



Climate Change AI

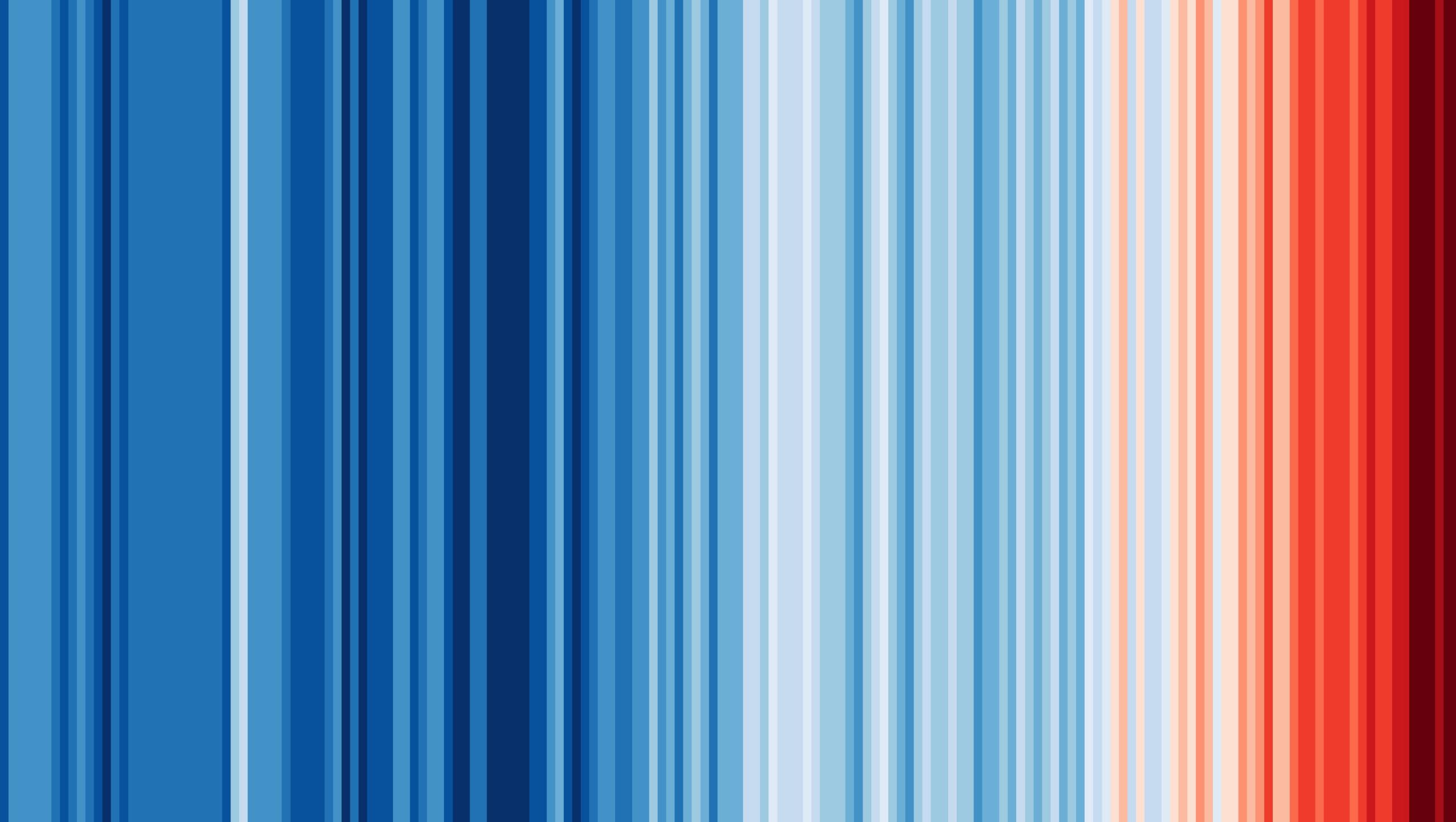
Tackling Climate Change with AI

Marcus Voß

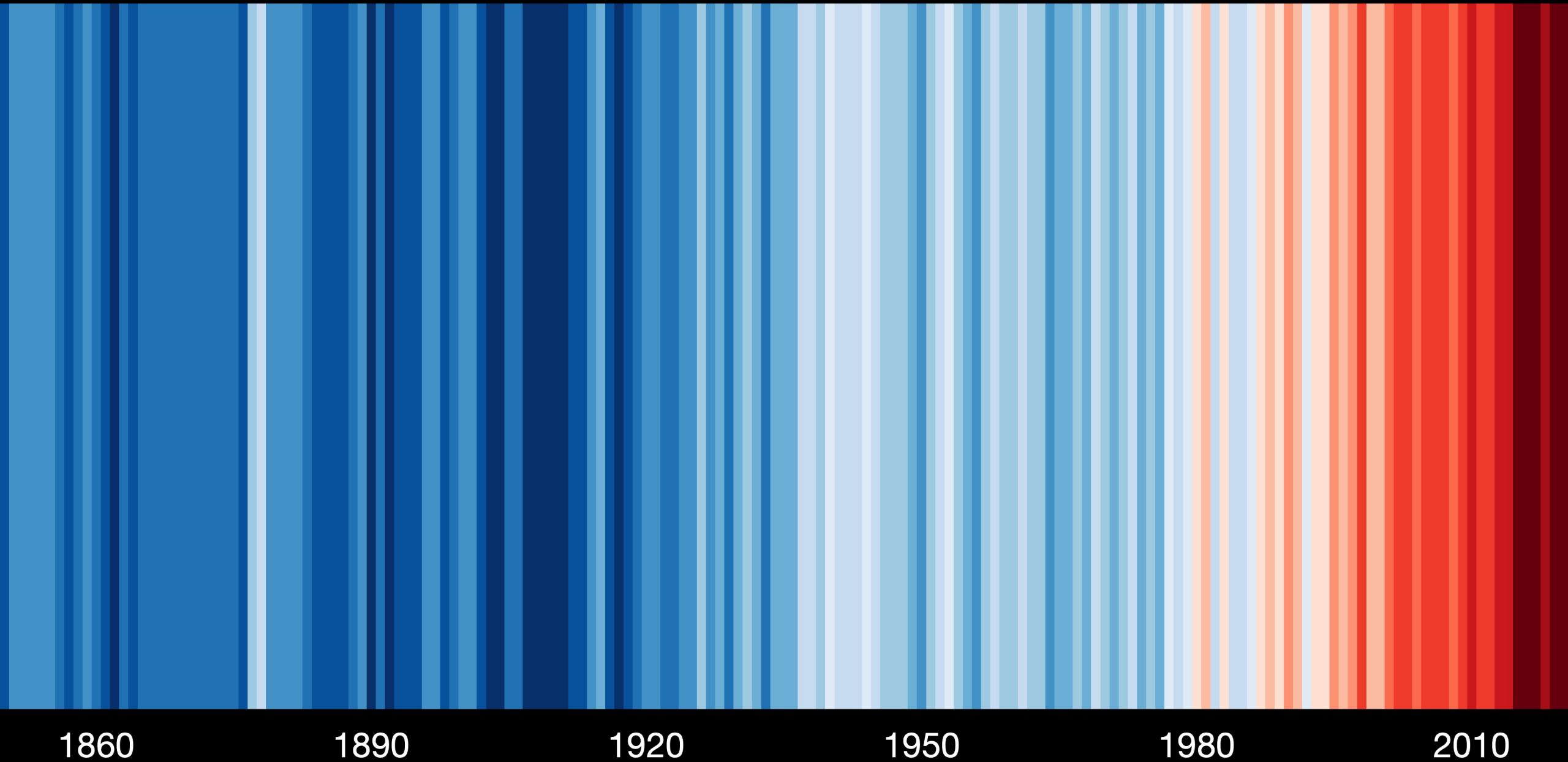
Birds on Mars & TU Berlin
Climate Change AI



Climate Change, so how bad is it?

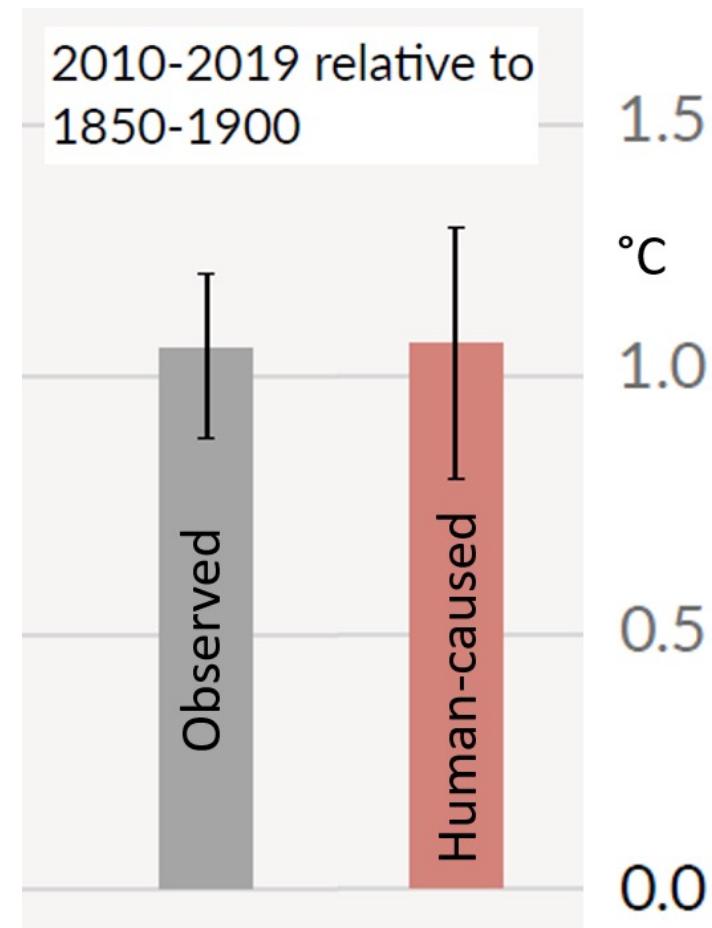


Global temperature change (1850-2020)

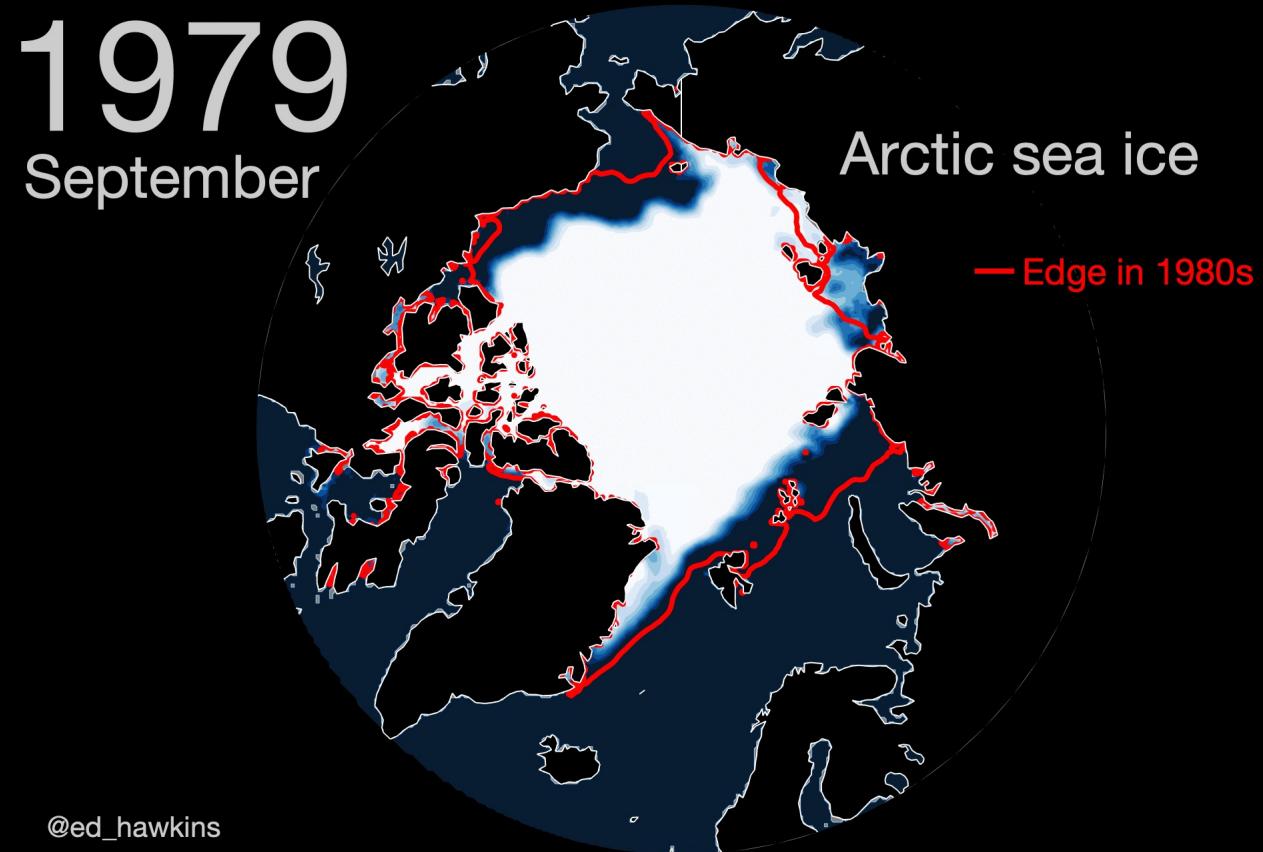




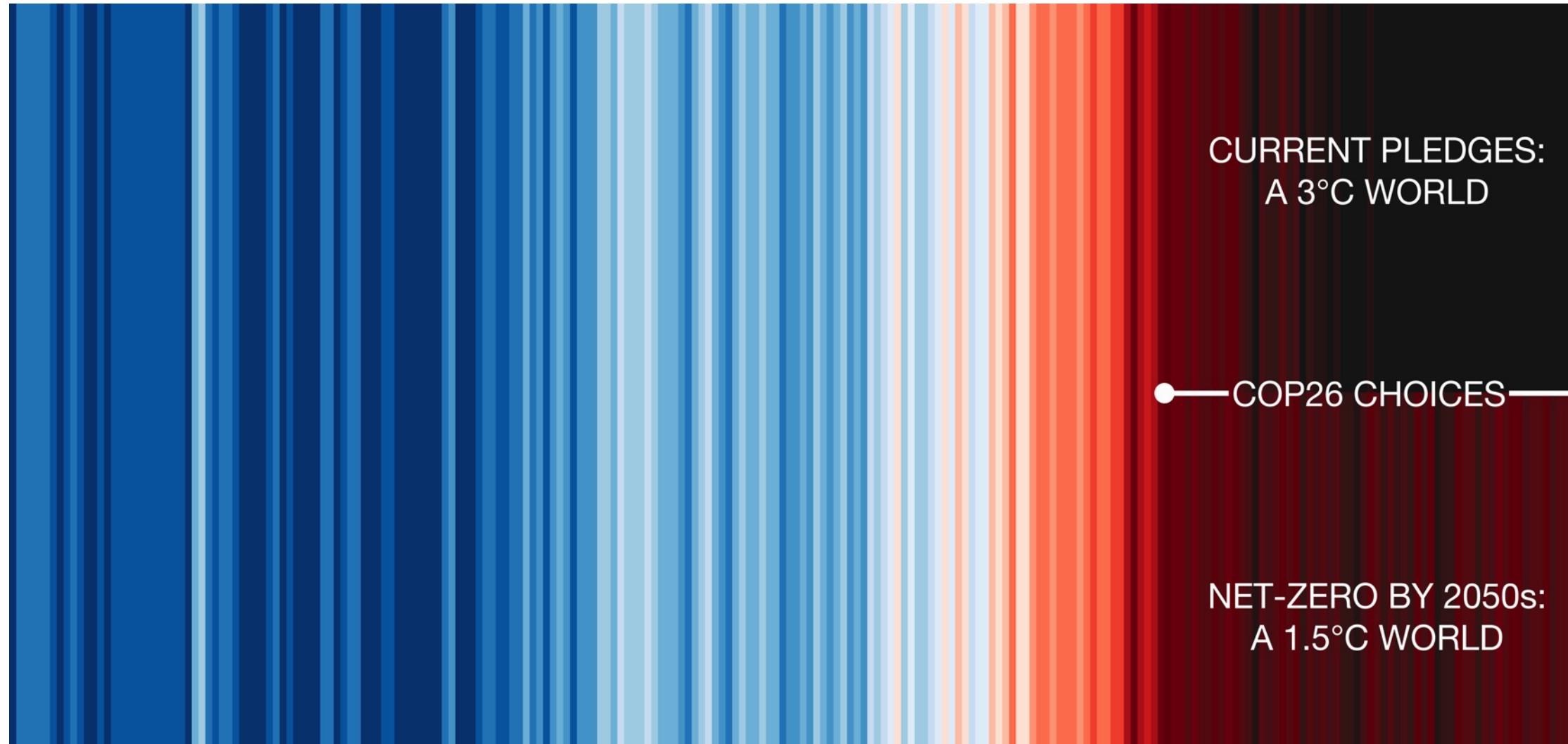
It is estimated that human activities have caused global warming of over 1.0 °C since 1850.



Human-induced climate change is already having an impact on many weather and climate extremes in all regions of the world.



Global surface temperature will continue to rise until at least 2050 under all emissions scenarios





Where can AI and Data Science help tackling climate change?



Picture by Andrew Parsons, from: <https://www.flickr.com/photos/number10gov/51644289284/in/photostream/>

Tackling Climate Change with Machine Learning

David Rolnick^{1*}, Priya L. Donti², Lynn H. Kaack³, Kelly Kochanski⁴, Alexandre Lacoste⁵, Kris Sankaran^{6,7}, Andrew Slavin Ross⁹, Nikola Milojevic-Dupont^{10,11}, Natasha Jaques¹², Anna Waldman-Brown¹², Alexandra Luccioni^{6,7}, Tegan Maharaj^{6,8}, Evan D. Sherwin², S. Karthik Mukkavilli^{6,7}, Konrad P. Kording¹, Carla Gomes¹³, Andrew Y. Ng¹⁴, Demis Hassabis¹⁵, John C. Platt¹⁶, Felix Creutzig^{10,11}, Jennifer Chayes¹⁷, Yoshua Bengio^{6,7}

¹University of Pennsylvania, ²Carnegie Mellon University, ³ETH Zürich, ⁴University of Colorado Boulder,

⁵Element AI, ⁶Mila, ⁷Université de Montréal, ⁸École Polytechnique de Montréal, ⁹Harvard University,

¹⁰Mercator Research Institute on Global Commons and Climate Change, ¹¹Technische Universität Berlin,

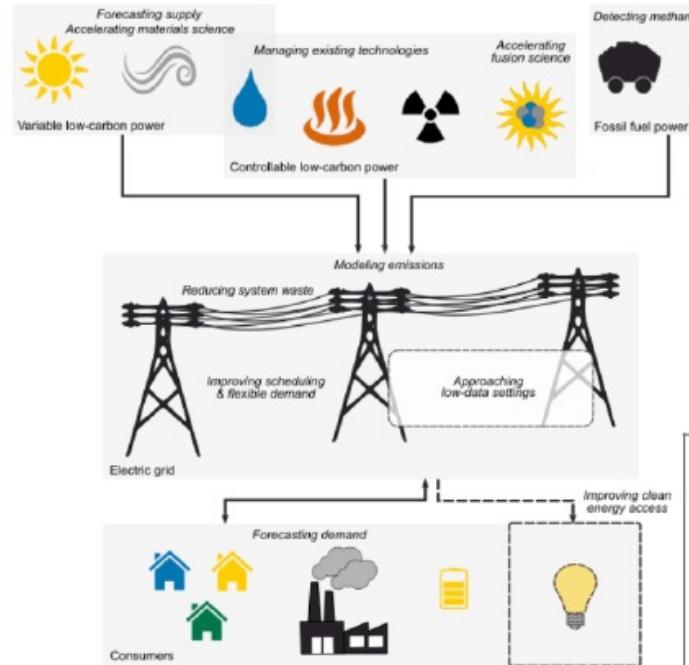
¹²Massachusetts Institute of Technology, ¹³Cornell University, ¹⁴Stanford University,

¹⁵DeepMind, ¹⁶Google AI, ¹⁷Microsoft Research

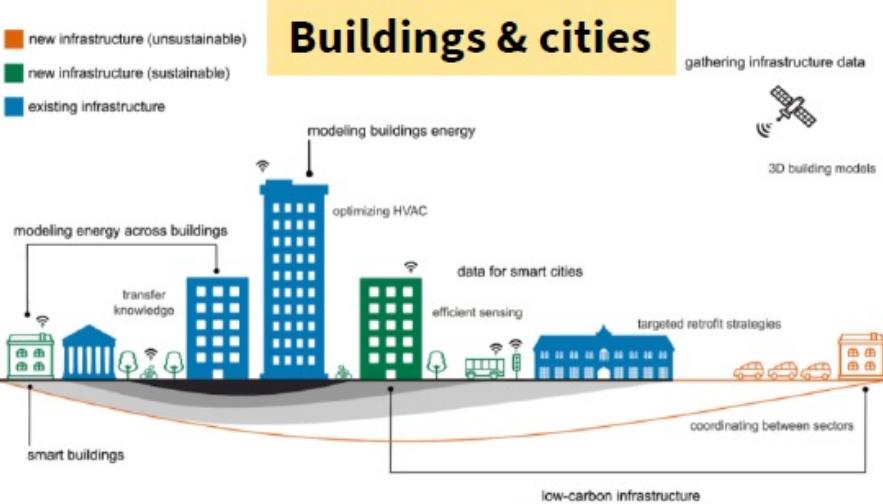
Abstract

Climate change is one of the greatest challenges facing humanity, and we, as machine learning experts, may wonder how we can help. Here we describe how machine learning can be a powerful tool in reducing greenhouse gas emissions and helping society adapt to a changing climate. From smart grids to disaster management, we identify high impact problems where existing gaps can be filled by machine learning, in collaboration with other fields. Our recommendations encompass exciting research questions as well as promising business opportunities. We call on the machine learning community to join the global effort against climate change.

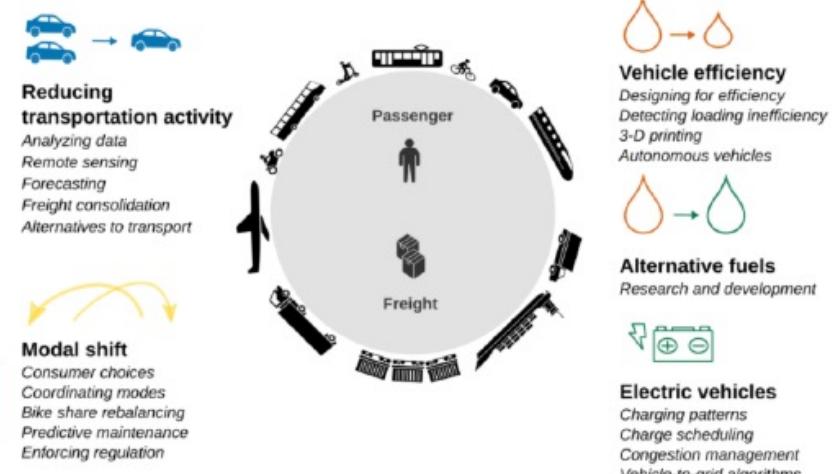
Electricity systems



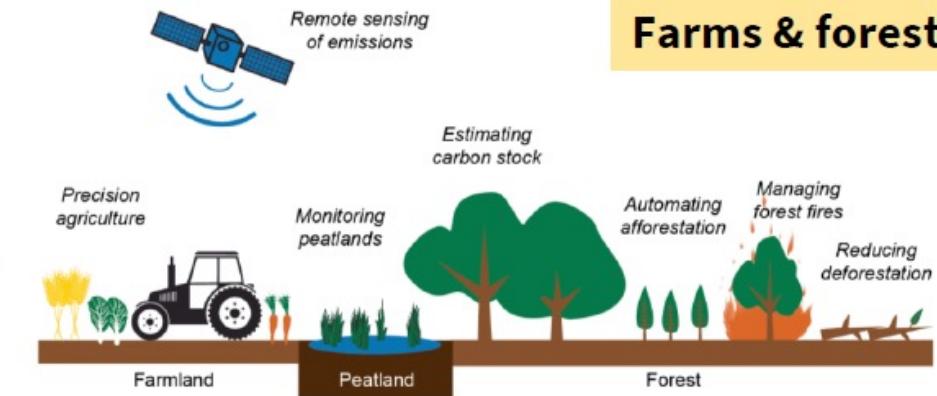
Buildings & cities



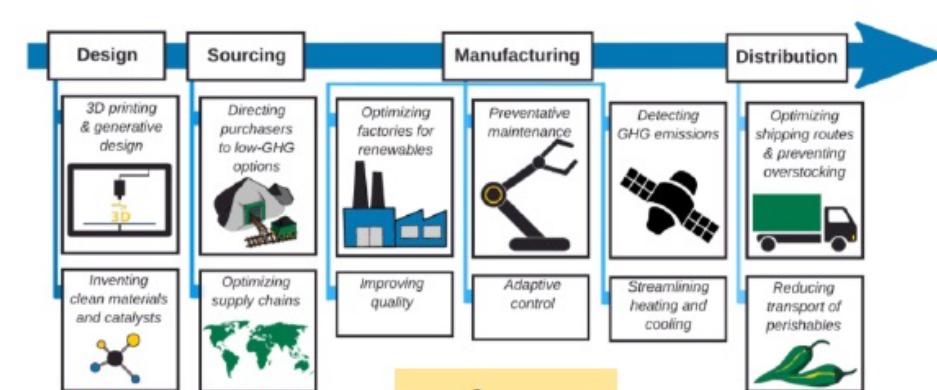
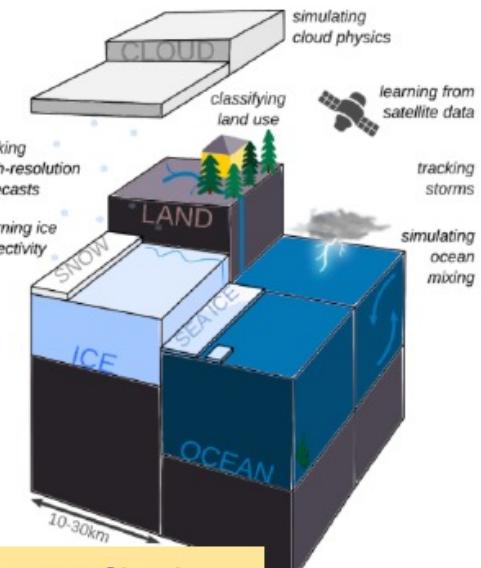
Transportation



Farms & forests



Climate prediction



Industry

Societal adaptation







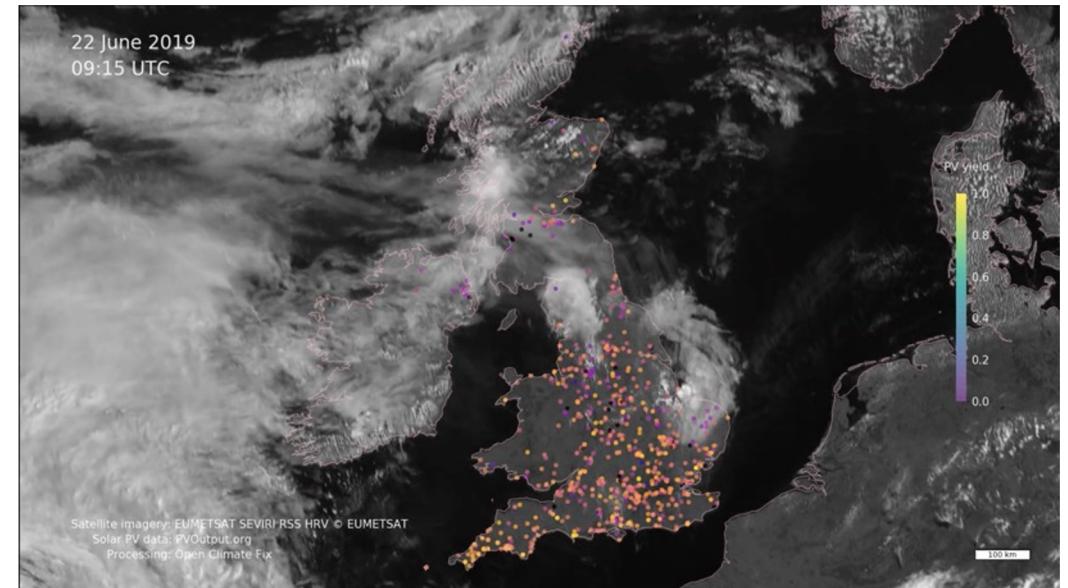
Forecasting

Example: Nowcasting of renewable generation

Motivation: Solar and wind energy vary greatly depending on factors such as weather.

Use case: Predicting power generation to support stable operation of power grids.

AI: Time series algorithms can learn pattern from historical data and weather data.







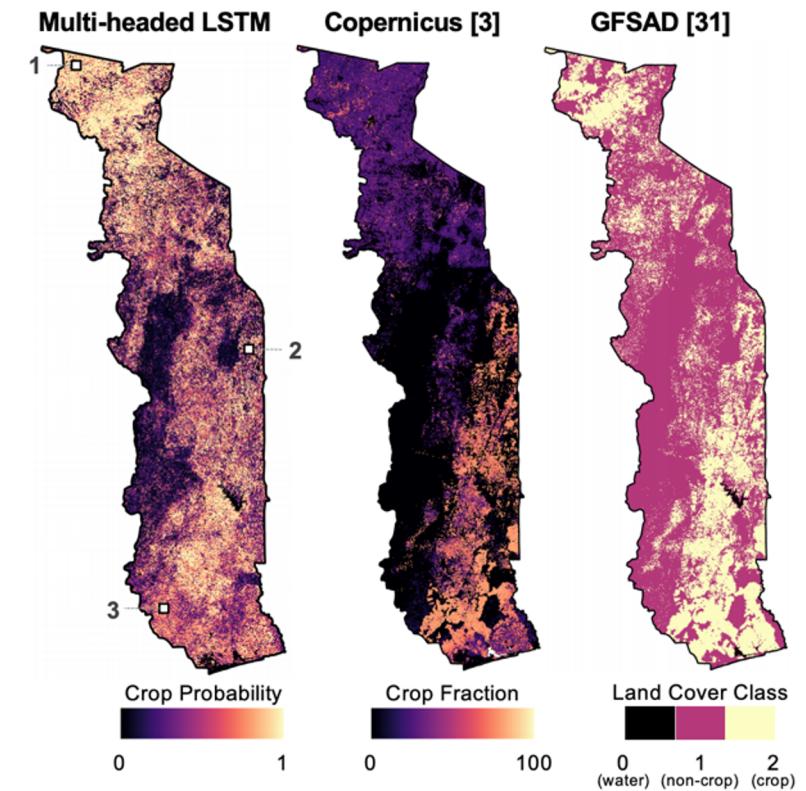
Remote sensing

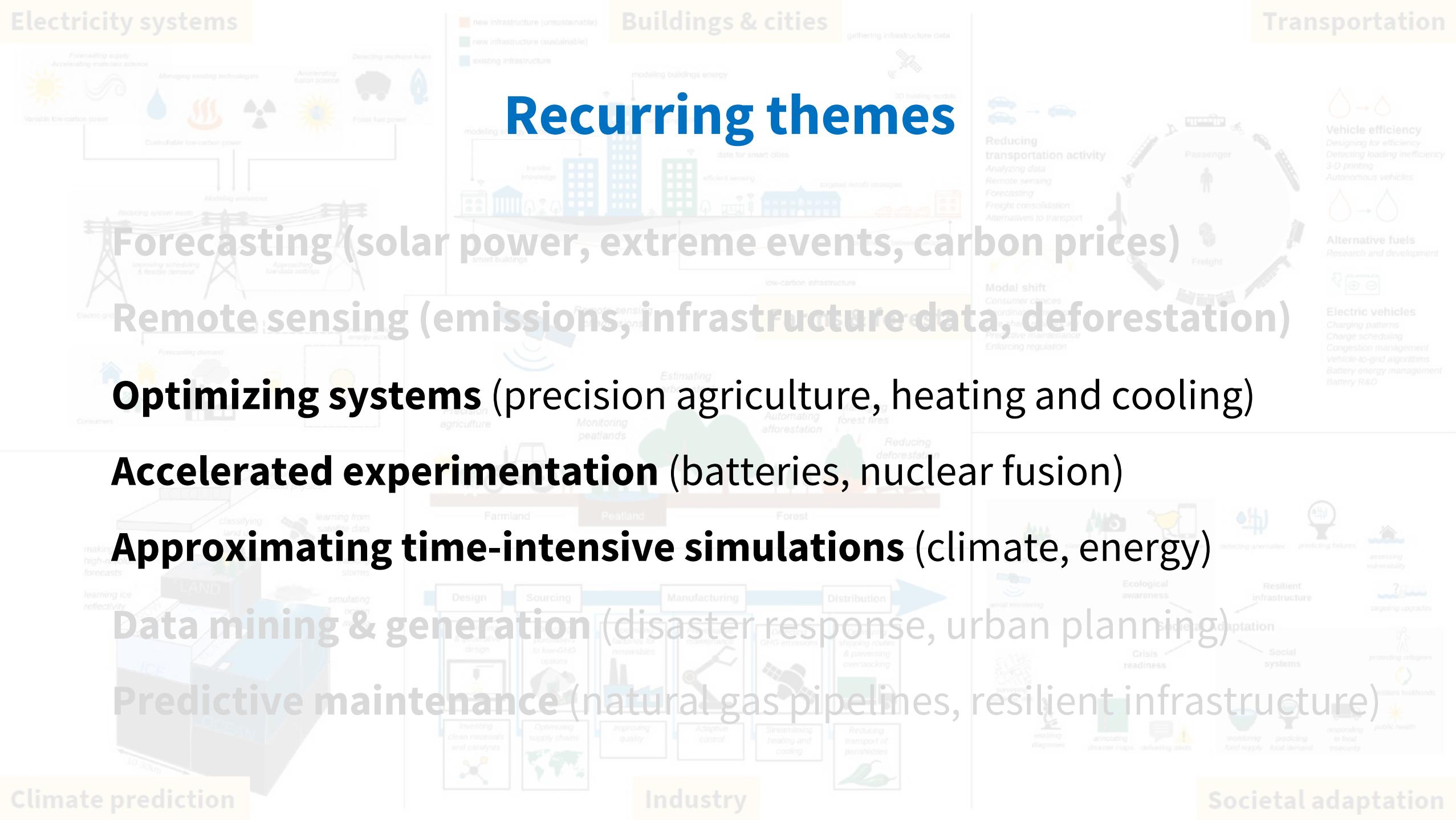
Example: Improving food security

Motivation: Impact of climate change on agriculture (droughts, excessive rainfall, pests).

Use case: Monitoring yields using satellite and aerial imagery.

AI: Computer vision, e.g. for automatic crop detection in a large area.







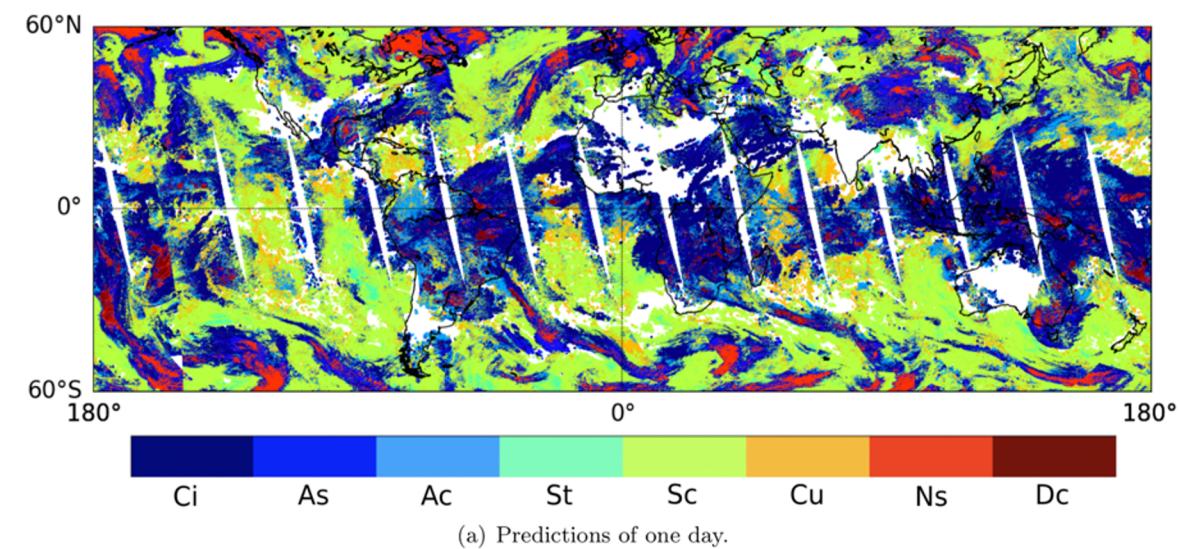
Approximating time-intensive simulations

Example: Local Climate Model

Motivation: Modeling of climate and its changes (e.g. atmospheric and ocean physics).

Use case: Accelerate simulations to enable higher spatial or temporal resolution.

AI: Learn patterns in simulated behavior to approximate it.







Data Generation

Example: <https://thisclimatedoesnotexist.com/>

Motivation: Climate change impacts seem far away for many people.

Use case: Generate synthetic climate change impacts on Google Earth to increase awareness.

AI: Generative models learn patterns from real data on disasters and combine them with real images.





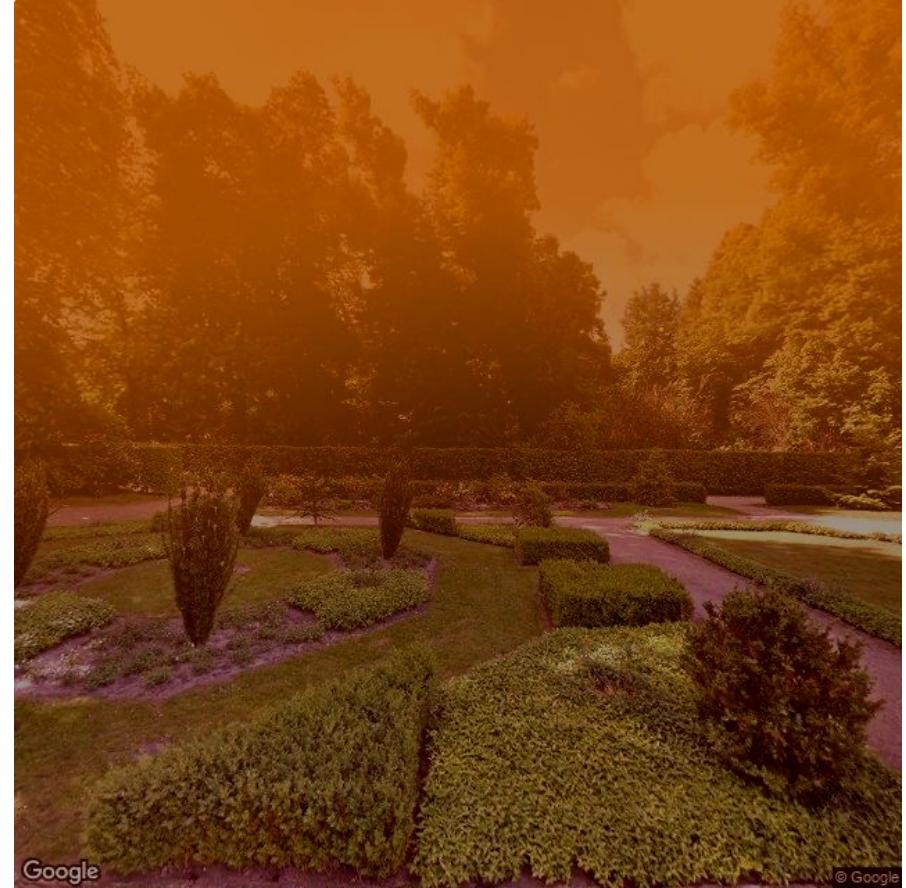
Data Generation

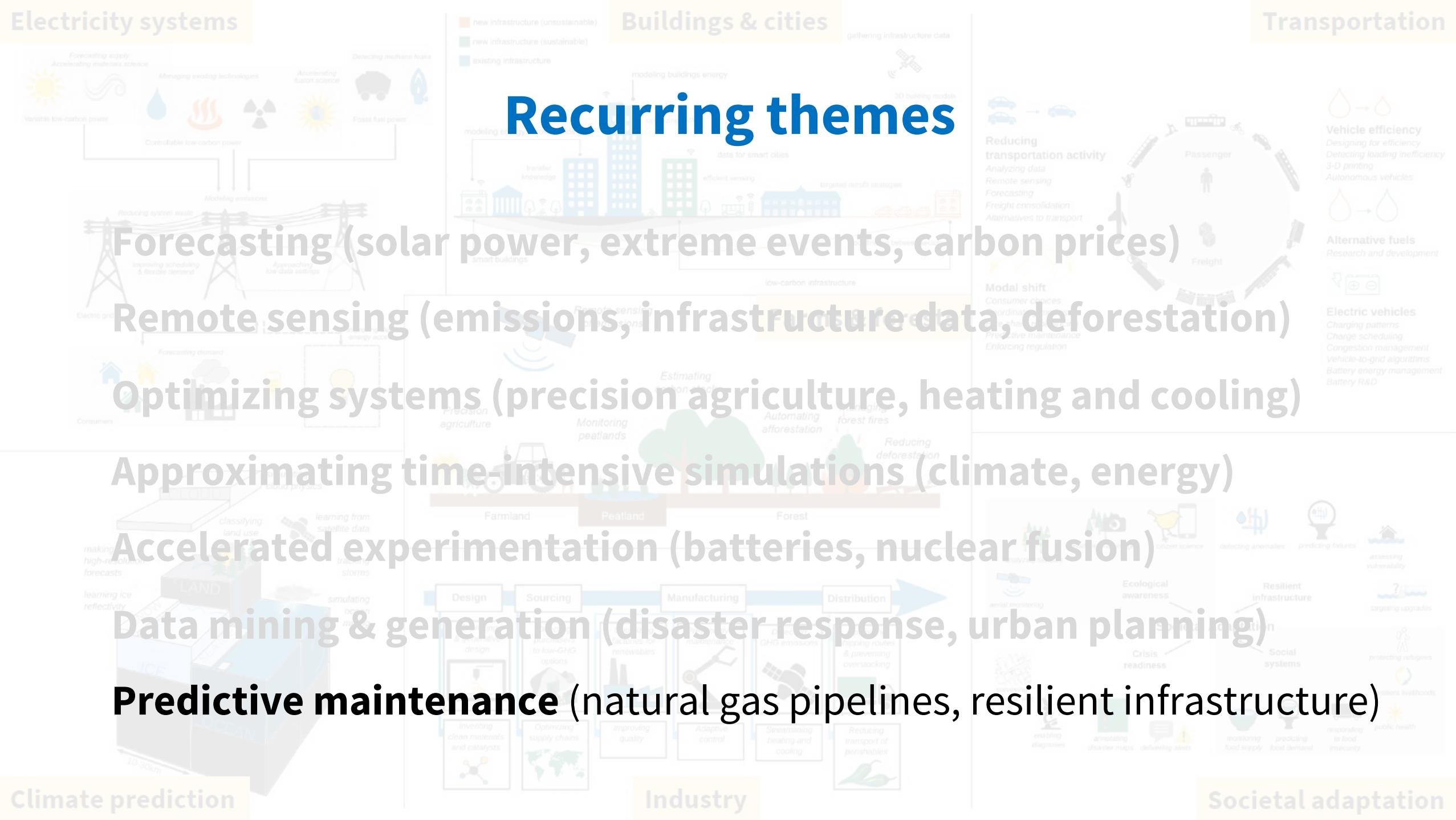
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Predictive maintenance

Example: Deutsche Bahn

Motivation: To make operation more efficient, more cost-effective and less error-prone.

Use case: Deutsche Bahn uses this in the operation of railroad facilities, e.g. for the maintenance of track switches.

AI: Analysis of measurement data to detect deviations and predict maintenance needs.





Predictive maintenance

Example: Airport

Motivation: To make operation more efficient, more cost-effective and less error-prone.

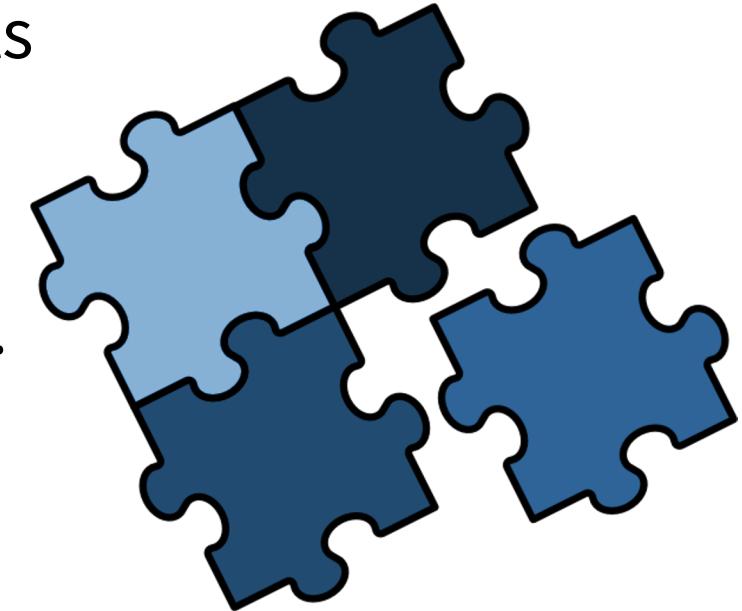
Use case: Airports uses this in the operation, e.g. for the maintenance of baggage handling systems, elevators and escalators.

AI: Analysis of measurement data to detect deviations and predict maintenance needs.



Important considerations

- ML/AI/Data Science are powerful tools and are on its own not good or bad for climate.
- ML is not a silver bullet! Not applicable everywhere.

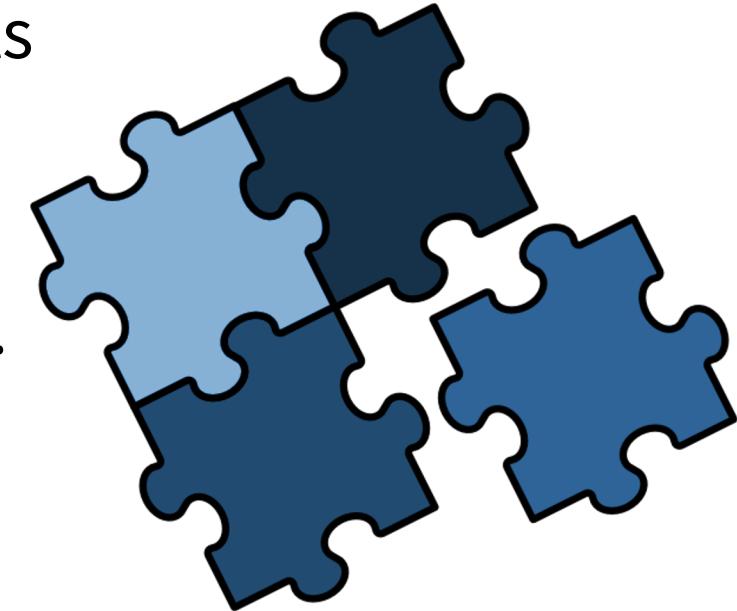






Important considerations

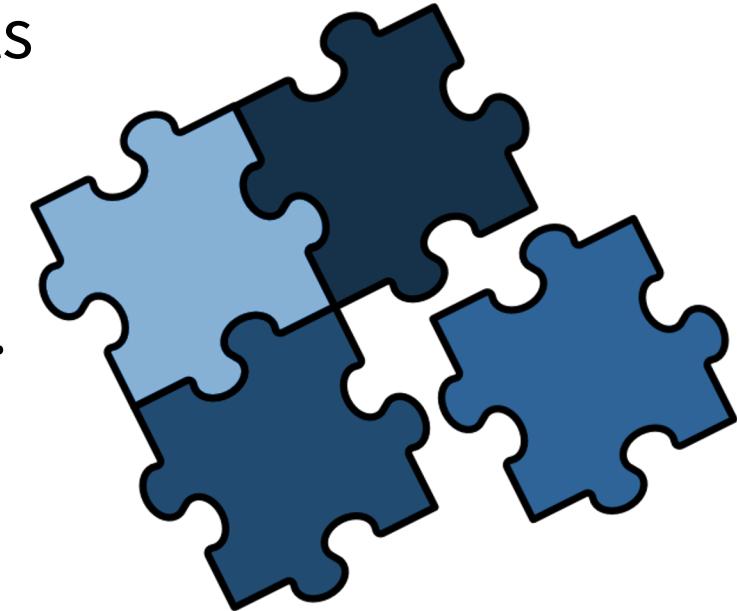
- ML/AI/Data Science are powerful tools and are on its own not good or bad for climate.
- ML is not a silver bullet! Not applicable everywhere.
- Where applicable, only **one part of the strategy**





Important considerations

- ML/AI/Data Science are powerful tools and are on its own not good or bad for climate.
- ML is not a silver bullet! Not applicable everywhere.
- Where applicable, only **one part of the strategy**
- Work needs to be driven by relevant stakeholders, **collaboration** is key to doing meaningful work.



Climate Change AI

An initiative to facilitate work in climate change and machine learning

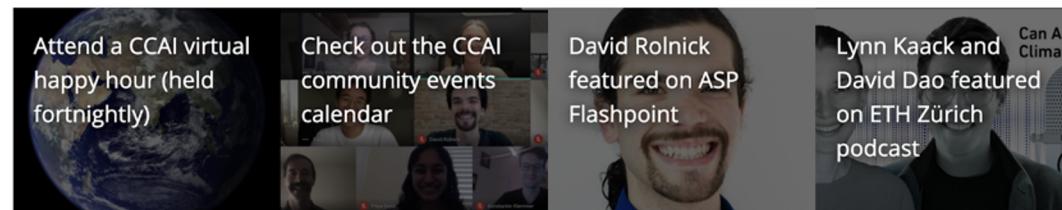


About ▾ Learn ▾ Engage ▾ Events ▾ FAQ

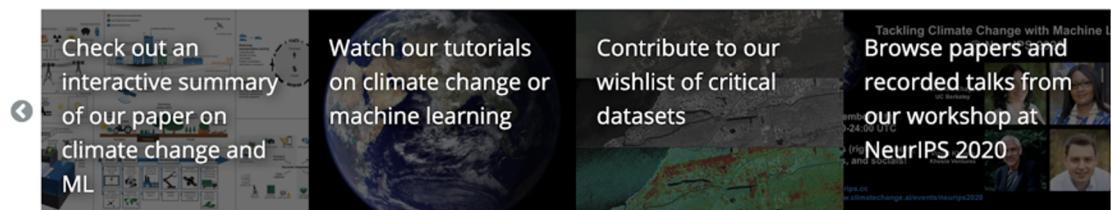
Climate Change AI

Catalyzing impactful work at the intersection of climate change and machine learning

News and events



Featured content



<https://www.climatechange.ai/>

Stay updated! CCAI Newsletter



Climate Change AI

Read on for details on upcoming events, recent developments, research, and new opportunities from across the climate change and machine learning community.

Do you have anything you would like to share in a future newsletter or an event you would like to add to the [community calendar](#)? Get in touch at info@climatechange.ai and/or fill out our [community events form](#)!

Join the discussion with fellow readers:

[Follow CCAI on Twitter](#)

[Join the CCAI forum](#)

Upcoming Events

Sign-up: <https://www.climatechange.ai/newsletter>



Calls for Submissions



Funding



Projects & Courses



Readings



Jobs



Climate Change AI Summer School 2022

Apply (until 17.12.): https://www.climatechange.ai/events/summer_school2022/

About ▾ Learn ▾

Climate Change AI Summer School 2022

Dates and Application Information

About

Call for Participation

Organizers

FAQ

Apply

The Climate Change AI summer school is designed to educate and prepare participants with a background in **artificial intelligence** and/or a background in a **climate-change related field** to tackle major climate problems using AI. The summer school aims to bring together a multidisciplinary group of participants and facilitate project-based team work to strengthen collaborations between different fields and foster networking in this space.

Dates and Application Information

- Date: Aug 15-26, 2022 (Weekdays only)
- Location: Virtual
- Deadline for Application to Participate: **Dec 17, 2021 23:59 AOE (Anywhere on Earth) (UTC -12)**
- Application Portal: https://www.climatechange.ai/summer_school2022_application
- Notification of acceptance: **Week of Feb 21, 2022**
- Contact: summerschool@climatechange.ai



Paper search made easy

On this page, we show accepted works from all our workshops on "Tackling Climate Change with Machine Learning."

Venue	Title	Subject Areas	Award?
All Venues	Enter search terms...	Select Some Options	<input type="checkbox"/>
ICML 2021	Examining the nexus of environmental policy, climate physics, and maritime shipping with deep learning models and space-borne data (Papers Track)	Computer vision and remote sensing Policy Meta- and transfer learning	
	► Abstract and authors: (click to expand)		
ICML 2021	A human-labeled Landsat-8 contrails dataset (Papers Track)	Computer vision and remote sensing Climate and Earth science	
	► Abstract and authors: (click to expand)		
ICML 2021	Urban Tree Species Classification Using Aerial Imagery (Papers Track)	Carbon capture and sequestration Buildings and cities Climate and Earth science Agriculture, forestry and other land use Computer vision and remote sensing	
	► Abstract and authors: (click to expand)		
ICML 2021	Estimation of Corporate Greenhouse Gas Emissions via Machine Learning (Papers Track)	Climate finance Industry Policy Classification, regression, and supervised learning Generative modeling Uncertainty quantification and robustness Unsupervised and semi-supervised learning	
	► Abstract and authors: (click to expand)		

<https://www.climatechange.ai/papers>

Ressource Wiki

MarcusV Talk Preferences Beta Watchlist Contributions Log out

Main page Discussion Read Edit Edit source View history More ▾ Search Climate Change AI Wiki

Welcome to the Climate Change AI Wiki

This is the approved revision of this page, as well as being the most recent.
This revision was approved by MarcusV.

The aim of this wiki is to help foster impactful research to tackle climate change, by identifying areas for a useful implementation of machine learning (ML). The scope of machine learning solutions to address climate change goes far beyond the intersection we address here. Tackling climate change requires cooperation between diverse stakeholders, domain scientists, and action in many forms. Whether you are a machine learning researcher looking to apply your skills to combat climate change, or an early career researcher aiming to have a meaningful impact in your career, a practitioner in one of the domain science areas looking to apply ML to your problem, or for any other reason you are interested in the intersection of climate change and ML, we hope these pages can help inform and facilitate your research!

We welcome your contributions and feedback! This wiki is maintained and moderated by members of CCAI. See [guide on contributing to the CCAI Wiki](#). Feel free to start suggesting changes to any of the following pages!

If you would like to discuss your ideas for additional pages or gain moderator privileges, feel free to reach out to CCAI at wiki@climatechange.ai.

Contents [hide]

- 1 Quick start
- 2 Topics by Application Area
 - 2.1 Mitigation
 - 2.2 Adaptation
 - 2.3 Climate science
 - 2.4 Tools for Action
- 3 Topics by Cross-cutting Theme

Quick start [edit | edit source]

- General Resources page
- Tackling Climate Change with Machine Learning: review paper or explore its interactive summary!
- Explore the Climate Change AI Workshop papers!

Topics by Application Area [edit | edit source]

The pages below provide overviews and resources on topics at the intersection of climate change and machine learning. Mitigation refers to reducing emissions in order to lessen the extent of climate change, while adaptation refers to preparing for the effects of climate change. We also provide overviews of various tools for action -- such as policy, economics, education, and finance -- that can help enable mitigation and adaptation strategies.

Mitigation [edit | edit source]

- Electricity systems
- Transportation

<https://wiki.climatechange.ai/>



Connect with the wider community!

Join us: <https://community.climatechange.ai/>

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Learning

CCAI @ ICML2021



Welcome to the Climate Change AI community!

We are excited to have you here!

This is a place to connect, share and discuss all things related to climate change & machine learning 🌎🔥💻

If this is your first time here, you might want to head over to the [Hello](#) channel and introduce yourself.

Trending Posts

-  Guide to Climate Change & Energy for High School students Konstantin Klemmer
-  JuliaCon2021 Parth Kanani
-  Howdy! Deval Pandya
-  Special Issue on AI and Disaster Management Eva Thelisson
-  Save the date ! AI Governance Forum - 8/9 December 2021 at Arboretum, Switzerland Eva Thelisson

Join #save-the-climate on CorreAid Slack



CorreAid ▾

+ More

▼ Starred

- Benjamin Fries
- Frie
- Liam Bailey

▼ Channels

- # berlin-cc-watchparty
- ↳ correaid-mentoring
- # correcon
- # datadialogue_topic2_micro...
- # ds-educational-challenge
- # events_and_conferences
- # fundraising
- # general
- # help
- # jobs
- # lc-berlin
- # lc-berlin-bookclub
- # lc-berlin-genderandmobility
- # lc-berlin-outreach
- ↳ machine-learning-worksho...
- # oodm
- ...
- # save-the-climate

save-the-climate ▾ <https://hackmd.io/WZYsnpHbTbyr5-tikRWuFQ>

+ Add a bookmark

Learning to See and Act in the Era of Climate Break Tuesday, November 2nd ▾
wo 24 nov. 2021 18:30: The climate crisis is one of the defining issues of our time. The actions we take – or not take – now will determine the conditions for life not only for us and our children, bu

Waar Wanneer
Online evenement wo 24 nov. 2021 18:30



Fabian Dablander 2:52 PM joined #save-the-climate along with Garret.

Wednesday, November 3rd ▾

Marcus Voß 10:15 PM Hey Climate Change AI is offering a great new format next year, a summer school on AI and Climate Change. It is for free, but given an expected large number of people interested, there is an application process (deadline Dec 17):
https://www.climatechange.ai/events/summer_school2022


Climate Change AI
Climate Change AI Summer School 2022
Climate Change AI Summer School 2022

1 1

Custom response
Slackbot 10:15 PM 1 Euro ins Phrasenschwein!

Message #save-the-climate

Message input field with rich text editor icons: bold, italic, underline, etc.

Berlin-based Project: Q-Trees

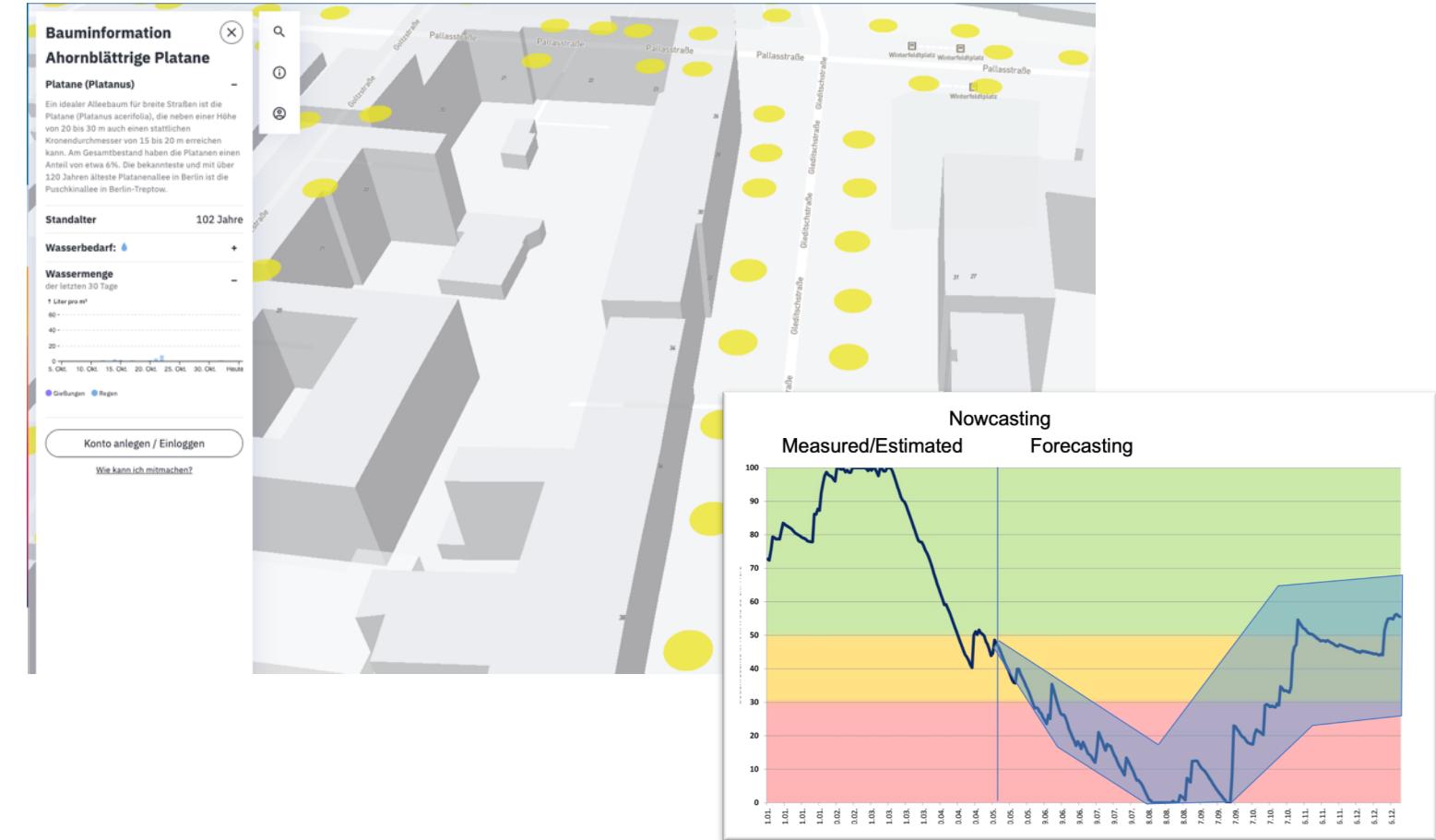
AI for Climate Change Adaption of Urban Trees



Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages



Check out (in a few weeks): <https://qtrees.ai/>

Thanks!

www.climatechange.ai



@ClimateChangeAI