work under supervision of Dr Mike Roberts. During the internship I worked on the problem of unsupervised video motion segmentation. During the project, I used variational and learned methods from the optical flow literature for foreground-background separation using motion signals.

CAMBRIDGE, UK

July 2022 - Sept 2022

University of Cambridge: Institute of Astronomy

Summer Internship Programme

Work under supervision of Dr Amy Bonsor (IoA): "Gas disk imaging around white dwarves"
During the internship I investigated gas disk light curve imaging around white dwarves, by modelling gas geometry. Funded by the [Institute of Astronomy](#).

CAMBRIDGE, UK

August 2021 - Sept 2021

University of Cambridge: Kavli Institute for Cosmology

Summer Research Intern

Work under supervision of Dr Will Handley (KICC): "Primordial power spectra from k-inflation with curvature"
During the internship I investigated the problem of interplay between inflationary sound speed and primordial curvature using analytical approximations. Funded by the [CMP](#).

CAMBRIDGE, UK

June 2021 - August 2021

University of Cambridge: Department of Applied Mathematics and Theoretical Physics

Summer Research Assistant

Work under supervision of Prof Carola Schonlieb (DAMTP), Prof Ozan Oktem (KTH) and Prof Par Kurlberg (KTH): "3DEM: Representation of atomic models"
During the internship I investigated the problem of protein fitting inside of atomic volumes acquired via cryo electron microscopy. During the project I used learned techniques and variational methods to obtain protein reconstructions. Funded by the [CSRIM](#).

CAMBRIDGE, UK

June 2020 - Sept 2020

University of Cambridge: Department of Applied Mathematics and Theoretical Physics

Summer Research Assistant

Work under supervision of Prof Carola Schonlieb (DAMTP).
During the internship I worked primarily in the field of inverse problems. In particular, I researched how Deep Learning can be used to help solve physics-based inverse imaging problems. This led to a joint work "Learned convex regularizers for inverse problems". Funded by the [CSRIM](#) and the [Tizard Fund](#).

CAMBRIDGE, UK

June 2019 - Sept 2019

Cambridge Coding Academy

Teaching Assistant

Supporting and leading coding sessions of the 'Coding++' course, covering the basics of AI using python and the pygame library.

CAMBRIDGE, UK

July 2018

Brighton College

After-school Teaching Assistant

Tutoring Year 9 - Year 13 students during after-school Mathematics classes.

BRIGHTON, UK

Sept 2017 - June 2018

University Of Sussex

Research Assistant to Professor Madzvamuse

I reviewed and extended the one-dimensional cell model of Shenoy(2016) by modelling cell contractility and strain with partial differential equations in Matlab.

UK

July 2017 - August 2017

Subject Olympiads

British Physics Olympiad Round 2

Gold Award (Top 15).

Invited to the University of Oxford Training Camp to compete for a spot on the UK IPhO team.

UK, 2018

British Astronomy and Astrophysics Olympiad

Gold Award.

UK, 2018

British Physics Olympiad Round I

Gold Award (Top 50).

UK, 2017

British Mathematics Olympiad Round I

Certificate of Distinction.

UK, 2017

AS Physics Challenge

Gold Award.

UK, 2017

British Physics Olympiad Round I

Gold Award.

UK, 2016

Senior Mathematics Challenge

Gold Award (100%).

UK, 2016

School Mathematics Olympiad

Winner of the inter-school team challenge.

RUSSIA, 2016

Russian Computer Science Olympiad

Winner of the district challenge.

RUSSIA, 2015

Russian Physics Olympiad

Winner of the district challenge.

RUSSIA, 2015

Positions of Responsibility

Cambridge AI Safety Fellowship	CAMBRIDGE AI SAFETY HUB
8-week reading and discussion group on fundamentals of AI safety.	
Treasurer and Membership officer	CAMBRIDGE UNIVERSITY ASTRONOMICAL SOCIETY
Keeping proper accounts of the income and expenditure of the Society.	
Deputy Head of School House	BRIGHTON COLLEGE
Coordinating and overseeing the House Prefects, attending and ensuring smooth running of House events.	
Founder and President of Brighton College STEM Society	BRIGHTON COLLEGE
Promoting an active interest in natural sciences, technology, engineering and mathematics at Brighton College.	
Leader of the House Chess Team	BRIGHTON COLLEGE
I have been practicing chess for 7 years and became a part of the House Chess Team.	

Awards

C.I.M.E. full grant	ITALY, 2023
Awarded 1,000 € grant to attend the C.I.M.E. School 'Machine Learning: From Data to Mathematical Understanding'.	
Trinity Henry Barlow Scholarship	UK, 2022
Awarded £81,000 scholarship to pursue PhD in Mathematics of Information at University of Cambridge.	
Cambridge Christs Bursary	UK, 2022
Awarded £15,000 to pursue PhD in Mathematics of Information at University of Cambridge.	
CCIMI	UK, 2022
Awarded £50,000 to pursue PhD in Mathematics of Information at University of Cambridge.	
Churchill College Prize Scholarship	UK, 2021
Awarded £120 in recognition of excellent academic performance.	
Churchill College Honorary Scholarship	UK, 2020
Awarded £100 in recognition of excellent academic performance.	
Churchill College Prize Scholarship	UK, 2019
Awarded £120 in recognition of excellent academic performance.	
Cambridge Trust Scholarship	UK, 2018
Awarded £40,000 to read Mathematics at University of Cambridge.	
Brighton College Governors Award for Independent Study	UK, 2018
Awarded £500 for a piece of work outside of the A-Level curriculum.	
Brighton College Physics Prize: Bayliss-Smith prize	UK, 2018
Prize to recognise sustained excellence and scientific endeavor.	
Brighton College Science Essay Competition 2018	UK, 2018
Winning essay: "The Tale of Cell Modelling".	
Brighton College Science Prize: Newton's Cup	UK, 2017
Prize to recognise sustained excellence and scientific endeavor.	
Brighton College Science Essay Competition 2017	UK, 2017
Winning essay: "Brief History of Exoplanets".	

Skills

Programming languages: Python . C

Software packages: pyTorch . odl . Matlab . Maple . Mathematica . LaTeX

OS & computing: Linux, MacOS, unix, bash, slurm, HPC, vim

Languages: Russian (*native*), English (*full professional proficiency*)