

The 12th International Conference on Climate Informatics

Programme Handbook

Trinity Hall, Cambridge, UK

19th — 21st April 2023



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Welcome

Dear Colleagues,

Welcome to Cambridge! On behalf of the entire organising team, we're delighted you've joined us here at Trinity Hall, one of the oldest Colleges of the University of Cambridge.

For over a decade, the Climate Informatics Conference has brought together researchers and users across different disciplines and sectors to forge international collaboration between climate science, data science, and computer science; share state-of-art developments in climate data and informatics; and accelerate the rate of discovery in climate science and adaptation of climate applications. We're proud to continue that tradition this year in Cambridge, a vibrant, modern city with a colourful history. We hope you will be able to enjoy much of what Cambridge has to offer this week.

We are personally very proud of the technical programme that our programme committee has assembled this year, which includes two world-renowned keynote speakers and an array of technical sessions and panel discussions that represent the wide breadth of climate informatics, to an online reproducibility challenge that aims to build community, facilitate collaboration, and advance open science.

We are pleased to partner again with the Environmental Data Science journal, published by the Cambridge University Press, to allow consideration of accepted full papers to be included in an open-access, peer-reviewed special collection on the journal. This long-standing partnership will ensure that the papers presented this week have a lasting impact on our collective work.

Furthermore, we are delighted to have the Institute of Computing for Climate Science (ICCS) as the local host of CI2023.

On behalf of everyone making this conference possible (the organising committee, programme committee, steering committee, student helpers, AV team, and editorial staff), thank you for joining us and enjoy your week in Cambridge!

Emily Shuckburgh, Yuhan (Douglas) Rao and Scott Hosking
CI2023 Co-Chairs

Organising Committees

Chairs

Yuhan (Douglas) Rao, North Carolina Institute for Climate Studies (Co-chair)

Scott Hosking, British Antarctic Survey (Co-chair)

Emily Shuckburgh, University of Cambridge (Local chair)

Local Organising Committee

Andrew Hyde, Cambridge University Press

Dominic Orchard, Institute of Computing for Climate Science, University of Cambridge

Marla Fuchs, Institute of Computing for Climate Science, University of Cambridge

Andrew McDonald, University of Cambridge (Communication co-lead)

Ricardo Barros Lourenco, McMaster University (Communication co-lead)

Annabelle Scott, AI for the study of Environmental Risks (AI4ER) Centre for Doctoral Training, University of Cambridge

Danny Huang, Institute of Computing for Climate Science, University of Cambridge

Sam Oliver, Institute of Computing for Climate Science, University of Cambridge

Programme Committee

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Maria J. Molina, University of Maryland

Peer Nowack, University of East Anglia

Maike Sonnewald, Princeton University

Karthik Kashinath, NVIDIA

Kasia Tokarska, ETH Zürich

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Jacquelyn Shelton, Hong Kong Polytechnic University

Julien Brajard, Nasen Environmental and Remote Sensing Center

Steering Committee

Claire Monteleoni, University of Colorado Boulder

Jakob Runge, German Aerospace Center (DLR)

Eniko Szekely, Swiss Data Science Center

Anastase Alexandre Charantonis, ENSIIE

Conference Helpers

Petr Dolezal, University of Cambridge

Aline Van Driessche, Genvision

Andrew McDonald, University of Cambridge

Kenza Tazi, University of Cambridge

Mala Virdee, University of Cambridge

Programme at a Glance

	Wednesday 19 th April	Thursday 20 th April	Friday 21 st April
9:00am			
10:00am	Registration	Session 4: Downscaling & Post-Processing	Session 8: xAI & Casual Discovery
11:00am	Welcome & Opening	Break	Break
12:00pm	Keynote Address — Shakir Mohamed	Session 5: Uncertainty & Trustworthiness	Session 9: Forecasting & Detection
	Session 1	Panel — Uncertainty, Trust & Ethics	
1:00pm	Lunch		
2:00pm	Session 2: Panel — Diversity & Inclusion in Climate Informatics	Session 6: Data-Driven Knowledge Discovery	
	Break	Keynote Address — Laure Zanna	
3:00pm		Break	
4:00pm	Session 3: Risks & Extremes	Session 7: Data Reconstruction & Gap-Filling	
5:00pm	Break / Hotel Check-In		
	Virtual Poster Session	Panel — Reproducibility	
6:00pm			
7:00pm	Reception / In-Person Poster Session		
8:00pm		Conference Dinner	
9:00pm			

- Keynotes
- Oral presentations
- Panel discussions
- Poster presentations & networking opportunities

Technical Programme — Wednesday 19th April

Time

09:00 — 10:30 Arrival & registration

10:30 — 11:00 Welcome & opening

Session 1

11:00 — 12:00 *Shakir Mohamed*: Keynote address

12:00 — 12:15 *James Byrne*: IceNet - demonstrating data-driven climate science for real-world applications

12:15 — 12:30 *Maxime Beauchamp*: Ensemble-based 4DVarNet uncertainty quantification for the reconstruction of sea surface height dynamics

12:30 — 13:30 Lunch

Session 2

13:30 — 14:30 Panel discussion: Diversity & inclusion in climate informatics

14:30 — 15:00 Break

Session 3

15:00 — 15:15 *Doji Kim*: Short-term forecasting of typhoon rainfall with deep learning-based disaster monitoring model

15:15 — 15:30 *Mala Virdee*: Locally time-invariant metric for climate model ensemble predictions of extreme risk

15:30 — 15:45 *Quentin Febvre*: Simulation-based learning of neural interpolation schemes for the mapping of real satellite-derived datasets

15:45 — 16:00 *Amy Green*: PYRAMID: A Platform for dYnamic, hyper-resolution, near-real time flood Risk AssessMent Integrating repurposed and novel Data sources

16:00 — 16:15 *David Sathiaraj*: Near-term forecasting of water reservoir storage capacities using long short-term memory

16:15 — 16:30 *William Collins*: Huge ensembles of weather extremes using the Fourier Forecasting Neural Network

16:30 — 17:00 Break & hotel check-in

17:00 — 18:00 Virtual poster session

18:30 — 20:00 Reception & in-person poster session

Location: The Cambridge Union

Address: 9A Bridge St, Cambridge CB2 1UB

Technical Programme — Thursday 20th April

Time

Session 4

- 9:00 — 9:15 *Jyoteeshkumar Reddy Papari*: Precipitation downscaling using a super-resolution deconvolution neural network with step orography
- 9:15 — 9:30 *Bobby Antonio*: Post-processing East African precipitation forecasts using a generative machine learning model
- 9:30 — 9:45 *Paula Harder*: Physics-constrained deep learning for downscaling
- 9:45 — 10:00 *Ruth Bowyer*: Clim-recal: an open repository of method comparison for bias correction of UKCP18 products
- 10:00 — 10:15 *Sophie Wilkinson*: Observations-based machine learning model constrains uncertainty in future regional warming projections
- 10:15 — 10:30 *Henry Addison*: Machine learning emulation of a local-scale UK climate model
- 10:30 — 11:00 Break

Session 5

- 11:00 — 11:15 *Peter Watson*: Machine learning applications for weather and climate need greater focus on extremes
- 11:15 — 11:30 *Philine Bommer*: Improving trustworthiness: Introducing eXplainable AI evaluation to climate science
- 11:30 — 12:30 Panel discussion: Uncertainty, trust & ethics
- 12:30 — 13:30 Lunch

Session 6

- 13:30 — 13:45 *Tom Beucler*: Systematically generating hierarchies of machine-learning models, from equation discovery to deep neural networks
- 13:45 — 14:00 *Rachel Furner*: An iterative data-driven emulator of an ocean general circulation model
- 14:00 — 15:00 *Laure Zanna*: Keynote address
- 15:00 — 15:30 Break

Time

Session 7

- 15:30 — 15:45 *Daisuke Matsuoka*: Neural style transfer between observed and simulated cloud images to improve the detection performance of tropical cyclone precursors
- 15:45 — 16:00 *Simon Clifford*: Reducing the overhead of coupled ML models between Python and Fortran: an application to gravity wave parameterizations
- 16:00 — 16:15 *Rendani Mbuva*: A novel workflow for streamflow prediction in the presence of missing gauge observations
- 16:15 — 16:30 *Tom Andersson*: Environmental sensor placement with convolutional Gaussian neural processes
- 16:30 — 16:45 *Peter Manshausen*: Pollution Tracker: Finding industrial sources of aerosol emission in satellite imagery
- 16:45 — 17:00 *Verena Bessenbacher*: Data-driven gap-filling of multivariate climate observations over land
- 17:00 — 18:00 Panel discussion: Reproducibility in climate informatics
- 19:30 — 21:00 Conference dinner
Location: Peterhouse
Address: Peterhouse, Trumpington Street, Cambridge, CB2 1RD

Technical Programme — Friday 21st April

Time

Session 8

- 9:00 — 9:15 *Kai Jeggle*: Understanding cirrus clouds using explainable machine learning
- 9:15 — 9:30 *Wiebke Günther*: Clustering of causal graphs to explore drivers of river discharge
- 9:30 — 9:45 *Saranya Ganesh S.*: Selecting robust features for machine learning applications using multidata causal discovery
- 9:45 — 10:00 *James Carzon*: Statistical constraints on climate model parameters using a scalable cloud-based inference framework
- 10:00 — 10:15 *Edward Pope*: A flexible data and knowledge-driven method for identifying climate drivers to predict summer conditions in China's Northeast Farming Region
- 10:15 — 10:30 *Frederick Iat-Hin Tam*: An interpretable, trustworthy machine learning framework to identify spatiotemporal patterns favoring tropical cyclone intensification
- 10:30 — 11:00 Break

Session 9

- 11:00 — 11:15 *Alper Unal*: Climate model driven seasonal forecasting approach with deep learning
- 11:15 — 11:30 *Timothy Lam*: Quantifying causal teleconnections to drought and fire risks in Indonesian Borneo
- 11:30 — 11:45 *Robert King*: Utilizing Bayesian History Matching for calibrating an internal gravity wave parameterization
- 11:45 — 12:00 *Emma Boland*: A heuristic method for detecting overfit in unsupervised classification of climate model data
- 12:00 — 12:15 *Nachiketa Acharya*: Statistical learning to construct probabilistic subseasonal precipitation forecasting over California
- 12:30 — 13:30 Lunch

Adjourn & Departure

Keynote Speakers



Dr Shakir Mohamed

Keynote date/time: 11:00 — 12:00, Wednesday 19th April

About the speaker: Dr Shakir Mohamed works on technical and sociotechnical questions in machine learning and artificial intelligence research, aspiring to make contributions to machine learning principles, applied problems in healthcare and environment, and ethics and diversity. Shakir is a research scientist and lead at DeepMind in London, an Associate Fellow at the Leverhulme Centre for the Future of Intelligence, and a Honorary Professor of University College London. Shakir is also a founder and trustee of the Deep Learning Indaba, a grassroots organisation aiming to build pan-African capacity and leadership in AI.

Shakir was the General Chair for the 2021 International conference on Learning Representations, and a member of the Royal Society Diversity Committee.



Professor Laure Zanna

Keynote date/time: 14:00 — 15:00, Thursday 20th April

About the speaker: Professor Laure Zanna is a Professor in Mathematics & Atmosphere/Ocean Science at the Courant Institute, New York University. Her research focuses on the dynamics of the climate system and the main emphasis of her work is to study the influence of the ocean on local and global scales. Prior to NYU, she was a faculty member at the University of Oxford until 2019, and obtained her PhD in 2009 in Climate Dynamics from Harvard University. She was the recipient of the 2020 Nicholas P. Fofonoff Award from the American Meteorological Society “For exceptional creativity in the development and application of new concepts in ocean and climate dynamics”. She is the lead principal investigator of the NSF-NOAA Climate Process Team on Ocean Transport and Eddy Energy, and M²LInES – an international effort to improve climate models with scientific machine learning. She currently serves as an editor for the Journal of Climate, a member on the International CLIVAR Ocean Model Development Panel, and on the CESM Advisory Board.

Poster Presentations

1. *Caroline Arnold*: Integrating machine learning components in Earth system models: Fortran-Python bridges for cloud microphysics
2. *Meghna Asthana*: Enhancing energy efficiency and retrofitting suitability models for residential buildings from high-resolution satellite imagery features
3. *Nitin Chaudhary*: Modelling climate response to peatland-mediated feedbacks
4. *Simon Driscoll*: Sensitivity analysis and machine learning of a sea ice melt pond parameterisation
5. *Luke Gloege*: Open Climate: an open-source climate data platform
6. *Seb Hickman*: Can simple machine learning methods predict concentrations of OH better than state of the art chemical mechanisms?
7. *Nafiseh Kakhani*: Causal explanations for soil organic carbon prediction model
8. *Solomiia S. Kurchaba*: Regression model for label-free estimation of NO₂ emissions from individual ships
9. *Nicolas Lafon*: Sampling realistic extremes of environmental data with VAE
10. *George Miloshevich*: Stochastic weather generator and deep learning approach for predicting and sampling extreme European heatwaves
11. *Grzegorz Muszynski*: Towards active learning for emulation of computationally expensive high-resolution cloud models
12. *Omer Nivron*: Using Large Language Models for better bias corrections of global climate models
13. *Ann Power & Claire Barnes*: The development of a 'guided deep learning' automated pollen classification system and implications for climate change research
14. *Raphael Rossellini*: Beyond ensemble averages: leveraging climate model ensembles for subseasonal forecasting
15. *Francine J. Schevenhoven*: Supermodelling: a trained ensemble of interacting models
16. *Tudor Suci*: Future extreme weather: a data and AI driven approach to understand future coastal flooding
17. *Ivan Sudakow*: Developing U-Net architecture for the detection of melt ponds on aerial images of the Arctic sea ice
18. *Ben A. Smith*: Addressing informatics challenges in integrated climate impact modelling
19. *Simon D. A. Thomas*: Tropical cyclone storm surge emulation around New Orleans

Information for In-Person Attendees

The 2023 Climate Informatics Conference will be held at Trinity Hall, located in central Cambridge — Address: Trinity Lane, Cambridge CB2 1TJ. Key venue locations are marked on this [Google My Map](#). The conference will be held in Trinity Hall's Lecture Theatre (please refer to page 15 and follow signage on the day).

Directions

Tea and coffee will be provided in the Terrace Room adjoining the Lecture Theatre on arrival and business lunch will be provided in the Graham Storey Room (please refer to page 15). Staff members will provide directions on the day.

Breaks & lunches

Delegates can join the UniOfCam Wi-Fi by using a social media login or they can ask for a login code from the Porters.

Wi-Fi

The drinks reception on Wednesday 19th April is sponsored by the Cambridge University Press and will be held at the Cambridge Union, home of the oldest debating society in the world! The drinks reception will run alongside the in-person poster session. In you are presenting a poster, please bring your poster to the session. Poster boards and Velcro tapes will be provided.

Drinks reception
& in-person
poster session

The conference dinner on Thursday 20th April will be held in Peterhouse, the oldest of the Cambridge Colleges (founded 1284). The main entrance of Peterhouse is located on Trumpington Street next to the Fitzwilliam Museum. Dress code is smart casual.

Conference
dinner

If you encounter any difficulties during the conference, please email iccs@maths.cam.ac.uk or speak to one of our local staff (wearing a staff lanyard) to get technical support.

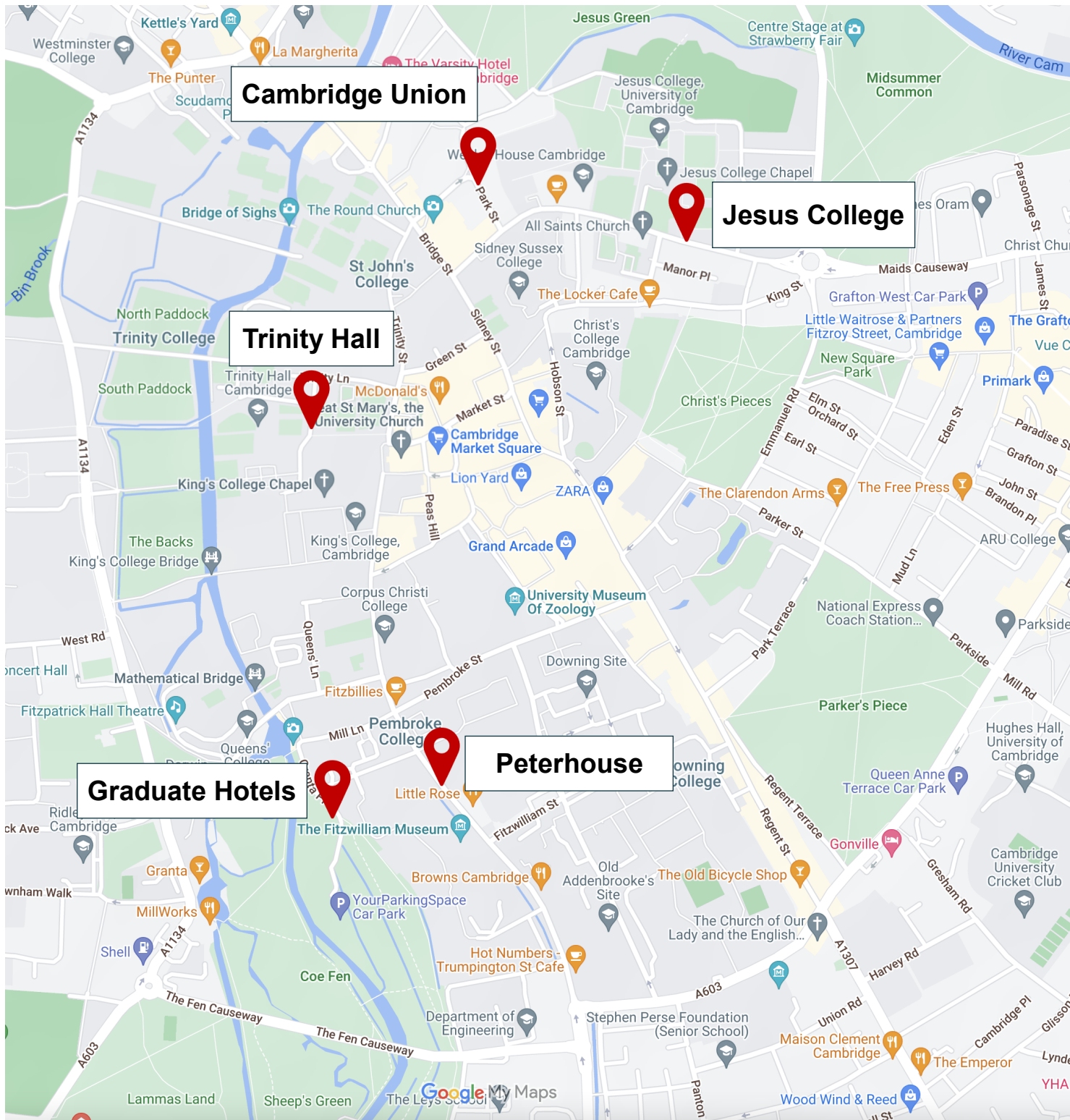
Technical
support

For out of town visitors, there's something for everyone when it comes to entertainment in Cambridge, ranging from visiting the King's College Chapel to the Fitzwilliam Museum, and from a walking tour of the city to punting on River Cam. Please see the TimeOut's article on [The 19 best things to do in Cambridge right now](#) and Visit Cambridge's list of [Things to See & Do](#).

Things to see &
do in Cambridge

Map of Cambridge City Centre

The main entrance of each venue is shown on the map.

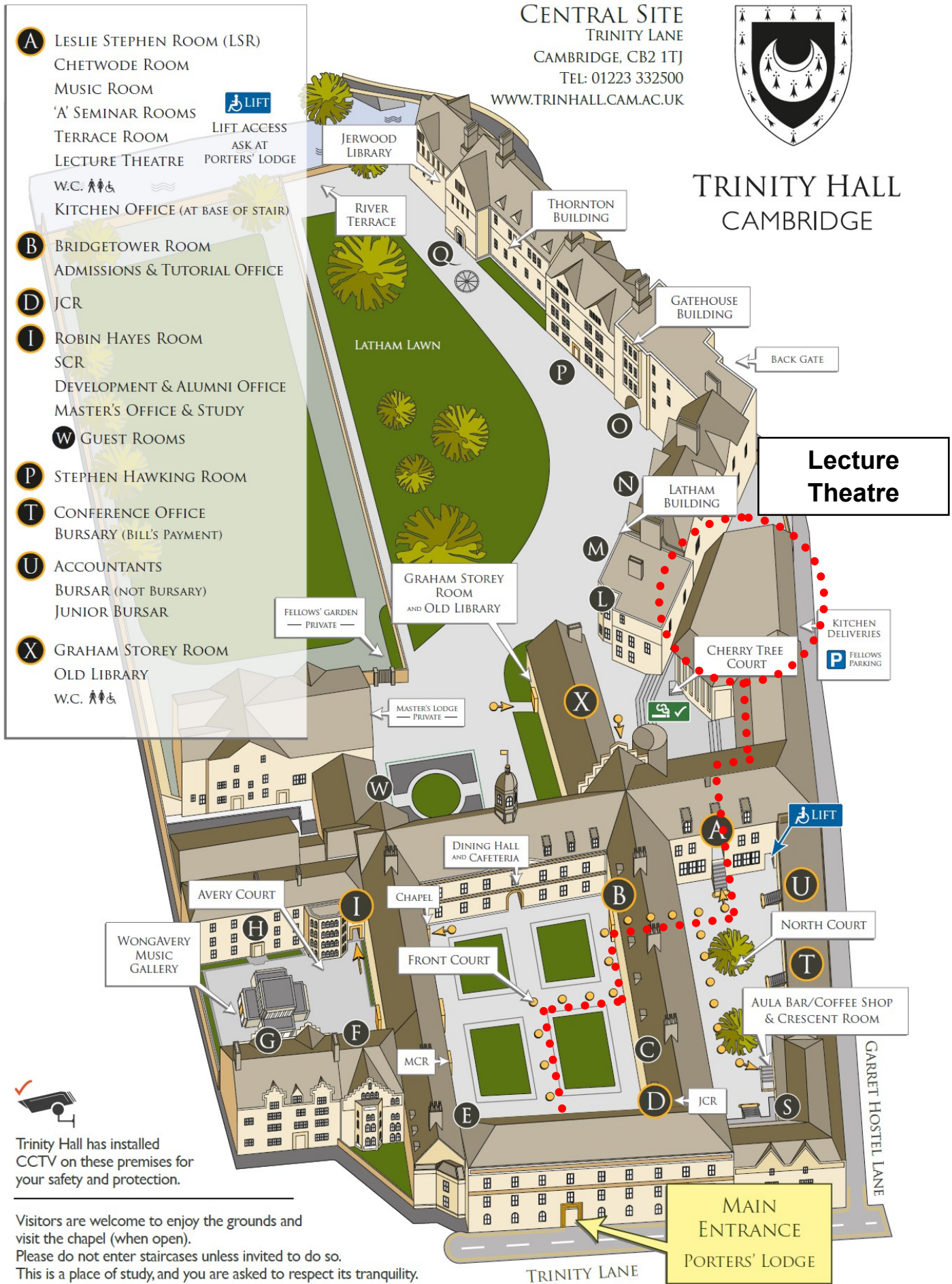


Map of the Conference Venue (Trinity Hall)

CENTRAL SITE
TRINITY LANE
CAMBRIDGE, CB2 1TJ
TEL: 01223 332500
WWW.TRINHALL.CAM.AC.UK



TRINITY HALL
CAMBRIDGE



- A** LESLIE STEPHEN ROOM (LSR)
CHETWODE ROOM
MUSIC ROOM
'A' SEMINAR ROOMS
TERRACE ROOM
LECTURE THEATRE
W.C. ♿
KITCHEN OFFICE (AT BASE OF STAIR)
- B** BRIDGETOWER ROOM
ADMISSIONS & TUTORIAL OFFICE
- D** JCR
- I** ROBIN HAYES ROOM
SCR
DEVELOPMENT & ALUMNI OFFICE
MASTER'S OFFICE & STUDY
- W** GUEST ROOMS
- P** STEPHEN HAWKING ROOM
- T** CONFERENCE OFFICE
BURSARY (BILL'S PAYMENT)
- U** ACCOUNTANTS
BURSAR (NOT BURSARY)
JUNIOR BURSAR
- X** GRAHAM STOREY ROOM
OLD LIBRARY
W.C. ♿

Lecture Theatre

 Trinity Hall has installed CCTV on these premises for your safety and protection.

Visitors are welcome to enjoy the grounds and visit the chapel (when open). Please do not enter staircases unless invited to do so. This is a place of study, and you are asked to respect its tranquility.

Information for Online Attendees

Meeting platform

Zoom meeting will be the main video conference platform for the event. All registered participants (both in-person and virtual attendees) will receive an email by Monday 17th April 2023 indicating that you have been registered for a recurring zoom meeting for the duration of CI2023.

Meeting link

The link for the Zoom meeting will be the same for all three days of the conference. Please DO NOT share the link with others. All talks will be recorded on Zoom and will be available on the [Institute of Computing for Climate Science's YouTube channel](#) after the conference for public viewing at a later date.

Meeting etiquette

- Please use your full name when joining the meeting as the conference hosts will check your name against the list of delegates.
- Please mute your microphone when joining the meeting.
- If you would like to ask the speaker a question after their presentation, please enter your question into the meeting chat and a staff member will relay the question to the speaker if time allows.

Virtual poster session

All poster presentations will be uploaded onto a private YouTube playlist before the conference. The virtual poster session will be conducted using Slack with each poster assigned a Slack channel to engage with participants for discussions live (during the virtual poster session) as well as asynchronously.

All conference participants are invited to join the Slack workspace for CI2023. You can continue the conversation with presenters even after the conference has ended. Please [join via this link](#).

Technical support

If you encounter any difficulties during the conference, please email iccs@maths.cam.ac.uk to get technical support.

Reproducibility Challenge

Registration: [registration for the reproducibility challenge](#) is open through 22 April @ 23:59 AOE.

Objectives: this year's challenge aims to build community, facilitate collaboration, and advance open science within the Climate Informatics community, continuing the tradition of an annual Climate Informatics conference-associated hackathon whilst drawing inspiration from The ML Reproducibility Challenge.

Overview: in this year's challenge, teams of 2-4 will collaborate to create a notebook which reproduces the key contributions of a published environmental data science paper for eventual integration in the open-source Environmental Data Science (EDS) Book. Over the course of a month, teams will locate the data and code associated with their chosen paper; train, validate, and test the models used in the paper; visualise key results from these experiments; discuss their work with peer reviewer(s); and ultimately weave together a narrative illuminating the value of open science which culminates in a citeable, DOI-tagged notebook. Teams will further have the opportunity to network and exchange technical Q&A with fellow participants in weekly drop-in socials throughout the competition. Check out this notebook in the EDS book which reproduces IceNet (Andersson, 2021) for an example of what you'll be working towards!

Tracks: teams may choose to join the challenge through one of two tracks:

Pre-Approved Paper Track: reproduce a paper pre-approved by the Organising Committee to have sufficient data and code availability. Pre-approved papers are listed in alphabetical order [here](#).

Participant-Suggested Paper Track: suggest a paper to reproduce, subject to approval by the Organising Committee. This mechanism is designed to ensure teams choose papers which are realistic to reproduce in a month.

Peer-Review: all notebooks within the EDS book are peer-reviewed to maintain a high standard of scientific integrity. A pool of peer reviewers consisting of original authors of pre-approved papers, reviewers for the Climate Informatics conference, and other members of the Climate Informatics and EDS book communities will begin working with participants at the two-week mark of the competition to sharpen the submission and ensure it is ready for publication in the EDS book following the competition.

Judging: submissions to both tracks will be judged together by a panel of environmental data science experts on the basis of their adherence to open science and FAIR practices, adherence to the objectives of the EDS book, and tutorial contributions, adjusted to consider the amount of resources provided by the authors of the original paper.

Prizes: each member of the winning team will receive a free book of their choosing (up to £500 in value split across the winning team) published by Cambridge University Press. Note that all participants who complete the challenge will have authorship on a citeable, DOI-tagged notebook within the Environmental Data Science (EDS) Book for listing on their CV.

Conference: registration for the challenge is FREE and does not require registration to the 12th International Conference on Climate Informatics held in Cambridge from 19-21 April, though we do encourage researchers interested in the topics covered by the conference to attend in-person or virtually.

Summary: teams of 2-4

Reproducing an existing environmental data science paper as a notebook

Submissions to be judged after one month

Winning team to receive Cambridge University Press book of their choosing

Authorship on a citeable, DOI-tagged notebook to be integrated within the Environmental Data Science (EDS) Book

Great networking and community-building opportunity

Key dates: Registration Closes: 22 April @ 23:59 AOE

Teams & Project Assignments Announced: 30 April

Challenge Begins: 1 May @ 00:00 AOE

Peer Review Begins: 15 May @ 00:00 AOE

Challenge Ends: 31 May @ 23:59 AOE

Results Announced: 15 June

Submissions Integrated into EDS Book: Throughout Summer

The 2023 Climate Informatics Reproducibility Challenge Organising Committee warmly welcomes your participation.

Organising Committee:

Andrew McDonald, University of Cambridge and British Antarctic Survey

Alejandro Coca-Castro, The Alan Turing Institute

Anne Fouilloux, Simula Research Laboratory

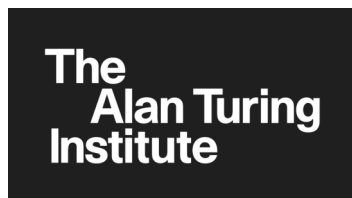
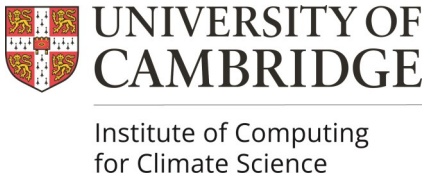
Andrew Hyde, Cambridge University Press

Please direct any questions to Andrew McDonald at arm99@cam.ac.uk.

Follow @Climformatics on Twitter for updates!

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Twitter: @NCState_NCICS

British Antarctic Survey

<https://www.bas.ac.uk/>

Twitter: @BAS_News

Cambridge University Press

<https://www.cambridge.org/>

Twitter: @CUPAcademic