Using AI to Study Environmental Risk

Scott Hosking + Risa Ueno

@scotthosking @risno_bas

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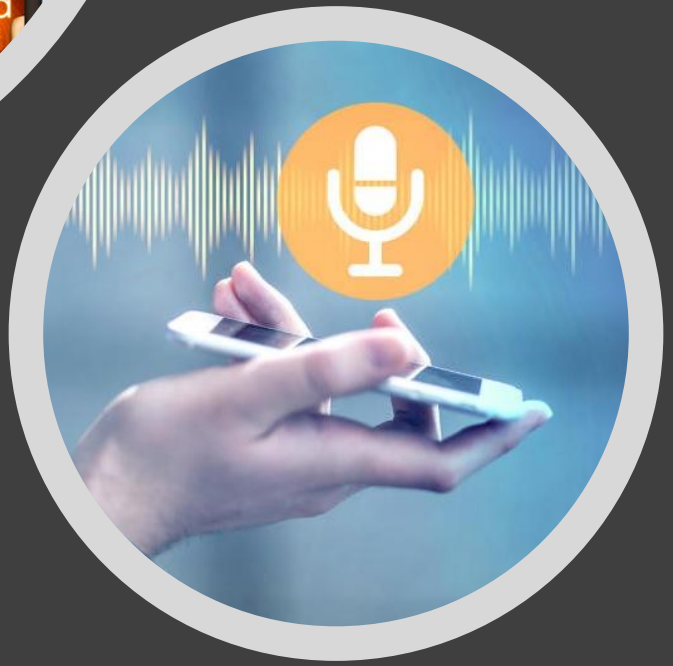
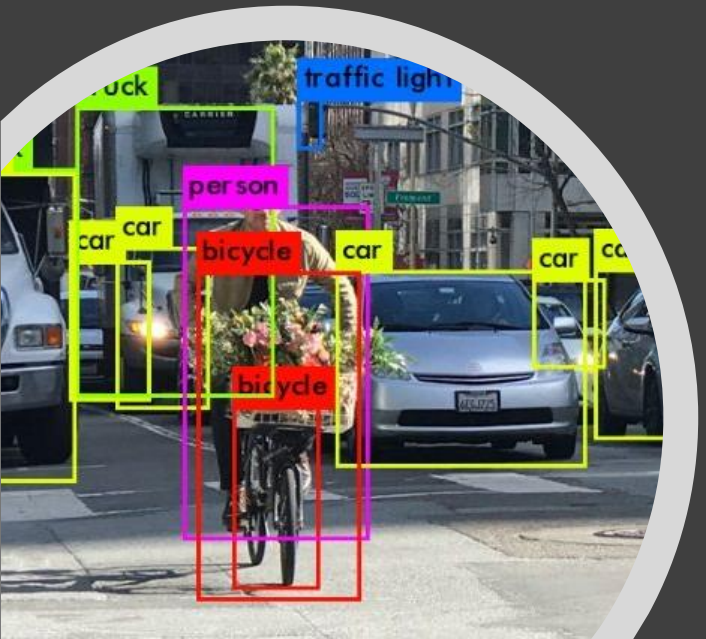
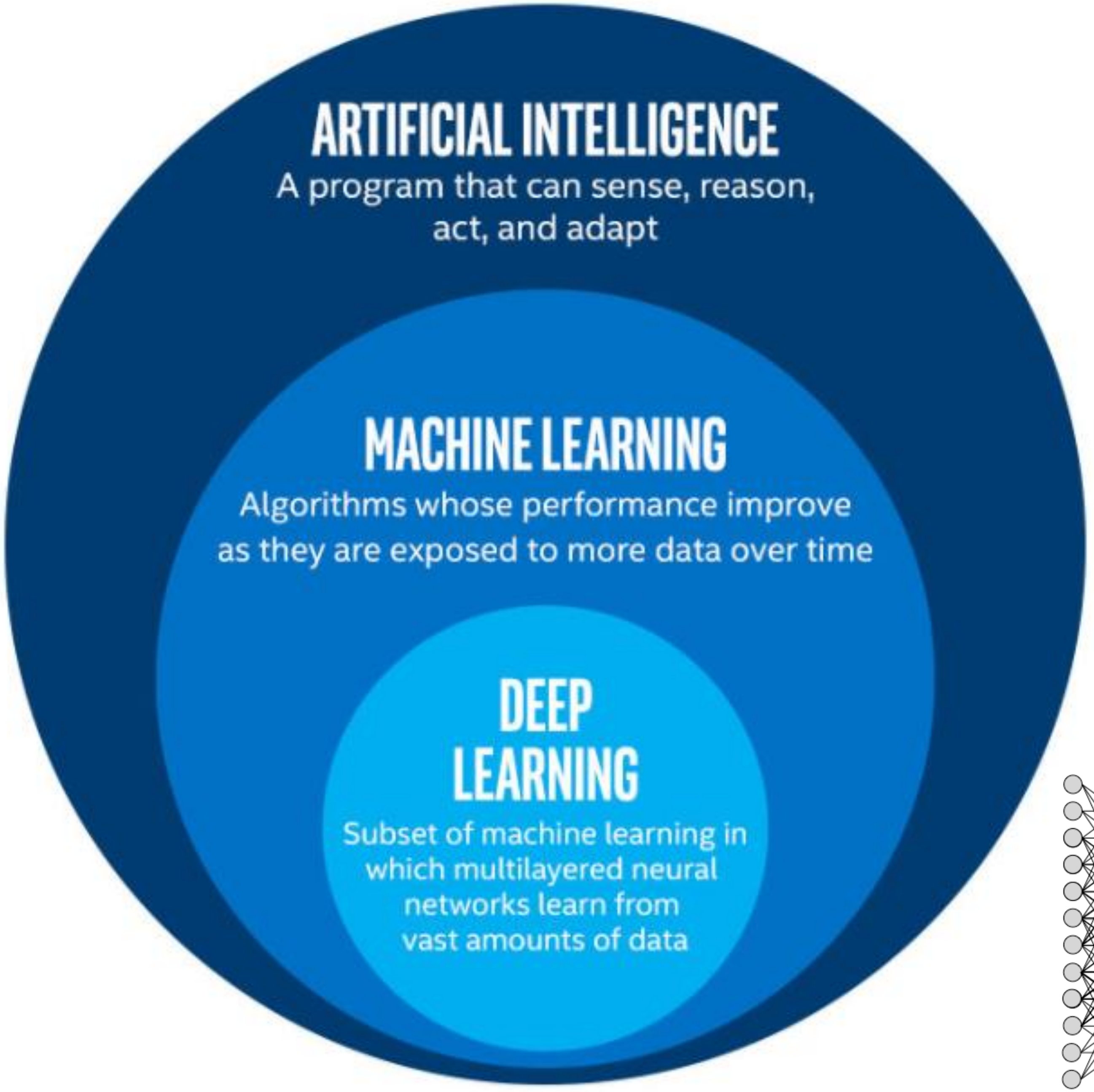
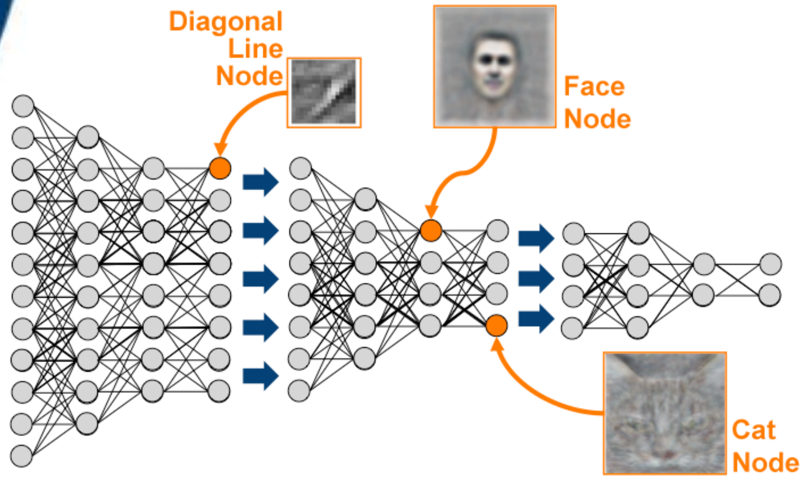




AI in our everyday lives


ARTIFICIAL INTELLIGENCE
A program that can sense, reason, act, and adapt
MACHINE LEARNING
Algorithms whose performance improve as they are exposed to more data over time
DEEP LEARNING
Subset of machine learning in which multilayered neural networks learn from vast amounts of data


Good email
spam


Diagonal Line Node
Face Node
Cat Node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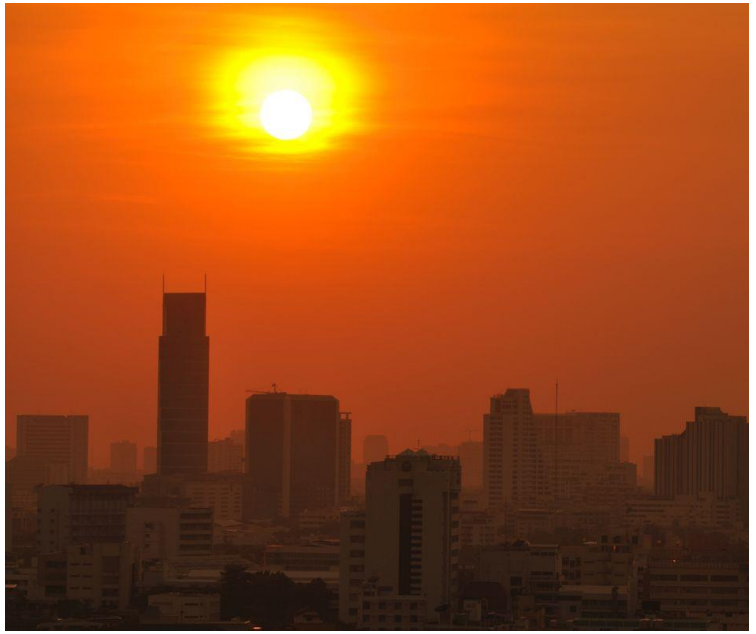
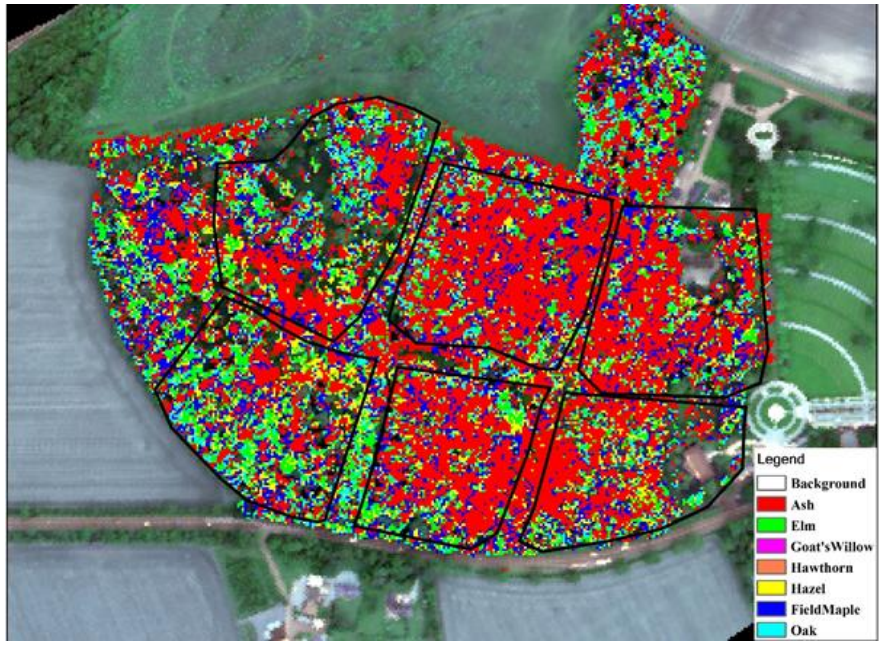
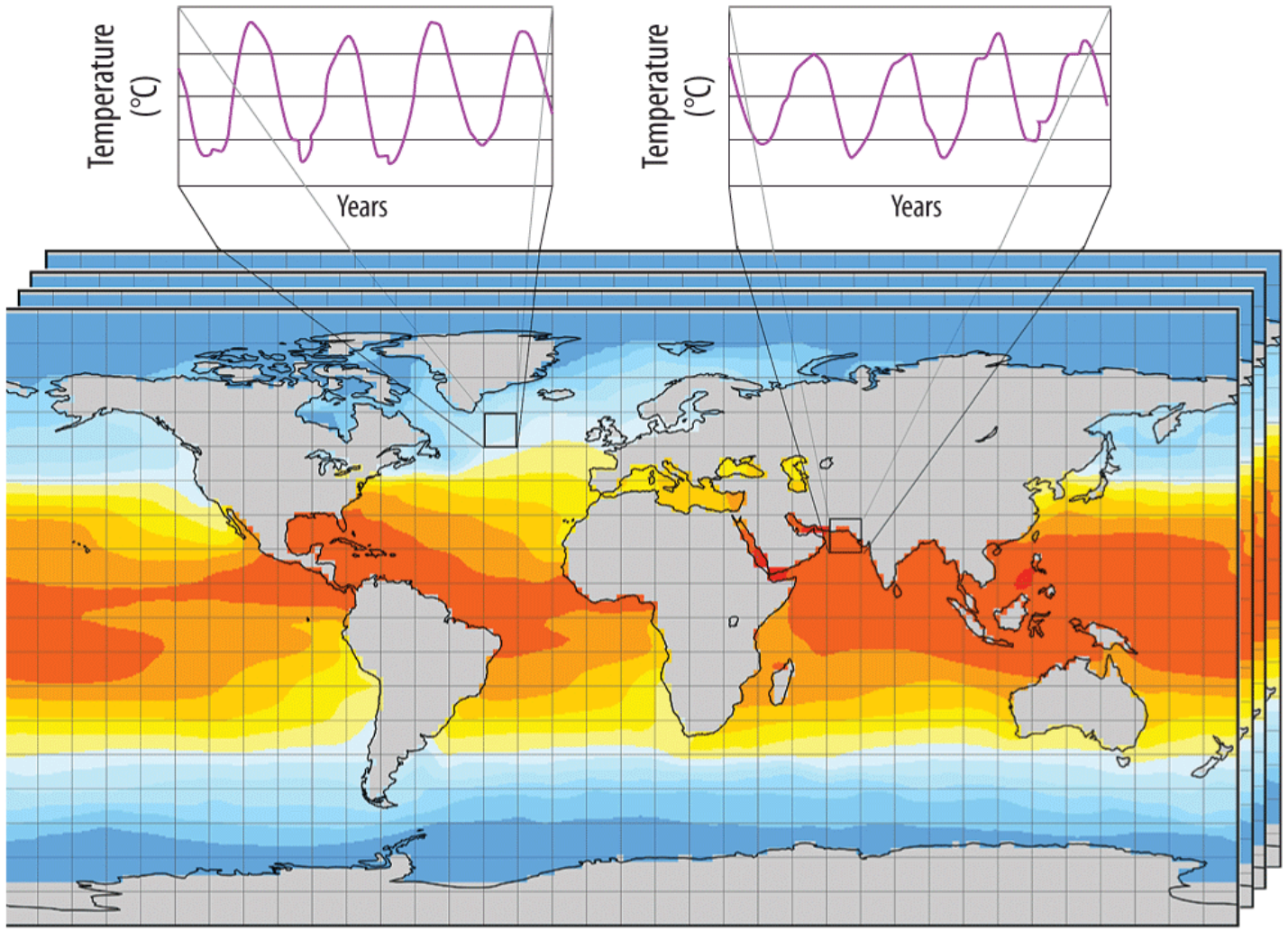




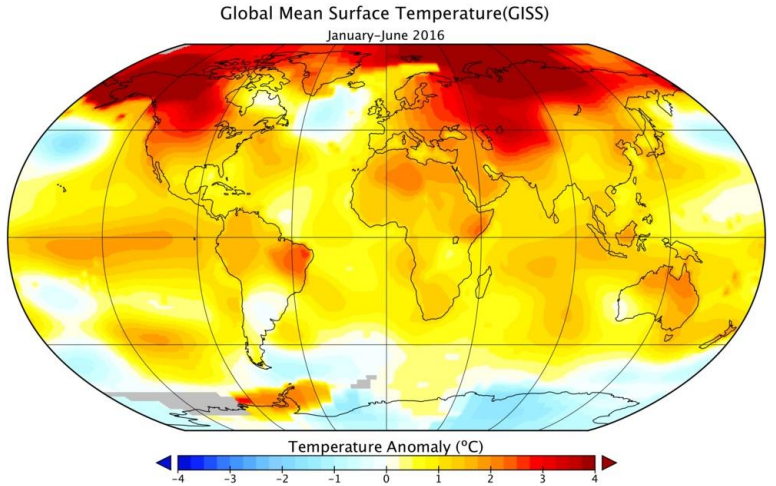
AI in Environmental Science @ Cambridge



Data is the fuel powering AI

Large-scale climate change

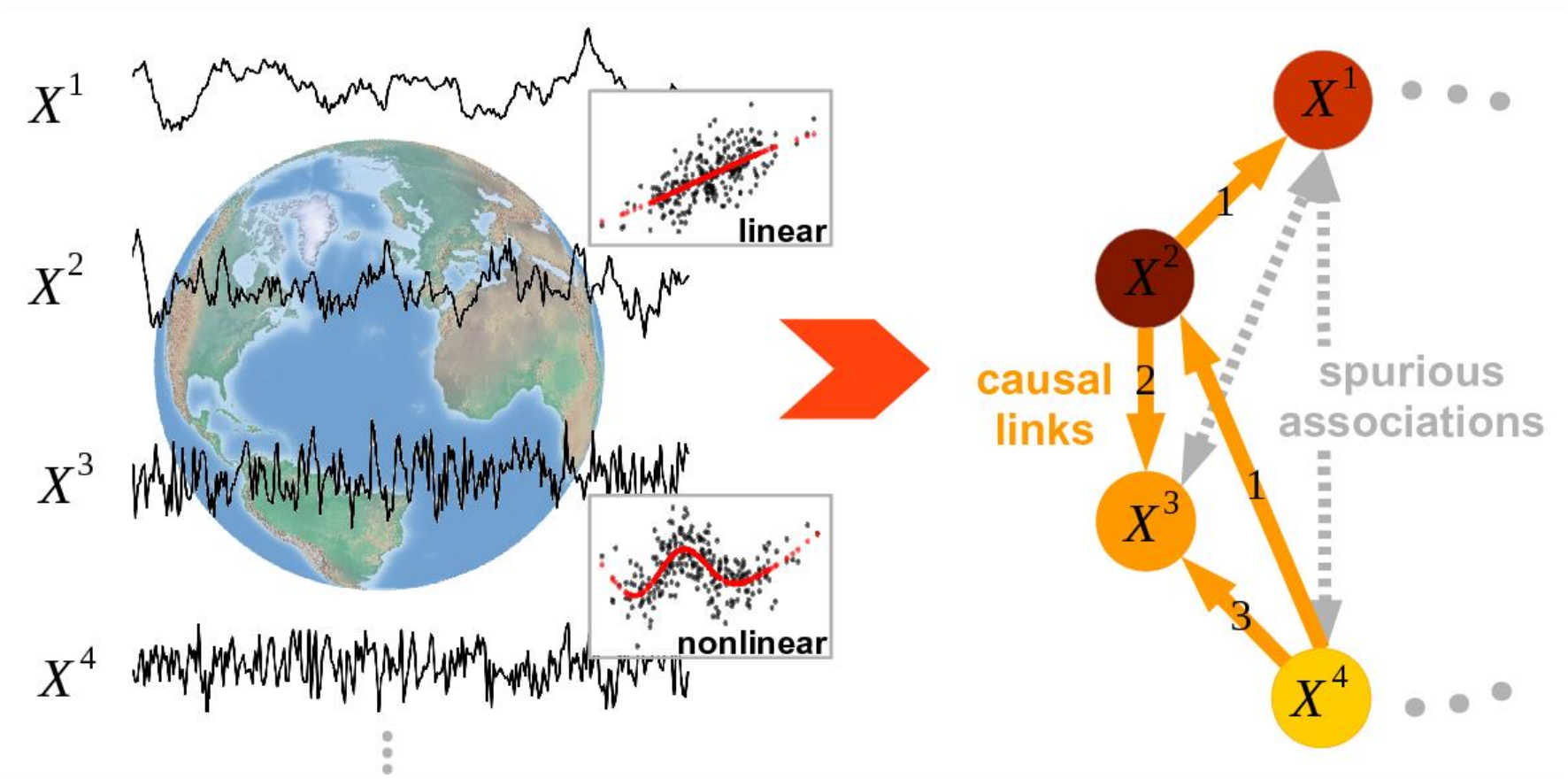
- Climate change is non-uniform



Localised extreme events

- Impacts are non-linear

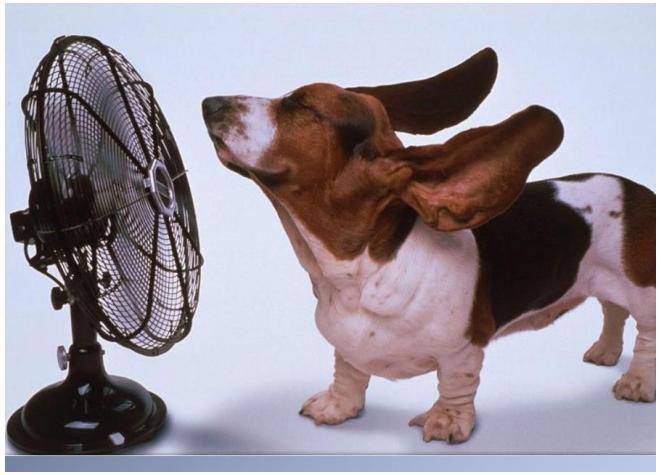
The challenge is in learning how timeseries are related to one another



Source: *https://climateinformaticslab.com/research/*

Intelligently combine datasets

e.g., predicting future energy usage from air conditioning



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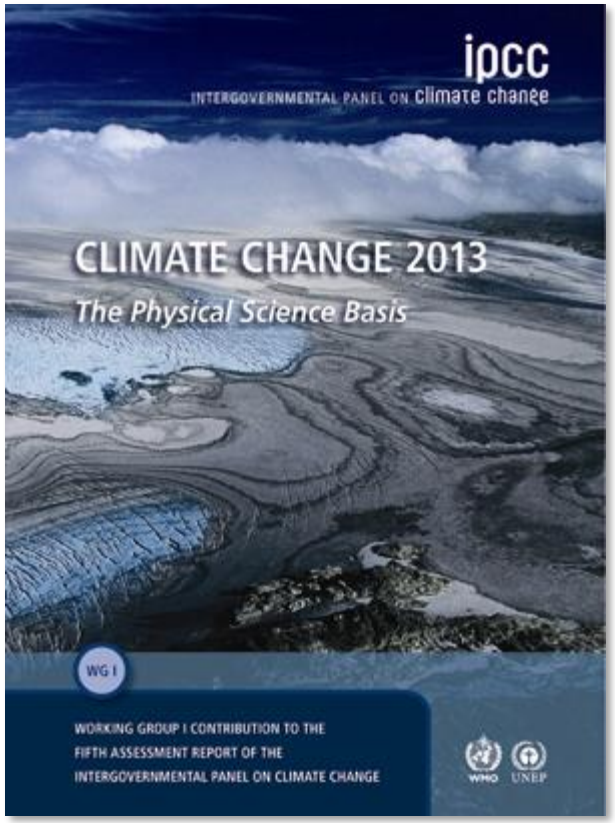
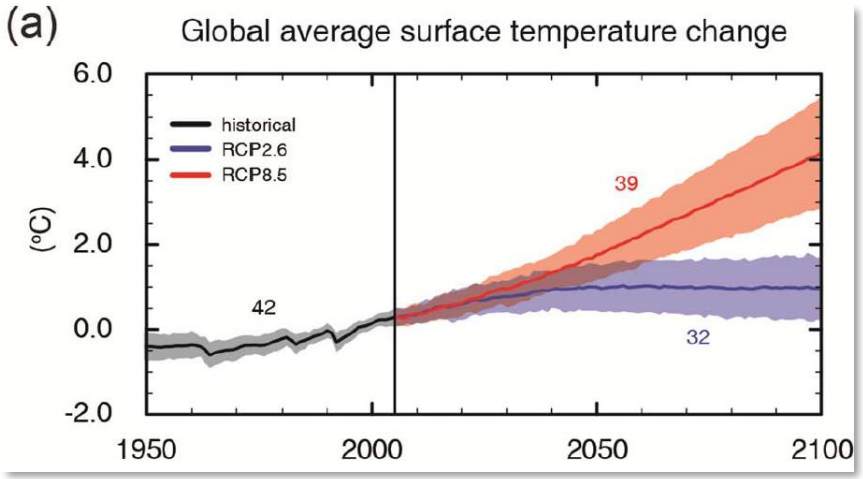
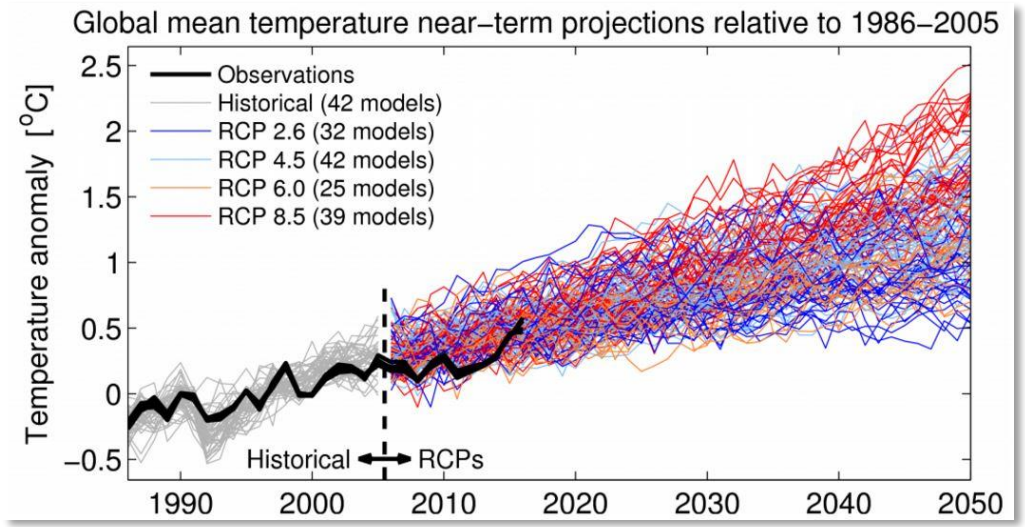
Intergovernmental Panel on Climate Change (IPCC)



42 models from modelling centres based around the world





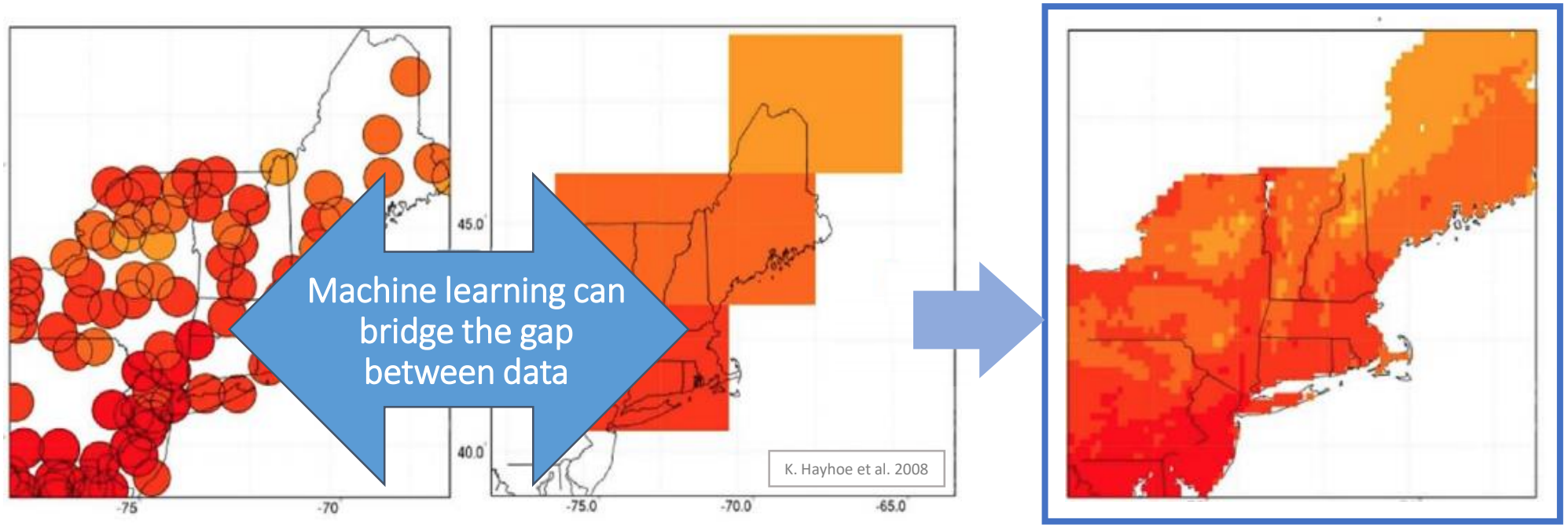
We require localised and <u>specific</u> climate-related information

Climate Downscaling

Observation data

Climate simulations

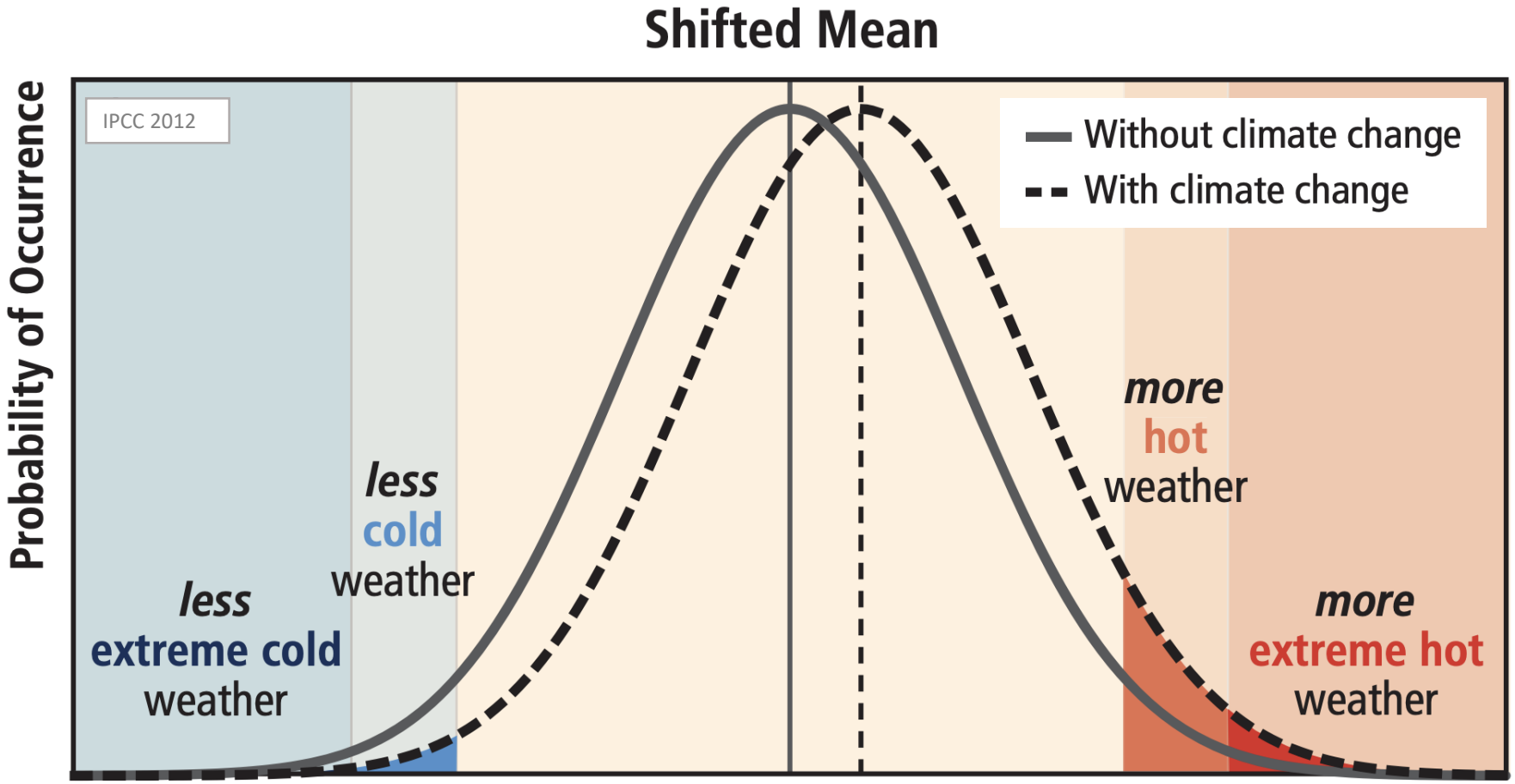
Local scale projections



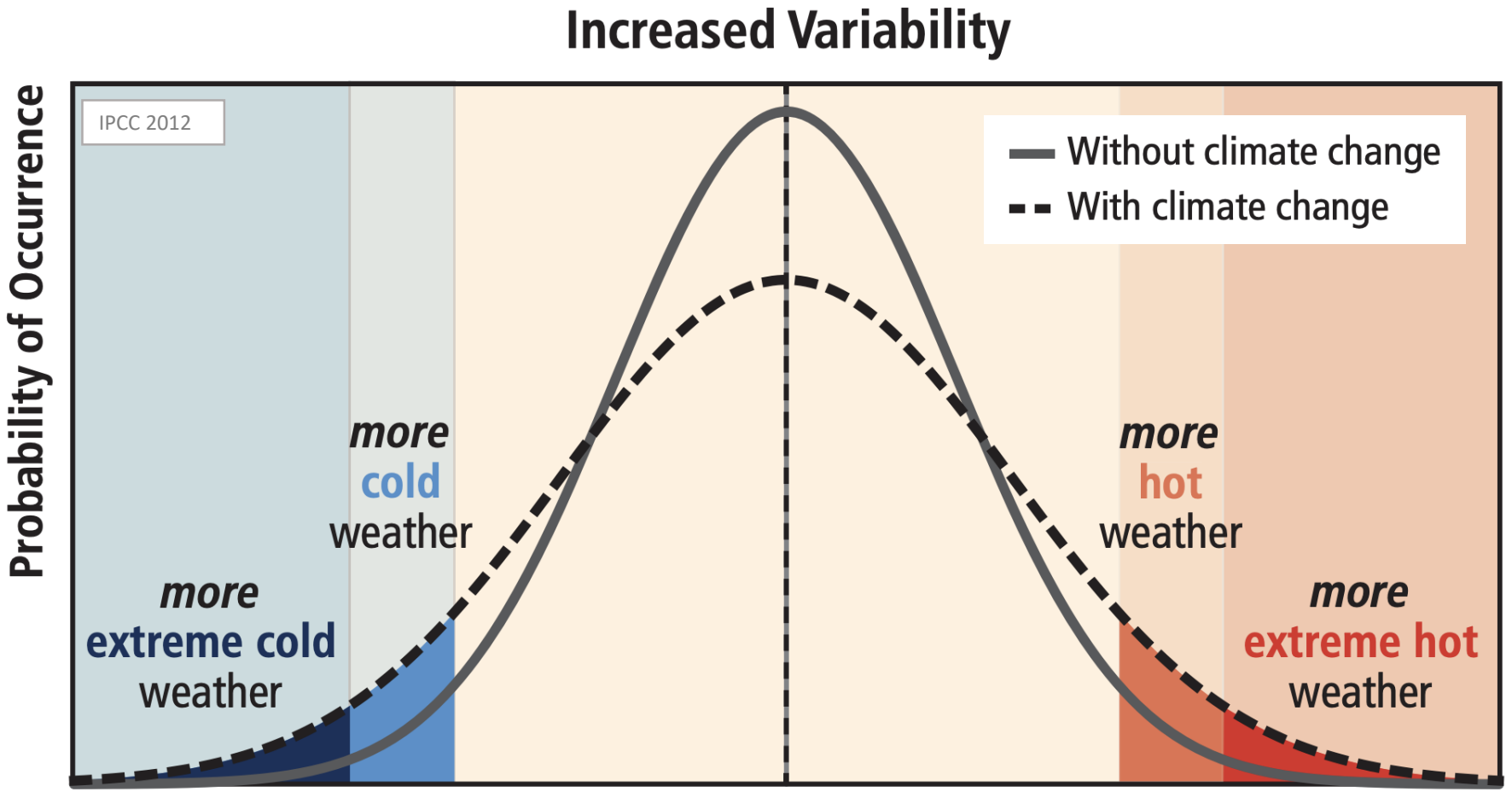
Local information
e.g. weather station measurements

Encodes scientific knowledge
Can simulate future climate
"Big data"

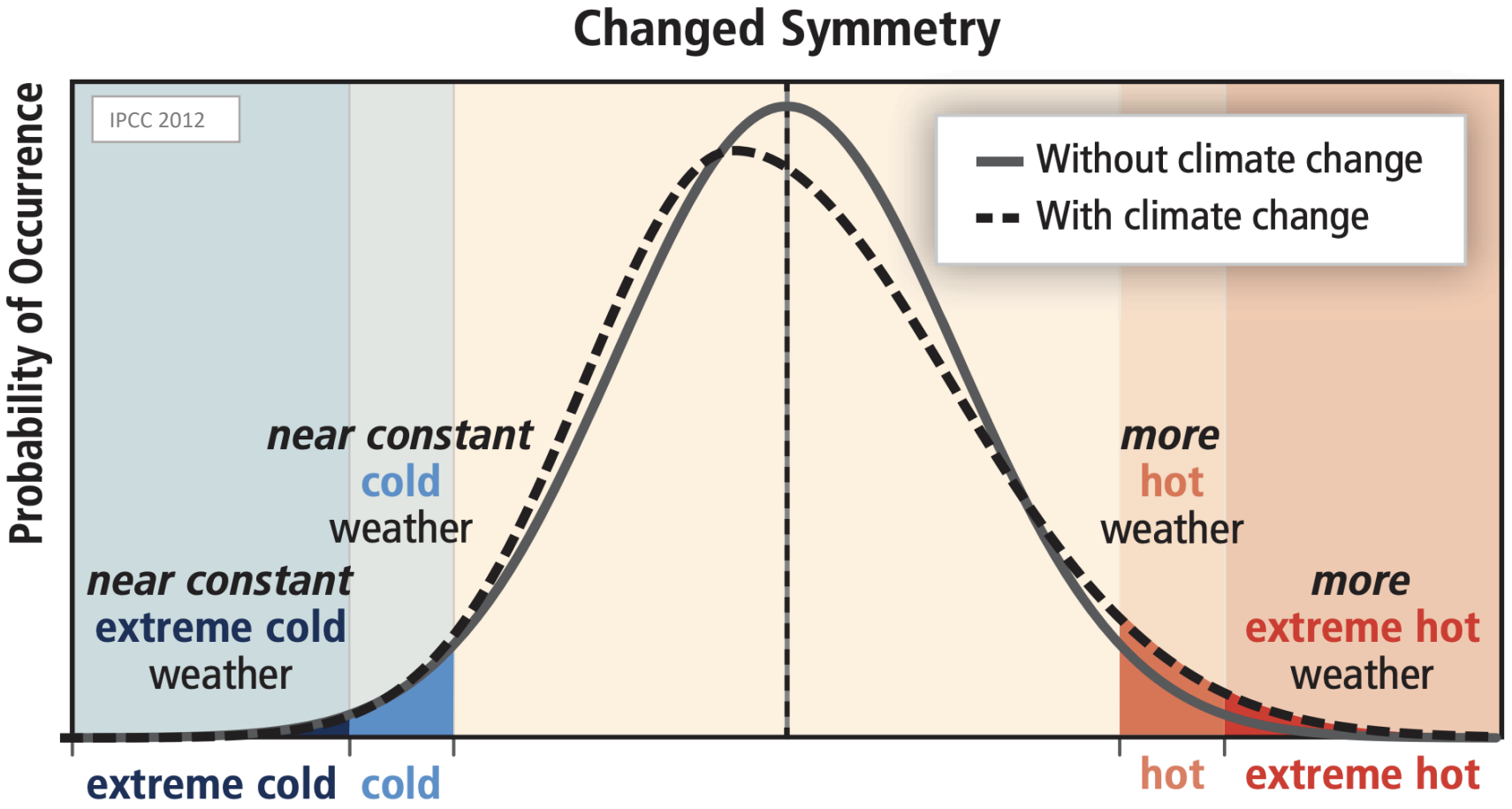
This can tell us about possible *distribution* changes of climate:



Or will we see more extremes on both ends?



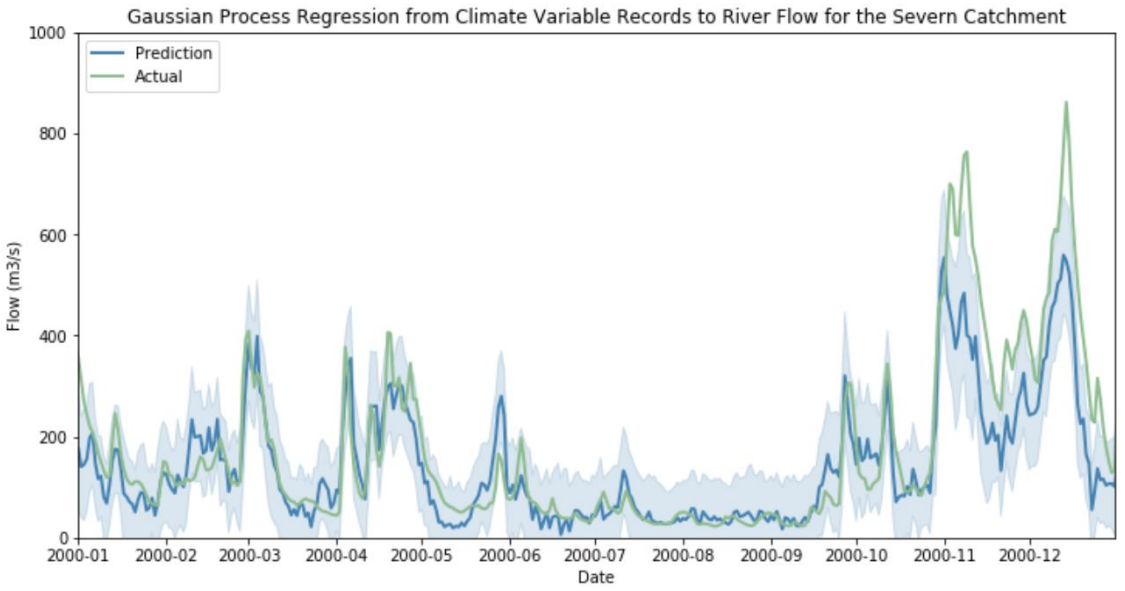
Distribution shape may change:



Challenge: reduce uncertainty in future extremes at local scale

How will risk of flooding in major cities change in the warming world?

AI model predictions of peak flow for the River Severn at the Haw Bridge



Robert Rouse

MOTT MACDONALD

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AI for the study of Environmental Risks (AI4ER)

UKRI Centre for Doctoral Training

- New £6m PhD Programme (2019-2027)
- 50 students over 5 cohorts
- Aim: to develop future leaders in *application of AI for the study of Environmental Risk*
- 30+ industrial partners
- Team challenges, hackathons

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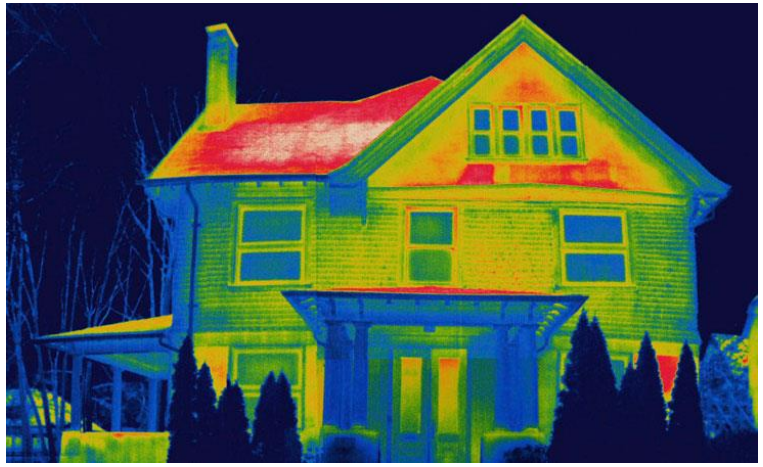

Future energy usage related to temperature extremes

Future climate related risks to agriculture

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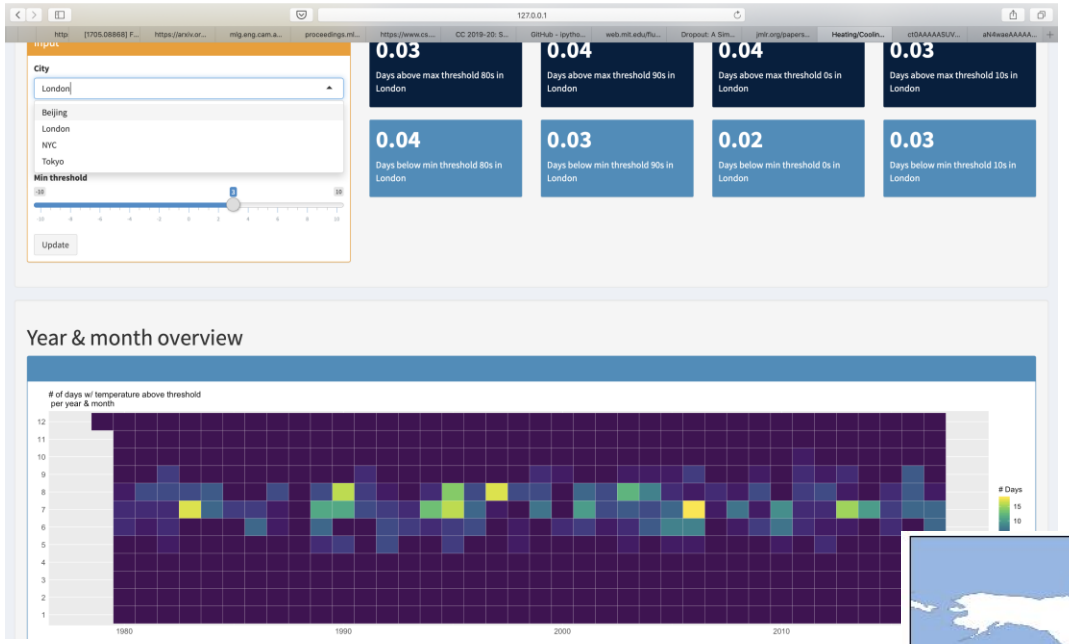
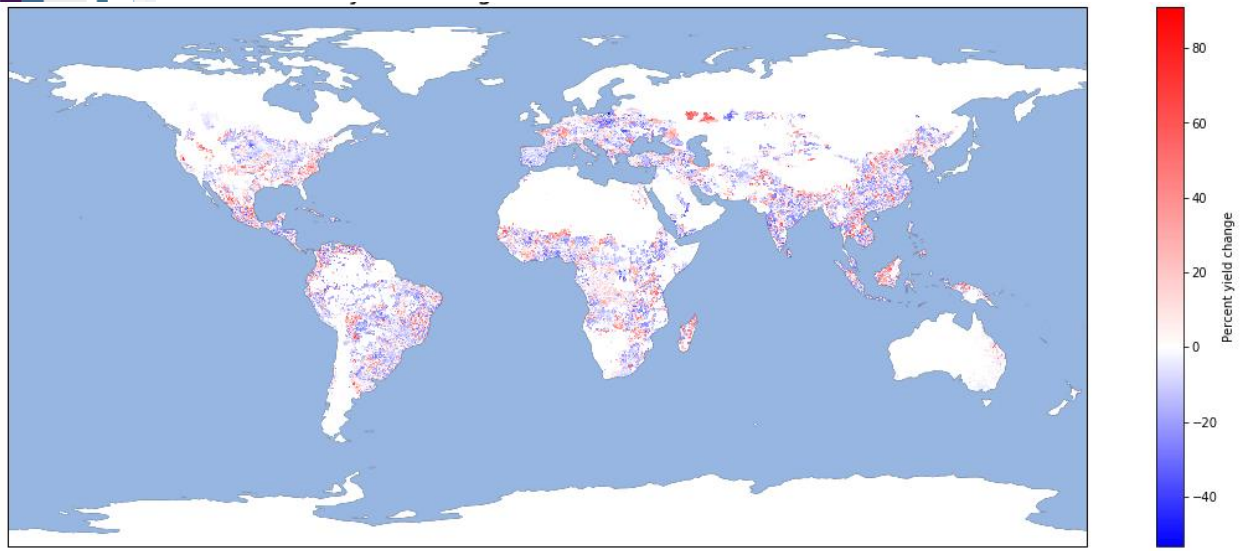


Web interface to visualize proportion of extreme days per month within cities

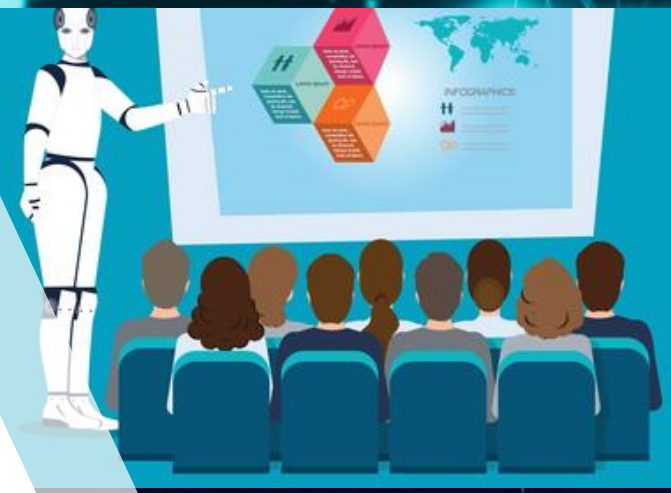
predicted changes in maize yield due to climatic factors for the year 2040



5-year vision

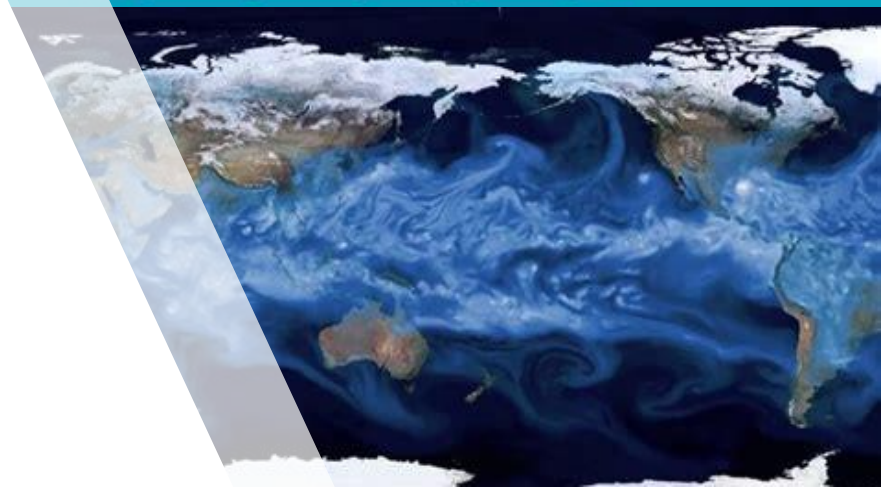
Environmental Data Platforms to aggregate data and apply AI

- Make it easier to extract information to aid decision-making



Explainable – AI tools to tell us '*why*' they work

- increasing confidence for use in business and policy



Finer detail climate simulations

- capture extreme weather events and impact on supply-chain nodes

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Thank you

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