The Alan Turing Institute

Alan Turing Institute Data Science for Science Programme: Climate Action

Call for pilot projects on AI for Climate Action
Deadline: 17:00 GMT, 19th July 2019

The Alan Turing Institute (Turing) invites pilot projects from multidisciplinary teams of researchers working in partnership, to apply data science approaches to environmental and sustainability challenges. These Guidance Notes contain all information about the call as well as essential guidance for applicants.

As part of the Turing Institute's Data Science for Science Programme, we are developing research around areas of key importance including environmental science. This call for pilot projects is part-funded by the UKRI's Strategic Priorities Fund programme through the AI for Science theme area. This research theme will develop the crucial role for Data science and Artificial Intelligence (AI) in enhancing global society's resilience to climatic and environmental changes and in facilitating transitions towards sustainability. It will provide the evidence and tools that are required for informed decision-making, improved risk management, and the technological innovation that will lead us towards a more sustainable interaction with the natural environment.

Background

Many impacts of climate change are already being detected, including warming of the troposphere, ocean acidification, rising sea levels, species extinction, slowing of increases to crop productivity etc. The International Panel on Climate Change (IPCC) report says that limiting human-induced global warming to 1.5°C may still be possible - but it requires ambitious action from national and sub-national authorities, civil society, the private sector and local communities. This requires among others:

- Reducing carbon emissions to net zero no later than 2030.
- Supporting the rapidly emerging climate action plans and resilience initiatives throughout the country.
- Ensuring current and future policies are consistent with averting climate change

In April 2019, the UK became the first country in the world to declare an environment and climate emergency. At the Alan Turing Institute, we believe that data science and AI has a significant role to play in climate change science, mitigation and adaptation efforts.

The advent of big data and general-purpose machine learning algorithms are heavily proliferating in scientific research areas relevant to climate change. Novel processes in

materials science can accelerate renewable energy research and the search for efficient solar panel and battery substrates. Analysis of vast amounts of data from sensors, satellites, and drones can help understand climate change effects on biological ecosystems; monitor emissions; and, importantly, track progress towards the United Nations Sustainable Development Goals (SDGs).

There are a number of challenges that need to be addressed to allow us to fully exploit the range of data that is available. These include:

(i) How to source and collate the data that is required and ensure it is of sufficient quality to form the basis of evidenced-based global decision making;

(ii) How to integrate information from multiple, diverse, data sources, acknowledging that each source might represent fundamentally different quantities with uncertainties and biases that vary over both space and time;

(iii) How to use data science and AI to better understand the interaction between the environmental, climatic, social and economic processes that drive environmental change;

(iv) How to develop methodology to calculate SDGs and other environmentally related indicators, in a way that will be scalable for use with large, and complex, datasets, allowing the indicators to be calculated, together with associated measures of uncertainty, potentially in near real-time;

(v) How to communicate to a wide variety of stakeholders in a manner that will ensure trust in the data and results, ensuring that the potential effects of the 'data journey' on final results and indicators are understood, and to produce output in a form that is readily useable in established, and developing, decision-making processes.

Scope

This call aims to catalyse new collaborations between environmental scientists and data scientists. It is designed to enable groups of researchers with complementary skills and expertise to explore opportunities at the nexus of sustainability and data science research.

Pilot projects are invited from multi-disciplinary teams for short, 6-month scoping and prototyping projects. The scoping projects are expected to lay the foundation of more substantial proposals for funding to UKRI and other funding bodies. Proposals must be innovative and interdisciplinary in nature, utilise existing data (that is fully consented and anonymised) and clearly explain the potential impacts of the work for environmental data science.

This call for pilot projects has three focus areas, namely:

A) The science of Climate Change
Scientists have developed an understanding of the earth's climate system through years of observations. We now know that global warming is the result of greenhouse gas emissions caused by human activity. New data and methods can give us a better understanding of the key processes underlying the climate-Earth systems, improve our climate projections and assess the impacts of climate change related events.

We are interested in areas such as (but not limited to): evaluation of climate models, improving indicators of climate change, climate change effects in forests, dry-land vegetation and atmospheric composition, assimilation of coupled data to account for links between different elements of the earth's system, optimal placement and use of sensors, urban weather and climate, climate adaptation, understanding of the polar processes in a global context and developing the next generation of fit for purpose Earth System models.

B) Reducing carbon emissions

The world today is powered by inflexible electricity grids that stand in the way of deep cuts to greenhouse gas emissions. New experiments are pushing artificial intelligence and sensor networks into the grid—and into power generation factories, high-energy consumption data centres, and transit systems—in order to achieve a decarbonised economy. However, the production of electricity is responsible for only 25% of all greenhouse gas emissions each year. Agriculture, buildings, and manufacturing are responsible for the rest.

We are interested in areas such as (but not limited to): solar flare prediction for protecting power grids, early crop yield prediction, precision agriculture, automated & enhanced land-use change detection for avoided deforestation, optimised energy system forecasting and monitoring the health & well-being in livestock farming.

C) Climate change impacts and resilience

Extreme weather events already cause damage and disruption. Around 2000 people across the UK died from the 2003 heatwave, widespread flooding has affected 55,000 homes, and cost the economy £3.2 billion. Insured losses from flooding and severe weather events cost ~ £1.5 billion per year over the past twenty years. Events such as these are likely to become more frequent and severe. Preparing for climate change today will reduce the impact of future costs and damages.

We are interested in areas such as (but not limited to): high impact weather event prediction, social media enabled disaster response, prediction of earth systems (e.g. climate, oceans, forests, icecaps) response to climate change, automated mitigation of flood risk, extreme weather event modelling and prediction and hyper-local weather forecasting.

Applicant guidance

Proposals should represent an inter-disciplinary team of environmental and data scientists and be a collaboration between at least two Institutions, either from the Turing University Network or from the Turing University Network and external Research organisations and environmental agencies.

All proposals must be led by two Investigators. The PI (Lead Applicant) must be either a Turing Fellow, Turing Research Fellow, Turing Visiting Researcher or situated at one of the Turing's university partners. Additional Investigators (co-applicants) who are not directly involved with the Turing or its university partners may participate alongside a PI who is affiliated with Turing as described above. Eligible additional co-applicants will be based at Higher Education Institution (HEI) or Independent Research Organisation (IRO).

Applications should demonstrate how the complementary expertise and experience in the two institutions are relevant to the project.

In this first call, up to two 6 month projects are intended to be supported. An award of up to £50,000 will be offered to each selected proposal. We plan to fund further projects in subsequent years.

Support available

Applicants should provide a costing covering 100% of direct costs for projects of up to 6 months in duration. Part of the aim of the call is to generate results quickly.

Awards may include:
- Up to 20% of investigator time (e.g. 4 investigators at 5%) costed as Directly Incurred for the purposes of this grant.
- Other Directly Incurred staff salaries (e.g. existing academic staff, research assistants or other research staff, technicians and other support staff).
  - Due to the short time frame of the projects and the requirement that projects will end on 1st March 2020, we would recommend naming available researchers at the point of application to allow projects to start quickly.
  - PhD studentships cannot be supported through this call.
- Overhead rate of £32,500 per 1 researcher FTE, per annum.
- Research consumables directly attributable to the project.
  - The Turing can contribute up to $20,000 in Microsoft Azure credits. Applicants should consult with the REG team if they require this donation.
- Research equipment essential for the project.
- Travel and subsistence, and other meeting costs where relevant.

Application process

The call opens on Tuesday 11th June 2019.

Please discuss all applications with your host institution/department ahead of submission. Typically institutions have an internal deadline of at least 5 working days prior to the funder deadline so take this into consideration when preparing an application.

Applications should be completed and submitted by **17:00 GMT, 19th July 2019** to the Turing's FlexiGrant portal: https://ati.FlexiGrant.com with the following documents:

- A copy of your proposed research case for support (two pages maximum, plus a maximum of one additional page for references)
  - This should include background and a description of the proposed research, aims and objectives, tools and methods, relevance and beneficiaries
- A fully completed costing using your Institution's costing tool
  - This should include a budget table (template provided) and narrative justification of resources.

Additional FlexiGrant sections:

a) **Project summary:** Please provide details of your proposed research project including its objectives, key research questions, impact and relevance, and how the project would be developed into a long-term collaboration between the two universities/Institutions. (Max. 300 words)

b) **Project team:** List the team members, who should represent different disciplines and areas of expertise. Specify the expected contributions from each person (i.e. who will do what?) and the strategy for achieving synergy across the project (Max. 300 Words)

c) **Expected Outputs and Impact:** Please provide information on the outputs expected from this project. These should include items such as anticipated papers, international conference presentations, applications made to external funds (including suggestions of possible sources) and impact. (Max 400 words)

Details of the project team

Although projects must be led by at least two Investigators, the application form should be submitted from the FlexiGrant account of the Lead Applicant. Co-applicants, collaborators and research management staff can be added as collaborators to FlexiGrant.

Applications will be assessed by peer review at the Alan Turing Institute and approved by the Strategic Priorities Fund Management Board. Applicants will be notified of their award in August 2019.

Key dates

Opening date for applications	11th June 2019 (via FlexiGrant system)
Closing date for applications	17:00 on 19th July 2019
Review panel meeting	End of July 2019
Results communicated	Mid August 2019*
Project start date	No later than 1st October 2019

* Depending on the level of interest received, it may not be possible to offer detailed feedback on unsuccessful applications.

Assessment Criteria

All pilot projects will be assessed by a multidisciplinary panel, chaired by Professor Jon Rowe and should consider each of the following areas.

Research excellence	The proposal must demonstrate novelty and added value in relation to current knowledge. Proposals should combine techniques from environmental science and data science and have guaranteed access to any datasets essential for the project so start dates are not delayed.
Anticipated outcomes and benefits	The proposal should describe the anticipated outcomes and benefits of the research. Significance and likelihood of these will form part of the assessment.
Potential for impact	Plans for engagement within and outside of academia should be outlined. Proposals should identify potential impacts and describe how these might be felt and where. Proposals should describe how insights from the research will address sustainability challenges of both national and international importance. Consideration will also be given to activities which raise the profile of Turing across multiple agencies (for example, industry, local community, government).
Leveraging funding	The proposal should clearly detail how the project will leverage external funding as a result of this award

Contacts

For questions regarding the application process or other elements of the call, please contact: ClimateAction@turing.ac.uk