

Institute of Computing for Climate Science

Inaugural Summer School 2022

Department of Applied Mathematics and Computer Science
19th – 23rd September 2022



UNIVERSITY OF
CAMBRIDGE

**Institute of Computing
for Climate Science**

Contents

1	Introduction	2
2	Programme and Abstracts	3
3	Participants (in-person)	10

1 Introduction

The Institute of Computing for Climate Science was founded to support the role of software engineering, computer science, artificial intelligence, and data science within climate science.

A big part of our immediate mission is to support the science teams comprising the Virtual Earth Systems Research Institute, providing research software engineering support to their scientific goals. We are pleased to welcome many from these groups to the summer school. Our goal is then to feed this work into wider research on how the latest computer science, data science, and mathematics research can be brought to bear in advancing the state-of-the-art in climate science.

This inaugural summer school focuses on core best practices in software engineering to support the development of models which are sustainable, in the sense that they will maintain their scientific value for longer, being more easily maintained, extended, and reused.

We hope that this summer school will help propel us all forward in applying software engineering best practices to advance the field. We gratefully acknowledge the support of Schmidt Futures in funding the institute and supporting the summer school.

The ICCS leadership:

Emily Shuckburgh

Cambridge Zero

Colm-cille Caulfield

*Department of Applied Mathematics
and Theoretical Physics*

Chris Edsall

University Information Services

Marla Fuchs

*Institute of Computing for Climate
Science*

Dominic Orchard

*Department of Computer Science
and Technology*

2 Programme and Abstracts

Logistics information and any programme updates can be found at:

<https://cambridge-iccs.github.io/summerschool.html>

Due to funeral of Her Majesty Queen Elizabeth II, we had to make last minute re-arrangements to the schedule, hence the quiet day on Monday.

Monday 19th September

12:30 - 14:00 Lunch in Jesus College

19:00 - Welcome dinner at Six Cambridge

Tuesday 20th September

09:00 - 09:30 Welcome and Introduction
ICCS directors and RSEs

09:30 - 10:30 WORKSHOP: Using Git and GitHub effectively
Dominic Orchard, ICCS

10:30 - 11:00 Tea

11:00 - 11:30 WORKSHOP: Follow-up to using Git and GitHub effectively
Dominic Orchard, ICCS

11:30 - 12:30 KEYNOTE: Bringing Scale and Trust to Carbon Credits Through Computer Science
S. Keshav, University of Cambridge

Carbon credits—especially those derived from nature-based solutions such as reforestation or averted deforestation—are deservedly viewed as being untrustworthy and their use by airlines and oil companies a barely-concealed form of greenwashing. In this talk, I will present a solution to these issues that leverages advances in earth observation, AI, cloud storage, and blockchain. This solution is being prototyped by the Cambridge Center for Carbon Credits (<https://4c.cst.cam.ac.uk>) and I will discuss the current status and our vision for the future.

12:30 - 13:30 Lunch

13:30 - 14:20 SCIENCE TALK: Multi-scale sea ice and ocean modeling.
Why and why now?

Chris Horvat, Brown University (SASIP)

Significant changes to Earth's climate are most prominent in the polar regions — especially in the Arctic, where surface temperatures have risen by up to 3x the global mean. In turn, the decline of Arctic sea ice, land ice, and permafrost has ushered in a new status quo for local food webs, peoples, and climate. New under-ice ecosystems and chemical exchange, alterations to transportation and ways of living, and disrupted atmospheric and oceanic variability are all features of the emergent "New Arctic." In spite (perhaps because) of this, climate models have repeatedly failed to capture these changes, so doubts loom over whether forecasts of Arctic and Antarctic change can be relied upon in the future. Here I'll discuss several newly observed features of the Arctic coupled system and how many are driven by a similar quality: the fragmented and fractal nature of the Arctic sea ice cover, which contemporary modeling frameworks largely ignore. I'll discuss efforts through the Scale Aware Sea Ice Project to observe, diagnose and rectify problems associated with the incorrect treatment of Arctic sea ice. These are led by (1) improved resolved-scale modeling of fragmented sea ice through the neXtSIM sea ice model, (2) new scale-aware parameterizations of ocean turbulence, waves, and air-sea exchange that drive polar change in climate models, and (3) new observations of sea ice and ocean variability for assimilating into cutting-edge forecast models.

14:20 - 15:00 WORKSHOP: Bridging Fortran and Python for ML
Athena Elafrou and Simon Clifford, ICCS

15:00 - 15:30 Tea break

15:30 - 17:00 WORKSHOP: Testing
Chris Edsall, ICCS

17:00 - 17:40 SHORT SCIENCE TALKS:

ML-based emulators of sea-ice models
Charlotte Durand, École des Ponts

Sensitivity Analysis and Machine Learning of a Sea Ice
Melt Pond Parametrisation
Simon Driscoll, University of Reading

- 17:45-18:30 Taxis to dinner
18:30-21:30 Drinks and dinner at Madingley Hall

Wednesday 21st September

- 09:00 - 10:30 WORKSHOP: Continuous Integration and GitHub actions
Ben Orchard, ICCS
- 10:30 - 11:00 Tea
- 11:00 - 11:30 SCIENCE TALK: Relationships between resprouting and fire regimes
Yicheng Shen, University of Reading (LEMONTREE)

Resprouting is a resilience trait that allows individuals to regenerate rapidly following fire. It has profound effects on the speed of post-fire ecosystem recovery and therefore on water- and energy-exchanges with the atmosphere and the carbon cycle. However, the ability to resprout requires investing in carbon storage. Balancing the benefits of rapid recovery of photosynthesis against the costs of carbon storage implies that resprouting is an optimal behaviour in environments where fire is neither too frequent nor too infrequent. Although there is anecdotal support for this assertion, there has been little quantitative investigation of the types of fire regime where resprouting is an optimal strategy. In this study, we use data on the abundance of woody species in Europe and Australia derived from the sPlotOpen database combined with information on whether the species present can resprout or not, derived from regional and global plant trait databases and field information, to examine how changes in the abundance of resprouting species varies with fire return interval and with fire intensity. We show that the proportion of resprouting species decreases as fire return intervals increase, while the abundance of resprouters is maximal at intermediate levels of fire intensity. This work suggests that it should be possible to model the occurrence and abundance of resprouting using an eco-evolutionary optimality approach based on balancing the costs and benefits of resprouting under different fire regimes.

11:30 - 12:30 SCIENCE TALK: Towards an improved understanding and representation of atmospheric gravity waves
Aditi Sheshadri, Stanford University (DataWave)

Atmospheric gravity waves (GWs) are ubiquitously excited on the Earth and are critical drivers of the atmospheric circulation, however, they present a challenge to climate prediction: waves on scales of 102-105m can neither be systematically measured with conventional observational systems, nor properly resolved in atmospheric models. I will describe recent work in my group aimed at understanding the effects of gravity waves on climate variability and improving their representation in GCMs. a) We have leveraged high-resolution data from balloon flights launched by Loon LLC, originally deployed for internet access. The opportunistic Loon dataset, though not from a scientific campaign, gives us access to thousands of balloon flights with measurements of position, pressure, and temperature from which we have inferred statistics of gravity wave motions in the lower stratosphere. b) We have developed a machine learning GW parameterization, coupled it to a global climate model, showed that it is stable and accurate when run online, and that it reproduces features of the climate that depend critically on GWs. c) I will describe recent results with regard to calibration and uncertainty quantification of a popular gravity wave parameterization.

12:30 - 13:30 Lunch

13:30 - 15:00 WORKSHOP: Automating forward and inverse geoscientific simulation in Firedrake.

David Ham, Imperial College London

Creating simulations of continuous systems, such as the ocean, atmosphere, or cryosphere, usually involves numerically solving partial differential equations. Creating these numerical solvers is a complex task that requires the composition of the right differential equation with suitable discretisations, parametrisations, solvers and preconditioners. In addition, many geoscientific simulation challenges are inverse problems which require the numerical solution of the adjoint PDE. Combine all of this with increasingly sophisticated parallel computing systems and creating geoscientific solutions becomes complex, labour-intensive and error-prone. Here I will present a radically different alternative.

The Firedrake system allows model developers to express the simulation they wish to conduct in a high-level mathematical language embedded in Python. High performance parallel implementations are automatically generated and the solution returned. Parallelisation and the evaluation of adjoint simulations are fully automated. Here I will present a short overview of the Firedrake system before we move on to a practical hands-on demonstration using Jupyter notebooks in the cloud. Participants should bring their laptops and be ready to participate. No software installation will be required.

- 15:00 - 15:30 Tea
- 16:30 - 17:30 Punting outing
- 19:00 - 22:00 Banquet at Sidney Sussex College

Thursday 22nd September

- 07:00 *Optional - 5k guided run along the river in Cambridge, starting from Jesus College. 25-30 minute pace with Dominic, and a leisurely 45+ minute pace with Marla for non-runners. Meet at Jesus College porters lodge.*
- 09:00 - 10:30 WORKSHOP: Training ML models
Will Handley, University of Cambridge
- 10:30 - 11:00 Tea
- 11:00 - 11:30 WORKSHOP: Questions and followup to Training ML models
Will Handley, University of Cambridge
- 11:30 - 12:30 SCIENCE TALK: Exploring parallel programming in Julia
Valentin Churavy, MIT (CliMA)

Parallel programming is required to solve large scale computational models in climate science. In this session we will explore the fundamentals of parallel programming with MPI and GPU, as well as performance engineering in Julia. The goal is to provide an intuition of what approaches for parallelism are out there and how one could apply them in their own work. We will use the Julia programming language to explore these concepts, but no prior knowledge of it is required.

- 12:30 - 13:30 Lunch
- 13:30 - 14:10 SHORT SCIENCE TALKS
- 14:10 - 15:00 SCIENCE TALK: Software and Infrastructure for Data-Intensive Climate Science
Ryan Abernathey, Columbia University (M²LInES)

Physics-informed machine learning for climate modeling is data-intensive; before any ML can begin, many terabytes of observational or model data often must be processed in order to prepare appropriate training data. Performing this work and effectively sharing data and code in a large, collaborative project is challenging. In this talk, I will give an overview of different open-source software and data infrastructure components used in the M2LInES project and the broader Pangeo community, including xarray, zarr, xgcm, xbatcher, Pangeo Forge, commercial cloud computing, and Open Storage Network. I will conclude with a future vision for a decentralized data platform for collaborative data-intensive science.

- 15:00 - 15:30 Tea
- 15:30 - 17:00 WORKSHOP: Pairing and code review
Ben Orchard and Dominic Orchard, ICCS
- 17:00 - 17:30 Hackathon pitches and introduction

Friday 23rd September

The Hackathon will take place in the Intel Laboratory at the William Gates Building (Department of Computer Science and Technology), where we will also be joined by PhD students from the doctoral training center in Artificial Intelligence for the study of Environment Risks.

- 09:00 - 10:30 Hackathon group work
- 10:30 - 11:00 Tea
- 11:00 - 12:30 Hackathon group work
- 12:30 - 13:30 Lunch
- 13:30 - 15:00 Hackathon group work

15:00 - 15:30 Tea

15:30 - 16:00 Finishing up and preparing short presentation

16:00 - 17:00 Group presentations

17:00 - 17:15 Short break

17:15 - 17:30 Prize giving and closing remarks

17:30 - 19:00 Refreshments

3 Participants (in-person)

Aaron Wienkers



PhD Student, DAMTP, University of Cambridge

Aaron Wienkers is a PhD Student in the Department of Applied Mathematics & Theoretical Physics (DAMTP) at the University of Cambridge — Trinity College. Before coming to Cambridge, he was a Graduate Research Fellow in Flow Physics & Computational Engineering at Stanford University. His work develops the theoretical underpinnings for complex dynamical processes in geophysical and astrophysical fluid dynamics aided by numerical modelling.

Aditi Sheshadri



Assistant Professor, Stanford University

Dr. Sheshadri is the Coordinating PI of DataWave. She joined Stanford's Earth System Science department as an assistant professor 2018. Prior to this, she was a Junior Fellow of the Simons Foundation in New York, and a postdoctoral research scientist at Columbia University's Department of Applied Physics and Applied Math and the Lamont-Doherty Earth Observatory. Dr. Sheshadri holds Ph.D. in Atmospheric Science from MIT's Department of Earth, Atmospheric, and Planetary Sciences, in the Program for Atmospheres, Oceans, and Climate, where she worked with R. Alan Plumb. Dr. Sheshadri is broadly interested in atmosphere and ocean dynamics, climate variability, and general circulation. More particularly, she is interested in fundamental questions in atmospheric dynamics, which she addresses using a combination of theory, observations, and both idealized and comprehensive numerical experiments. Current areas of focus include the dynamics, variability, and change of the mid-latitude jets and storm tracks and the stratospheric polar vortex.

Alexander Smith

Software Engineer, The MathWorks (ICCS Guest)

(Candidate) Research Software Engineer ICCS, Software Engineer at The MathWorks, PhD in Computational Physics studying organic solar cell structure and charge transport.

Anna Lo Piccolo



Athena Elafrou



Aurélie Albert



Graduate Student, Brown University

Anna is a graduate student at Brown University supervised by Chris Hovart and Baylor Fox-Kemper. She has a Masters from the University of Bologna, Italy, supervised by Nadia Pinardi. At Brown she has been working together with Baylor and Chris on sea ice-ocean interactions at ice edges and leads and their parameterization.

HPC Consultant, University Information Services and ICCS

Athena Elafrou is an HPC Consultant at the Research Computing Services (RCS) of the University of Cambridge. Her expertise lies in the area of high-performance computing and her research interests revolve around parallel computer architecture, algorithm design and programming models with the aim to efficiently map applications on current and future heterogeneous computing systems.

Research Engineer, CNRS/IGE

Aurélie Albert, PhD, is currently in charge of the distribution of high-resolution simulations of the ocean, fine scales analysis and big data management and solutions. She has a background in Environmental Sciences from Ecole Nationale Supérieure des Techniques Avancées. She graduated in 2011 with a PhD in physical and biogeochemical oceanography from Université Pierre et Marie Curie, Paris VI. Aurélie Albert is a research engineer in the oceanography research team (MEOM) of the Institute of Geosciences and Environment (IGE) in Grenoble. This team promotes an integrated data-driven approach to computational oceanography that combines ocean modeling, geophysical fluid dynamics and satellite/in-situ observations. Aurélie is a specialist in high resolution modeling of ocean and sea-ice and develops methods and workflows suited to 'big' scientific data that come with the production and analysis of frontier simulations.

Ben Orchard



Research Assistant, University of Kent and ICCS RSE

Language fanatic (Haskell & Japanese) working on modern Fortran tools: Haskell fanatic working on modern Fortran static analysis tooling CamFort and staggered grids Python package xGCM, interested in compilers and Japanese.

Cecilia Bitz



Professor, University of Washington

Dr. Cecilia Bitz is a Professor of the Atmospheric Sciences Department and faculty in the Program on Climate Change, both at the University of Washington. Dr. Bitz has a research focus on polar climate change. She is an expert on climate prediction and works with models and observations of the earth system. She uses a variety of models for her research, from simple reduced models to sophisticated earth-system models. Cecilia's group has recently written papers about Arctic sea ice predictability, extreme sea ice loss at both poles, sea ice data assimilation, and polar amplification. She has testified before the U.S. Senate Energy and Natural Resources Committee on Arctic climate change, and she was a Fulbright Senior Scholar to New Zealand, during which time she did fieldwork in Antarctica. Dr. Cecilia Bitz is a Professor of the Atmospheric Sciences Department and faculty in the Program on Climate Change, both at the University of Washington. Dr. Bitz has a research focus on polar climate change. She is an expert on climate prediction and works with models and observations of the earth system. She uses a variety of models for her research, from simple reduced models to sophisticated earth-system models. Cecilia's group has recently written papers about Arctic sea ice predictability, extreme sea ice loss at both poles, sea ice data assimilation, and polar amplification. She has testified before the U.S. Senate Energy and Natural Resources Committee on Arctic climate change, and she was a Fulbright Senior Scholar to New Zealand, during which time she did fieldwork in Antarctica.

Charlotte Durand



PhD, CEREA Ecole des Ponts

Charlotte Durand is a second year engineering PhD student at École des Ponts studying Deep Learning, Data assimilation, and sea-ice dynamics. Charlotte Durand is a second year engineering PhD student at École des Ponts studying Deep Learning, Data assimilation, and sea-ice dynamics

Christopher Edsall



Head of Research Software Engineering, University of Cambridge

Christopher Edsall is a co-director of the Institute of Computing for Climate Science. He is also the Head of Research Software Engineering at RCS. He leads the team of research software engineers and HPC consultants with the goal of better software enabling better research. Christopher studied physics at the University of Canterbury and then worked in several research institutions in New Zealand (NIWA) and the UK (National Oceanography Centre and the University of Bristol) administering their HPC systems and upskilling researchers in software engineering to make best use of the supercomputing facilities.

Christopher Horvat



Senior Lecturer, Auckland University

Chris Horvat is a Senior Lecturer in Physics at the University of Auckland, and a Visiting Assistant Professor at Brown University. Between the two, he leads an exciting and nearly-antipodal group of polar oceanographers. Dr. Horvat studies connections between Earth's climate, oceans, sea ice, and life across physical scales.

Colm-cille Caulfield

Professor, DAMTP, University of Cambridge



Colm-cille P. Caulfield is Professor of Environmental and Industrial Fluid Dynamics and Head of the Department of Applied Mathematics and Theoretical Physics (DAMTP), University of Cambridge. He is co-director of the Institute of Computing for Climate Science. He is a Professorial Fellow of Mathematics in Churchill College, and an Adjunct Professor of Mechanics at Zhejiang University in Hangzhou, China. In 2014, he was elected as a Fellow of the American Physical Society, Division of Fluid Dynamics, and is Editor of the Journal of Fluid Mechanics, published by Cambridge University Press. His research focuses on (trying to) understand turbulence and mixing in environmentally and industrially relevant flows, particularly where buoyancy forces play a key dynamical role. Important examples include heat transport in the world's oceans, the dynamics of volcanic plumes, and the design of building interiors to minimise energy use while maintaining comfort and safety. More recently, he has become interested in addressing research problems relevant to the modelling of our rapidly changing climate using a twin-pronged approach of physics-informed and data-driven methods in combination.

Dang Toai Phan

PhD student, Laboratoire Jacques-Louis Lions

Daniel Lee

Program Scientist, Schmidt Futures



Daniel A. Lee is a Program Scientist at Schmidt Futures. In this role, he shares broad responsibility for leading, developing, and managing innovative research programs, technologies, and people to address pressing issues and advance cutting-edge science. Dan is an interdisciplinary scientist with 20 years of experience investigating the biological mechanisms underlying physiology, behavior, and neurodevelopment.

He has a record of leading high-impact research with publications in the journals *Nature Neuroscience*, *Neuron*, *Advanced Materials*, *eLife*, *Science Advances*, and the *Proceedings of the National Academies of Science*. His research has been recognized through several awards including the NIH K99/R00 Pathway to Independence Award, NARSAD Young Investigator Award, and the Sleep Research Society Outstanding Early Investigator Award. Prior to Schmidt Futures, he was a Senior Research Associate at the California Institute of Technology, co-founded and led several not-for-profit groups, and served as a Board Member for the Wiseburn Education Foundation, and the Diversity Leadership Council at the Johns Hopkins University.

Dan holds a B.A. in Molecular and Cell Biology from the University of California, Berkeley, a Ph.D. in Neuroscience from the Johns Hopkins School of Medicine and completed his postdoctoral fellowship in Behavioral Genetics at the California Institute of Technology.

Daoping Wang



Research Fellow, University of Cambridge

Dr Daoping Wang is a research fellow at the Department of Computer Science and Technology, University of Cambridge. Before joining Cambridge, Daoping received his PhD in Economics from the Shanghai University of Finance and Economics in 2022. His main fields of scientific interest include the economics of disasters and risk management; the complex interactions of climate change, global economic networks, and sustainable development; climate change and human behavior. His current research focuses on modeling the propagation of negative shocks on global supply-chain networks.

Dominic Orchard



Department of Computer Science and Technology,
University of Cambridge

Dr Dominic Orchard is Co-Director of ICCS with responsibility for the computer science and software engineering vision of the project. He is based at the Department of Computer Science and Technology, University of Cambridge but also works in the Programming Languages and Systems Group at the University of Kent. His work in programming languages focusses on correctness and expressibility.

He has over a decade of experience in crossing the chasm from computer science to scientific computing, including his EPSRC-funded “CamFort” project at Cambridge which developed lightweight bug-finding tools working with scientists using Fortran. He is a Fellow of the Software Sustainability Institute through which he maintains cross-disciplinary links with the UK’s growing RSE community.

Ellen Buckley



Postdoc, Brown University

Ellen is a PhD candidate in Atmospheric and Oceanic Science at the University of Maryland. Ellen is studying remote sensing of Arctic sea ice and is particularly interested in summer melt.

Emily Shuckburgh



Director of ICCS and Cambridge Zero, University of Cambridge

Professor Emily Shuckburgh OBE is Professor in Environmental Data Science at the Department of Computer Science and Technology. She is a mathematician and climate scientist, a Fellow of Darwin College, and a Fellow of the Cambridge Institute for Sustainability Leadership. She is an Associate Fellow of the Centre for Science and Policy and a Fellow of the British Antarctic Survey.

At the University of Cambridge Emily is Director of the UKRI Centre for Doctoral Training on the Application of AI to the study of Environmental Risks (AI4ER), Academic Director of the Institute of Computing for Climate Science, and co-Director of the Centre for Landscape Regeneration. She worked for more than a decade at the British Antarctic Survey where her work included leading a UK national research programme on the Southern Ocean and its role in climate. Prior to that she undertook research at École Normale Supérieure in Paris and at MIT. She has also acted as an advisor on climate to the UK Government in various capacities. In 2016 Emily was awarded an OBE for services to science and the public communication of science. She is co-author with HRH The Prince of Wales and Tony Juniper of the Ladybird Book on Climate Change.

Ira Shokar



PhD Student, DAMTP/AI4ER CDT, University of Cambridge

My research is currently focused on using Machine Learning to determine the predictive nature of fluid flows, specifically investigating the Beta-Plane System - an idealised model analogous to the tropospheric mid-latitudinal regions of our atmosphere, that govern jet streams.

Machine Learning is being used to learn the dynamics of the system in order to produce a forecast or long-term emulation that is able to dramatically reduce the associated computational cost when compared to numerical integration. We explore obtaining this Reduced Order Model by utilising the inertial manifold that the system lies on with machine learning, however, the Beta-Plane System is a stochastically forced system with a non-stationary manifold, so generative models will be used.

Ivo Pasmans

Postdoctoral Research Assistant, University of Reading



Jack Atkinson



RSE/Researcher, ICCS, University of Cambridge

Jack currently works at the British Antarctic Survey as a radiation belt scientist. Jack studied for a PhD in the Engineering Department at Cambridge University where he investigated thermals and tropical cyclones and then in the Geography Department studying volcanic plumes. Jack's main interests are in geophysical fluid mechanics, specifically of the atmosphere and space.

Jacob Petersen



Manager, Community, Schmidt Futures

Jacob Petersen is a Manager of Community at Schmidt Futures. In this role, he designs and implements convenings and community strategy across all programs and initiatives at Schmidt Futures, focusing closely on Talent Ventures. Previously, Jacob's career has spanned more than 10 years in events and philanthropy, with a focus on the environmental nonprofit sector. He came to Schmidt Futures from Ocean Conservancy where he was head of events leading all aspects of their fundraising and programmatic convenings, while also managing a portfolio of individual major donors and corporate partnerships. Prior to that, Jacob worked as the director of special events for the Prevent Cancer Foundation, leading large scale fundraisers including one of Washington, D.C.'s top galas. Jacob began his events and philanthropy career at the California Science Center and later spent 4 years at the Jane Goodall Institute as a liaison, supporting the day-to-day activities of famed conservationist Dr. Jane Goodall, DBE including planning her worldwide lecture tour. Jacob holds a B.S. in Environment Science and Management from the University of Maryland.

Jia He



Research Scientist, CliMA/Caltech

Jia He is a research scientist at Caltech working with CliMA group. Jia earned her PhD in Atmospheric Science from Georgia Tech in 2017 and joined Clima In 2019.

Joseph
Ovwemuvwose



PhD Student, Imperial College London

Joseph Ovwemuvwose is a PhD Student at Imperial College London, working under the guidance of Dr. Heather Graven and Professor Colin Prentice. His PhD work is focused on developing models to simulate and evaluate carbon exchanges in comparison to atmospheric CO₂ and isotope data to study water use efficiency, carbon turnover and other ecophysiological processes. Joseph's previous research experience involved developing portable nuclear magnetic resonance (NMR) device for the measurement of water use efficiency and carbon allocation at the institut de recherche pour le développement (IRD) and the Université de Montpellier in France.

Kacper Kornet



Senior Research Software Engineer, University of Cambridge

Kacper Kornet is a Research Software Engineer at Research Computing Services, University of Cambridge and in the Cambridge Open Zettascale Lab.

Kenza Tazi



PhD Candidate, University of Cambridge

Kenza is a PhD candidate at the University of Cambridge in the 'AI for Environmental Risk' doctoral program. Kenza is jointly based at the Department of Engineering and the British Antarctic Survey. Kenza's research focuses on improving predictions of precipitation over mountainous areas. Through this project and others, she is interested in communicating scientific results to policymakers in order to make evidence-based decisions in the face of climate change.

Leyu Yao

PhD student, University of Cambridge

Mala Virdee



PhD student, University of Cambridge

Mala Virdee is a PhD Student at the University of Cambridge with the AI4ER Centre for Doctoral Training. Her research uses probabilistic machine learning tools to study risk from future climate extremes.

Marla Fuchs



Executive Programme Director,
Institute of Computing for Climate Science,
University of Cambridge

Marla Fuchs has joined the Institute of Computing for Climate Science (ICCS) as the Executive Programme Director, based in the Department of Applied Mathematics and Theoretical Physics within the University of Cambridge. Marla studied mechanical engineering at Rensselaer, in New York and went on to complete an MPhil in Engineering for Sustainable Development at the University of Cambridge. She has worked in a variety of industries including nuclear fuels, inkjet technology, and carbon consultancy. She has been leading international programmes within higher education for the last 10 years with a focus on sustainability.

Martin Brolly



PhD Candidate, University of Edinburgh

Martin is a final year PhD student in the School of Mathematics at the University of Edinburgh. He works with Jacques Vanneste on inference problems in fluid dynamics, particularly in ocean turbulence.

Momme Hell



Postdoctoral Research Associate, Brown University

Momme is a PostDoc at the Institute at Brown for Environment and Society with Chris Horvat and Baylor Fox-Kemper and was a postdoc with Nick Lutsko at Scripps Institution of Oceanography (SIO). Momme graduated from SIO in November 2020 in Physical Oceanography under the supervision of Arthur "Art" Miller, Sarah Gille, and Bruce Cornuelle. Before that, Momme studied at GEOMAR in Kiel (2009-2012) and ETH Zurich (2013-2015) Atmosphere, Ocean, and Climate.

Momme's interest spans from climate variability and large-scale dynamics to air-sea-interaction, surface waves, and sea ice. His research focuses on the Southern Ocean surface and air-sea interaction on many scales. Momme combines Geophysical Fluid Dynamics, physically-constrained optimization, and idealized models to reveal fast and intermittent air-sea interaction under storms in mid-to-high latitudes.

Nolan Reilly

Graduate student, New York University / Courant Institute



Olivier Narinc

PhD candidate, IGE/MEOM

Olivier Narinc is PhD student working with the Multi-scalE Ocean Modelling (MEOM) research group at Institut des Géosciences de l'Environnement (IGE).

Rafael Santana



Postdoc, The University of Auckland

Rafael Santana is a physical oceanographer with expertise in the dynamics of coastal, sub- and mesoscale ocean variability. Rafael's focus is on improving our understanding of ocean dynamics using observations, numerical modelling, and data assimilation. Currently, Rafael is a research fellow at The University of Auckland working on the Scale-Aware Sea Ice Project (SASIP). At SASIP, Rafael's research targets at understanding ocean-ice interactions in the Antarctic ocean using the sea-ice model neXtSIM.

Samuel Brenner



Postdoctoral Researcher, Brown University

Samuel Brenner is a postdoc at Brown University, working under the supervision of Chris Horvat. He is studying the interactions of sea ice with the upper ocean as part of the Antipodal Oceanography Group. He earned his PhD in 2022 from the School of Oceanography and the Applied Physics Lab at the University of Washington under the joint supervision of Luc Rainville and Jim Thomson. Previous to that, he completed a Master's of Applied Science degree (MSc) in Civil Engineering at the University of British Columbia in 2017, where he worked with Bernard Laval.

Simon Clifford



Research Software Engineer, University of Cambridge

Simon is a Research Software Engineer at the University of Cambridge. Prior to that, Simon was an HPC System Support Analyst at Imperial College London where his time was divided between Research Computing support and Research Software Engineering. Simon holds a PhD from King's College London in Computational Chemistry and was a Postdoctoral Researcher at Yale, Queen Mary University of London, and University College London.

Simon Driscoll



PhD Researcher, University of Reading

Researching machine learning and emulation for climate modelling with a particular focus on Arctic Sea Ice models. Researching machine learning and emulation for climate modelling with a particular focus on Arctic Sea Ice models.

Sophie Turner



PhD student, AI4ER, University of Cambridge

AI4ER student

Valentin Churavy



Research Assistant/PhD Student, MIT

Valentin is a Computer Science PhD student at MIT and a Member of the JuliaLab in the Computer Science and Artificial Intelligence Laboratory (CSAIL). Valentin earned a Bachelor of Science in Cognitive Science from the University of Osnabrück.

Will Handley

Royal Society University Research Fellow, University of Cambridge



Yihua Luo

Student, University of Cambridge



Institute of Computing for Climate Science, 2022
University of Cambridge