World Series Events on Artificial Intelligence

Event 6 Report

AI for climate change mitigation and adaptation

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UNESCO
United Nations
Educational, Scientific and
Cultural Organization

IRCAI
International Research Centre
on Artificial Intelligence
under the auspices of UNESCO

si2021.eu

REPUBLIC OF SLOVENIA
MINISTRY OF FOREIGN AFFAIRS

About the Series

The Ministry of Foreign Affairs of the Republic of Slovenia, the Slovenian Presidency of the Council of the EU, and the International Research Centre on Artificial Intelligence, under the auspices of UNESCO (IRCAI), have joined forces to organise 12 events in close cooperation with Slovenian embassies and other permanent representations in 10 countries around the world. The aim of this effort is to set an active agenda for AI during the Slovenian Presidency, and to provide a basis for continuing and promoting bilateral discussions in the field of AI and sustainable development beyond the Presidency.

International Events	Showcasing government, research and business perspectives in AI and Sustainable Development across the world from Abu Dhabi, Ottawa, Tel Aviv, Geneva, Bucharest, Tokyo, Paris with OECD and Berlin and ending at the main stage event for DigiEduHack 2021 in Slovenia.
Digital Education Hackathon	Hosting main stage on AI and Education, themed across solutions for UN Sustainable Goals, as the final event of this international marathon. This is an EU flagship initiative, a two-day event made of 24 hours of 'hacking' and 'generating ideas'.
International Network	A distributed center of excellence for research, innovation and expertise, to become a world reference in AI that can attract investments in AI and Sustainability research and the best talents in the field, and provide in-depth work based on the multistakeholder global discussions coming from the events series.
International AI Award	A pan-European and international award started by the Slovenian Presidency and to be presented annually.

Event 6: AI applications for climate change mitigation and adaptation

Photo by Sandra Ivleva on Unsplash

*Ottawa (CA) / online*
26 October 2021 at 10:00 EST

This online event was hosted by the Slovenian Embassy in Ottawa (Canada) and is part of the World Series Events on AI. The Ministry of Foreign Affairs of the Republic of Slovenia, the Slovenian Presidency, and the International Research Center Artificial Intelligence (IRCAI) have joined forces to organize 13 events in close cooperation with Slovenian embassies and other permanent representatives in 12 countries around the world.

To provide insight into the various applications of AI to combat climate change and build resilience, two experts have been invited to this roundtable. Welcomed by **Andrej Gregor Rode** (Ambassador of the Republic of Slovenia in Canada), the panel discussion is moderated by **Aidan O'Sullivan** (PC Chair in AI and Climate Change at IRCAI & Associate Professor in Energy and AI at UCL). The roundtable is joined by **David Rolnick** (Assistant Professor at the School of Computer Science at McGill University & Canada CIFAR AI Chair) and **Marko Grobelnik** (CTO at IRCAI & AI Researcher at Jožef Stefan Institute). Finally, a closing remark is given by **Melita Gabrič** (Head of the EU Delegation in Ottawa).

Agenda

Artificial Intelligence (AI) has a wide-range applicability and has the potential to influence several pressing issues humanity is facing, one of them being climate change. By applying AI, we can better understand the current global climate reality and through that better prepare for possible consequences and future climate events. AI can be transformative in its ability to gather, analyze and monitor large amounts of raw data (i.e., satellite and aerial imagery, geospatial and sensor data, etc.). AI is already used to enhance weather predictions and response. It can also assist all stakeholders, public and private, in reducing their greenhouse gas emissions and strengthening resilience and reducing vulnerability to the effects of climate change. Meanwhile, AI technologies can also pose a threat on our climate, for example recommender algorithms that lead to superfluous consumption and production of goods.

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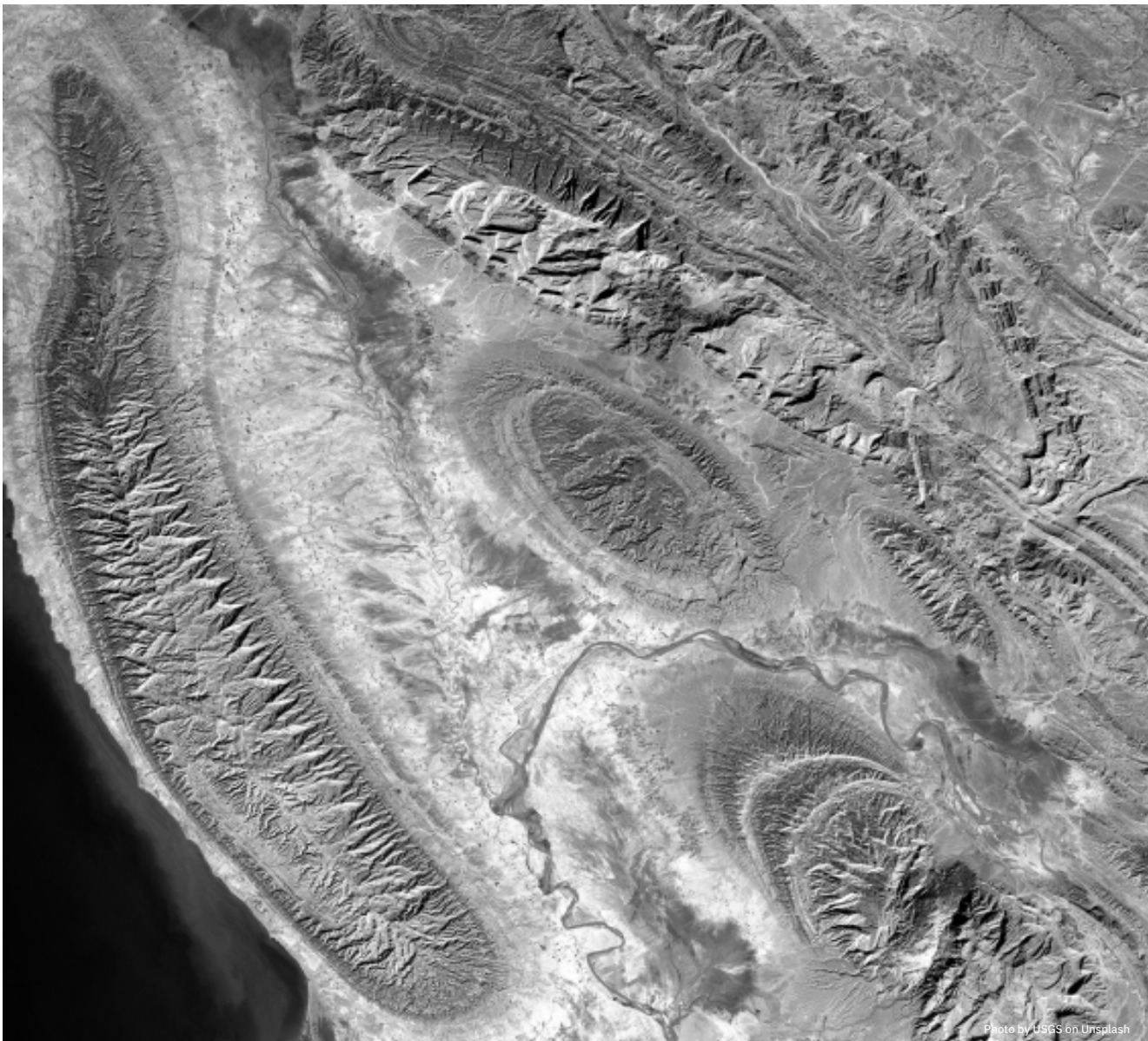
Event Proceedings

Introduction: the climate crisis

The Secretary-General of the United Nations (UN) Antonio Guterres calls the latest report of the Intergovernmental Panel on Climate Change (IPCC) "code red for humanity", underlining the "irrefutable evidence of human influence": With heatwaves, droughts and floodings becoming increasingly frequent, we are at imminent risk of hitting 1.5°C in the near term. The sole way to prevent exceeding this threshold is by urgently stepping up our efforts and pursuing the most ambitious path to tackle the climate crisis. In his welcome address, Ambassador Rode posits that artificial intelligence (AI) applications can thereby help us "better understand the current reality and better prepare for possible repercussions and future climate events."

Impactful applications of AI for climate change mitigation and adaptation

Artificial intelligence (AI) can tackle a myriad of opportunities for progressing on bottlenecks in climate change areas. As brought forward by David, one needs to think of AI as being an "enabling technology that is powerful when it's well matched to bottlenecks in specific areas – whether that is in energy, policy, land use or other areas". As lead author of an influential paper describing how machine learning (ML) can reduce greenhouse gas emissions, David points at four major challenges where AI can play a role:

1. Distilling large amounts of unstructured data into usable information to guide policy (e.g. tracking deforestation using satellite imagery or pinpointing locations exposed to coastal flooding)
2. Controlling complicated systems (e.g. turning the knobs of an energy-efficient heating system or optimizing the network of a public transport system)
3. Optimizing forecasting (e.g. forecasting demand and supply of renewables or forecasting the agricultural yield of climate-threatened areas)
4. Accelerating and modelling scientific discovery (e.g. accelerating the design of solar perovskites or executing compute-intensive simulations of physics-based modelling).

Marko adds that climate change is a global topic, whereby "public opinion is the point where things break – either in the positive or in the negative direction". Thereby, a major breakthrough could be achieved if we were to develop an application that tracks public opinion changes across the world, where seeds of problematic and healthy discussion can be pinpointed at. Therewith, research could then identify the determinants that mitigate these perceptions. Such a system would function as "a cover system on top of existing earth observation (EO) systems". A cross-boundary digital twin of the Earth, i.e. a digital representation of the Earth, could make a substantial impact according to Marko: Such an application would display more than just separate climate topics (e.g. just concrete sea or weather measurements), but would integrate all these measurements and the associated causal effects, as well as their impact on society, economy and well-being, into the one and same computer program. In other words, a digital representation of our planet would "help us illustrate this clear relationship between what's happening today and what is likely to happen in the future".

Engaging the ML community and CS students in climate change applications

"ML practitioners are lazy", says Marko: "They wait for someone to bring the data and challenge them and just optimize whatever there is to optimize". He restates that "these geeks can do a lot, but usually they are lacking the rest of the context". This is why both panelists accentuate the importance of collaboration between the ML community and other field specialists. The most important ingredients to engage the ML community in climate change applications are "collaboration and humility", says David, pointing at impactful contributions other field specialists can make: They can better explain the most burning challenges and highlight the associated deployment-related considerations. Acknowledging the urge to collaborate with other fields to satisfy the cross-disciplinary nature of climate-related challenges, Marko adds that students and researchers should not only be provided with a dataset and the associated optimization task, but also a platform (such as a digital twin of the Earth) where "people can pick the data they want to analyze themselves".

Working as an Assistant Professor in the Computer Science department, David brings forward that oftentimes students work on merely a few projects, of which many are not geared towards real-world use cases. He therefore suggests a higher usage rates of meta learning and transfer learning to gear students towards projects that could positively contribute to the climate. Thereby, students should be acknowledged with the adverse effects certain AI applications can have on the environment, such as systems that conduce to an overexploitation of natural resources. Therefore, "AI for good should be a lens through which we consider all applications of AI and ML". Moreover, to tackle the current imbalances in climate research across the globe, students should avoid perpetuating this digital divide by training their algorithms also in places that tend to attract lower rates of attention and investment.

Making AI greener itself

In a message that Lucilla Sioli (Director for AI and Digital Industry at the European Commission) recorded ahead of this roundtable, she reasserts the intertwining nature of the digital and the green transition ambitions of the European Union. Mentioning an example from the mobility sector, Lucilla brings forward how AI has facilitated the electrification of vehicles and the minimization of their energy consumption. However, "AI is part of digital technologies that can increase the carbon footprint". Therefore, Lucilla stresses the importance of rendering chips (the enabler of AI, essentially) more energy-efficient.

Acknowledging the challenge to make the associated hardware greener, David refers to a pre-print he co-authored to bring forward that negative applications of AI have been and are projected to be "substantially more harmful than the direct energy usage of AI": Recommender algorithms can, for example, directly conduce to a superfluous consumption of goods, which represents a substantially larger share of global greenhouse gas emissions.

Capacitating governments with AI systems and collaborating with policymakers

Marko accentuates that to reach the full potential of AI for climate, the "chasms of terminology" need to be bridged between policymakers and the AI/ML community: "Working with policymakers is not precisely a waste of time, but it certainly has a lower impact". Seeking to align AI's overall use with climate change goals, David brings up a working paper jointly composed by GPAI, OECD. AI and Climate Change AI: The paper aims to capacitate governments with sufficient digital literacy to enable a more efficient development and deployment of climate-related AI systems, providing recommendations on facilitating upskilling programs and segment programs as well as on implementing standards for the development and deployment of AI for our climate. Besides government capacitating programs, David also stresses the importance of platforms to facilitate cross-disciplinary collaboration, for example through the establishment of data taskforces, data portals and data sharing standards. Marko acknowledges that the EU institutions have already invested a substantial effort in harnessing cross-disciplinary research in the climate space, but stresses the importance of working on common platforms, such as the abovementioned idea of having a integrative digital twin of the entire Earth.

In her concluding remark, Melita Gabrič (Head of EU Mission in Canada) seconds the notion that the cycle needs to be closed between policymakers and the "technical side of things". There are still substantial gaps of understanding present among both parties, hindering progress in the space of AI for climate. Still, "while the climate emergency poses a great threat, what we've heard from our speakers today on AI-enabled solutions gives us some reason to be optimistic".

The full transcript of the panel discussion can be found here.

Quotes

> **"By applying artificial intelligence (AI) we can better understand the current reality and better prepare for possible repercussions and future climate events."**
>
> H.E. Andrej Gregor Rode (Ambassador of the Republic of Slovenia in Ottawa)

> **"Climate change is a global topic. Thereby, public opinion is the point where things break – either in the positive or in the negative direction"**
>
> Marko Grobelnik (CTO at IRCAI & AI Researcher at Jožef Stefan Institute)

> **"AI is not the only tool that's going to solve climate change. It's one of the tools that needs to work in conjunction with others. It's not a silver bullet."**
>
> David Rolnick (Assistant Professor at McGill University & Canada CIFAR AI Chair)

> **"The general rule of thumb is: If people can do it well, machines or AI can do it even better."**
>
> Marko Grobelnik (CTO at IRCAI & AI Researcher at Jožef Stefan Institute)

> **"AI for good should be a lens through which we consider all applications of AI and ML"**
>
> David Rolnick (Assistant Professor at McGill University & Canada CIFAR AI Chair)

> **"The sustainable use of AI is an intrinsic part of human-centric AI."**
>
> Lucilla Sioli (Director for AI and Digital Industry at the European Commission)

> **"While the climate emergency poses a great threat, what we've heard from our speakers today on AI enabled solutions gives us some reason to be optimistic."**
>
> Melita Gabrič (Head of the EU Delegation in Ottawa)