KENZA TAZI

PhD Student

University of Cambridge & British Antarctic Survey

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https://kenzaxtazi.github.io/

EDUCATION	University of Cambridge, MRes + PhD Environmental Data Science	2019-2025

PhD thesis: Predicting precipitation over High Mountain Asia using Gaussian processes

- Focused on improving historical and future precipitation estimates for the 1.9 billion people who rely on these mountains for **water security**. In particular, modelling the probability of extremes events that lead to floods and droughts.
- Applied wide range of **deep learning** models including convolutional neural networks and neural processes and developed novel Gaussian process models, including **climate model emulators**.
- Used a large range of **hydrological datasets**, including weather station data, satellite observations, reanalysis and climate model outputs.
- Supervised by Richard Turner (Uni. of Cambridge), Scott Hosking (Alan Turing Institute), Andrew Orr (British Antarctic Survey) and Javier Gonzalez (Microsoft).

MRes thesis: Precipitation prediction in the Upper Indus Basin using Gaussian processes
Probabilistic machine learning model for future precipitation predictions in key area for Pakistani, Indian, and Chinese water security.

Imperial College London, MSci Physics	2015-2019

MSc thesis: Cloud identification in satellite images using artificial intelligence
Deep learning model to improve cloud identification for Sentinel 3 satellites by over 30% over polar regions where clouds are most important to global radiation forcing and most challenging to identify.

BSc thesis: Modelling the behaviour, occurrence and emissions of wildfire on a global scale

ADDITIONAL RESEARCH EXPERIENCE	Frontier Development Lab	2022

- Led team of PhD students and post-doctoral researchers to study pyroCb clouds associated with the most intense and unpredictable wildfires with support from Google, NVIDIA, and the European Space Agency.
- Created the first global pyroCb database and machine learning forecasting system and conducted causal invariance modelling to better understand pyroCb drivers.

Geophysical Fluid Dynamics Group, University of Oxford — 2018

- Investigated the 2016 stalling of the Quasi-Biennial Oscillation through laboratory experiments.
- Designed framework to simultaneously run twelve motors in different wave patterns to generate pseudo-gravity waves in a water filled annulus and analysed footage of the waves using particle image velocimetry.

Planetary Science Group, University of Oxford — 2017

- Designed and built a light source for evaluating three-dimensional thermal emissions from lunar and asteroid samples with a cooling system.
- Built electronic interface to move two-axis platform and measured performance of light source and radiometer.

British Antarctic Survey, Cambridge — 2016

- Wrote program to calculate diurnal and nocturnal cloud cover for wide field cameras using model simulations, image analysis, multi-coordinate system mapping.

- Software deployed at the Halley and Rothera bases in Antarctica and used for microphysical cloud property and gravity wave research.

AWARDS	Best student precipitation presentation award, AGU23	2023
	First place in Cambridge ICCS Reproducibility Hackathon	2022
	AJ Pressland Fund, University of Cambridge	2022
	AI for Earth Grant, Microsoft (USD25,000)	2021
	AI for Environmental Risk (AI4ER) CDT Studentship	2019
	Stevenson Award, Imperial College London	2019
	Student Award for Outstanding Achievement, Imperial College London	2019
	Dean's Fund, Imperial College London	2018
	Royal Astronomical Society Grant	2018

PUBLICATIONS   * presented at international conference

Tazi K, Kim SWP, Girona-Mata M, Turner RE. (2025). Refined climatologies of future precipitation over High Mountain Asia using probabilistic ensemble learning. Submitted to *Environmental Research Letters*. *

Tazi K, Orr A, Hosking JS, Turner RE (2025). Precipitation prediction over the Upper Indus Basin from large-scale circulation patterns using Gaussian Processes. Accepted in *Environmental Data Science*. *

Tazi K, Orr A, Hernandez-González J, Hosking JS, Turner RE (2024). Downscaling precipitation over High Mountain Asia using Multi-Fidelity Gaussian Processes: Improved estimates from ERA5. *Hydrology and Earth System Science*. *

Tazi K, Lin JA, Viljoen R, Gardner A, John T, Ge H, Turner RE (2023). Beyond intuition, a framework for applying Gaussian Processes to real-world data. In *ICML 2023 Workshop on Structured Probabilistic Inference and Generative Modelling*. *

Tazi K, Salas-Porras ED, Braude A, Okoh D, Lamb KD, Watson-Parris D, Harder P, Meinert N (2022). Pyrocast: A machine learning pipeline to forecast pyrocumulonimbus (pyroCb) clouds. In *NeurIPS 2022 Workshop Tackling Climate Change with Machine Learning*. *

Salas-Porras ED, **Tazi K**, Braude A, Okoh D, Lamb KD, Watson-Parris D, Harder P, Meinert N (2022). Identifying causes of Pyrocumulonimbus (PyroCb). In *NeurIPS 2022 Workshop on Causality for Real-world Impact*. *

Lalchand V, **Tazi K**, Cheema TM, Turner RE, Hosking JS (2022). Kernel Learning for Explainable Climate Science. In *UAI 2022 Workshop on Bayesian Modelling Applications*. *

Poulsen C, Egede U, Robbins D, Sandeford B, **Tazi K**, & Zhu T. (2020). Evaluation and comparison of a machine learning cloud identification algorithm for the SLSTR in polar regions. *Remote Sensing of Environment*.

TEACHING   <u>Lecturer</u>
- Gaussian processes in practice, NERC Bayesian Machine Learning as a Tool for Climate Scientist Workshop (2024)
- FAIR data practices, AI4ER CDT (2020, 2021, 2022, 2023)

<u>Workshop organiser</u>
- Weekly pair programming sessions for AI4ER CDT students (2021-2025)
- University of Cambridge 'Stochastic Processes Workshops' to collaborate on applications to real-world problems (2021, 2023)

<u>Supervisor</u>

- Small group problem sheet supervisions for the Department of Engineering's Inference course (3F8, 2025)
- Example classes for AI4ER CDT students auditing Advanced Machine Learning (MLMI4, 2022) and Machine Learning & Bayesian Inference (Part II, 2023)
- Supervision and assessment of students undertaking their 3rd year projects for the Department of Engineering. Topics ranged from civil, mechanical, information and bioengineering (2021, 2022, 2023)

<u>Tutor</u>
- Private tutoring with a focus on maths, computer science and physics at high school and undergraduate level (2018-2022)

INVITED TALKS	<u>Precipitation prediction from over the Upper Indus Basin using Gaussian processes</u>	
	The Alan Turing Institute, *Environment & Sustainability Seminar Series*	Oct 2024
	<u>Ensembling climate models with Gaussian processes to better predict future extremes</u>	
	University of Leeds, *SciML Seminar Series*	Oct 2024
	University of Cambridge, *Atmospheric Chemistry Group*	Oct 2024
	AGU, *Precipitation Technical Committee Seminar*	Mar 2024
	<u>Improving precipitation predictions over High Mountain Asia using Gaussian processes</u>	
	University College London, *Environment and Sustainability Group*	Jul 2024
	<u>Narrowing precipitation uncertainty over High Mountain Asia using probabilistic ML</u>	
	Shanghai AI Lab, *Lu Group*	May 2024
	MILA – Québec AI Institute, *Rolnick Group*	Apr 2024
	NERC Bayesian Machine Learning for Climate Scientists Workshop	Mar 2024
	NASA Jet Propulsion Laboratory*, SUDS Seminar*	Dec 2023
	Morocco AI, *Research Webinar Series*	Jul 2023
	University of Cambridge, *Energy and Environment Group*	Jun 2023
	<u>Gaussian processes in practice</u>	
	NERC Bayesian Machine Learning for Climate Scientists Workshop	Mar 2024
	<u>Pyrocast: A machine learning pipeline to forecast pyrocumulonimbus clouds</u>	
	University of Cambridge, *AI for Environmental Risk CDT*	Nov 2022

CONFERENCES	Climate Informatics (talk)	2024
	AGU Fall Meeting (poster and talk)	2023
	ICML – Probabilistic Inference & Generative Modelling Workshop (poster)	2023
	AI for Environmental Risk CDT showcase (talk)	2023
	NeurIPS– Tackling Climate Change with AI Workshop (poster)	2022
	Climate Informatics (poster)	2022
	Lunar and Planetary Science Conference (poster)	2018

ACADEMIC SERVICE

<u>Programme leadership</u>
High Mountain Data Co-Lead for the Himalayan University Consortium (2023-2025)

<u>Outreach</u>
- BCG 'Climate and Sustainability Stewardship' Programme (2022-2024)
- She Talks Science Webinar (2021, 2023)
- Raspberry Pi magazine: Hello World (2022), Issue 19: Sustainability & Computing
- Rocket Seeds - see Fernando B, Wade J, Tazi K. (2016) Sowing seeds from space. Astronomy & Geophysics. 2016 Oct 1;57(5):5-11

<u>Reviews</u>: Climate Informatics; ICML – Structured Probabilistic Inference and Generative Modelling Workshop; Journal of Geophysical Research - Atmospheres

<u>Committees</u>
- AI4ER CDT Management Committee (2021-2023)
- AI4ER CDT Ethics Diversity and Inclusion Committee (2022-2023)
- Undergraduate Student Staff Committee, Department of Physics, Imperial College London (2016-2017)
- University Student Network Executive Committee, Institute of Physics (2016-2017)

POLICY

<u>Polar Summit, Paris Peace Forum,</u> invited delegate   2023
Worked collectively with other scientists to secure EUR 1 billion pledge
towards polar and high mountain research from French government.

<u>Cambridgeshire County Council</u>, consultant   2020-2021
Undertook research for the Council through the Cambridge University Science and
Policy Exchange (CUSPE) creating the Cambridgeshire Decarbonisation Fund, a
new policy framework to decarbonise the county by 2050.

<u>All Party Parliamentary Group on Air Pollution</u>, lead author   2020
Guided a small team to submit evidence on ways to keep low air pollution levels as UK
exited the first Coronavirus Lockdown. Measures including making temporary cycle and
pedestrian lanes were implemented.

<u>Tsinghua University's Environment Summer School</u>, invited delegate   2017
Imperial delegate sent to design and pitch policy project to overcome one of China's
environmental challenges to leading academics and policymakers.

OTHER EXPERIENCES

<u>EntrepriseTech</u>, University of Cambridge   2020-2021
Led team to propose business plan for a drug-discovery start-up with mentorship from
the Head of Strategy to the VP of Artificial Intelligence at AstraZeneca Cambridge.

<u>Science Museum</u>, London   2018-2019
Advised curators on instrument displays and public engagement for the 'London: City of
Science' permanent exhibit.

<u>Winter Olympic Games</u>, Sochi   2014
Represented Morocco in the Women's Alpine Skiing Giant Slalom and Slalom events
and competed in international circuits (FIS races, South America Cup and French Cup).

LANGUAGES

English and French (fluent), Korean (TOPIK Level 3), German (prev. C1)

Python (incl. TensorFlow, PyTorch, Jax), Julia, MATLAB, Arduino, R, HTML, CSS

OTHER SKILLS   Cloud and high-performance computing, manufacturing and graphic design training