

# Zakhar Shumaylov

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

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## Education

[University of Cambridge](#)

**PhD in Mathematics of Information**

CAMBRIDGE, UK  
2022 – 2026

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).

[University of Cambridge](#)

**Mathematics BA/MMath (1st Class/Distinction)**

CAMBRIDGE, UK  
2018 – 2022

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.

[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

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## 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](#)*

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](#)*

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## Talks and Conferences

[ICIAM 2023](#)

TOKYO, JAPAN

Talk on "Learned weakly convex regularizers in inverse problems"

[C.I.M.E. School on 'Machine Learning: From Data to Mathematical Understanding'](#)

CETRARO, ITALY

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

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## Work Experience

[University of Cambridge](#)

**Supervisor for University of Cambridge Undergraduates**

CAMBRIDGE, UK  
Oct 2022 - Now

Supervising undergraduate students in a variety of courses.

(2022/2023): Part IA Vectors and Matrices (48h)

[Ryff AI](#)

**Summer Research Intern**

CAMBRIDGE, UK  
July 2022 - Sept 2022

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.

## University of Cambridge: Institute of Astronomy

### Summer Internship Programme

CAMBRIDGE, UK  
August 2021 - Sept 2021

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.

## University of Cambridge: Kavli Institute for Cosmology

### Summer Research Intern

CAMBRIDGE, UK  
June 2021 - August 2021

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.

## University of Cambridge: Department of Applied Mathematics and Theoretical Physics

### Summer Research Assistant

CAMBRIDGE, UK  
June 2020 - Sept 2020

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.

## University of Cambridge: Department of Applied Mathematics and Theoretical Physics

### Summer Research Assistant

CAMBRIDGE, UK  
June 2019 - Sept 2019

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 Coding Academy

### Teaching Assistant

CAMBRIDGE, UK  
July 2018

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

## Brighton College

### After-school Teaching Assistant

BRIGHTON, UK  
Sept 2017 - June 2018

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

## University Of Sussex

### Research Assistant to Professor Madzvamuse

UK  
July 2017 - August 2017

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

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## Subject Olympiads

British Physics Olympiad Round 2	UK, 2018
Gold Award (Top 15).	
Invited to the University of Oxford Training Camp to compete for a spot on the UK IPhO team.	
British Astronomy and Astrophysics Olympiad	UK, 2018
Gold Award.	
British Physics Olympiad Round I	UK, 2017
Gold Award (Top 50).	
British Mathematics Olympiad Round I	UK, 2017
Certificate of Distinction.	
AS Physics Challenge	UK, 2017
Gold Award.	
British Physics Olympiad Round I	UK, 2016
Gold Award.	
Senior Mathematics Challenge	UK, 2016
Gold Award (100%).	
School Mathematics Olympiad	RUSSIA, 2016
Winner of the inter-school team challenge.	
Russian Computer Science Olympiad	RUSSIA, 2015
Winner of the district challenge.	
Russian Physics Olympiad	RUSSIA, 2015
Winner of the district challenge.	
Russian Computer Science Olympiad	RUSSIA, 2014
Winner of the district challenge.	

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## 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.	

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## 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".	

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## 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*)