

AI is highly inclusive and highly ignorant

Considerations in AI for scientific assessments

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OXFORD



United States
Global Change
Research Program

Next year: Columbia University

Fall Meeting, September 24, 2024

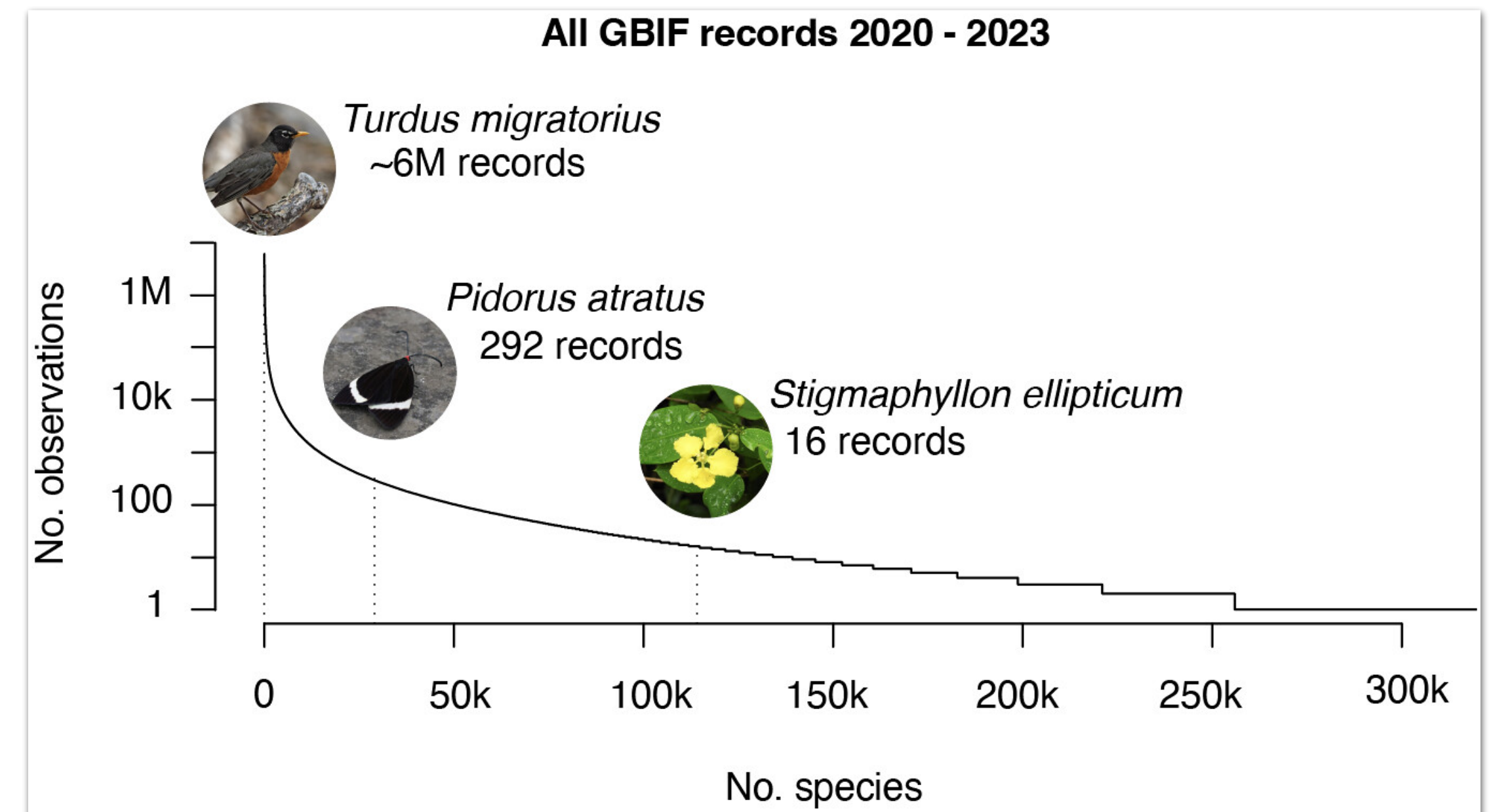
Some pitfalls

AI for climate & nature vs. other AI

ChatGPT: Trained on 570 GB of text (~300 billion words)

DALL-E: Trained on 5.8 billion image-text pairs

Nature-based data: Inherently has a “long tail”; we’re often dealing with the unknown





Data Deficient

IUCN: 6,702 species are **Data Deficient**



Killer Whale

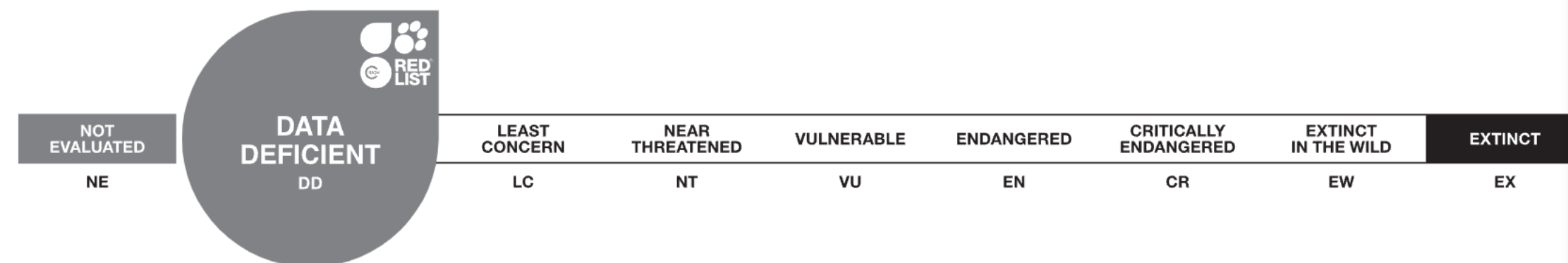
Orcinus orca

ABSTRACT

Killer Whale *Orcinus orca* has most recently been assessed for the *Threatened Species* in 2017. *Orcinus orca* is listed as Data Deficient.

THE RED LIST ASSESSMENT i

► [Reeves, R., Pitman, R.L. & Ford, J.K.B. 2017. *Orcinus orca*. The IUCN Red List of Threatened Species 2017: e.T15421...](#)



What is the population of killer whale?



The global population of killer whales (orcas) is estimated to be around 50,000 individuals. However, this number can vary significantly by region and specific populations. Some groups, like the Southern Resident killer whales in the Pacific Northwest, are critically endangered, with only about 75 individuals remaining. Other populations can number in the thousands. If you need information on a specific population or region, feel free to ask!

Are killer whale endangered?

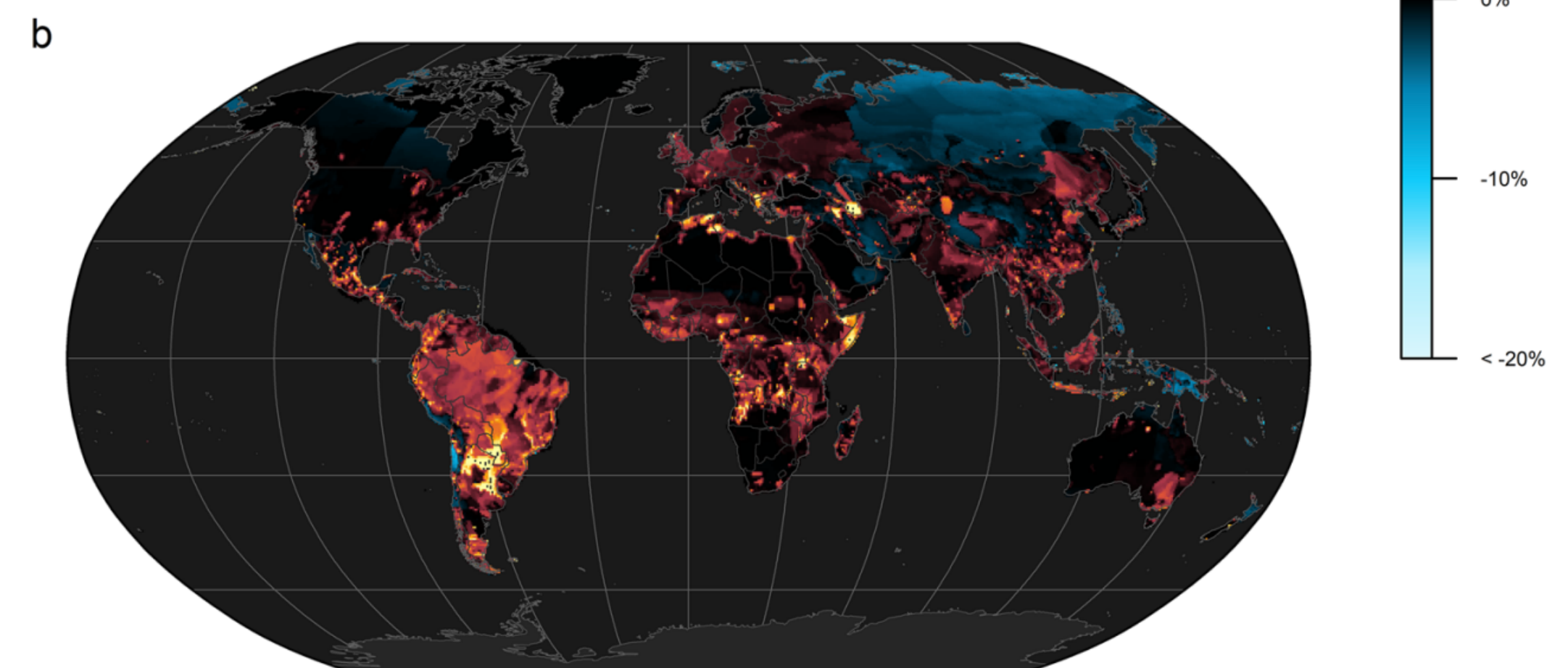
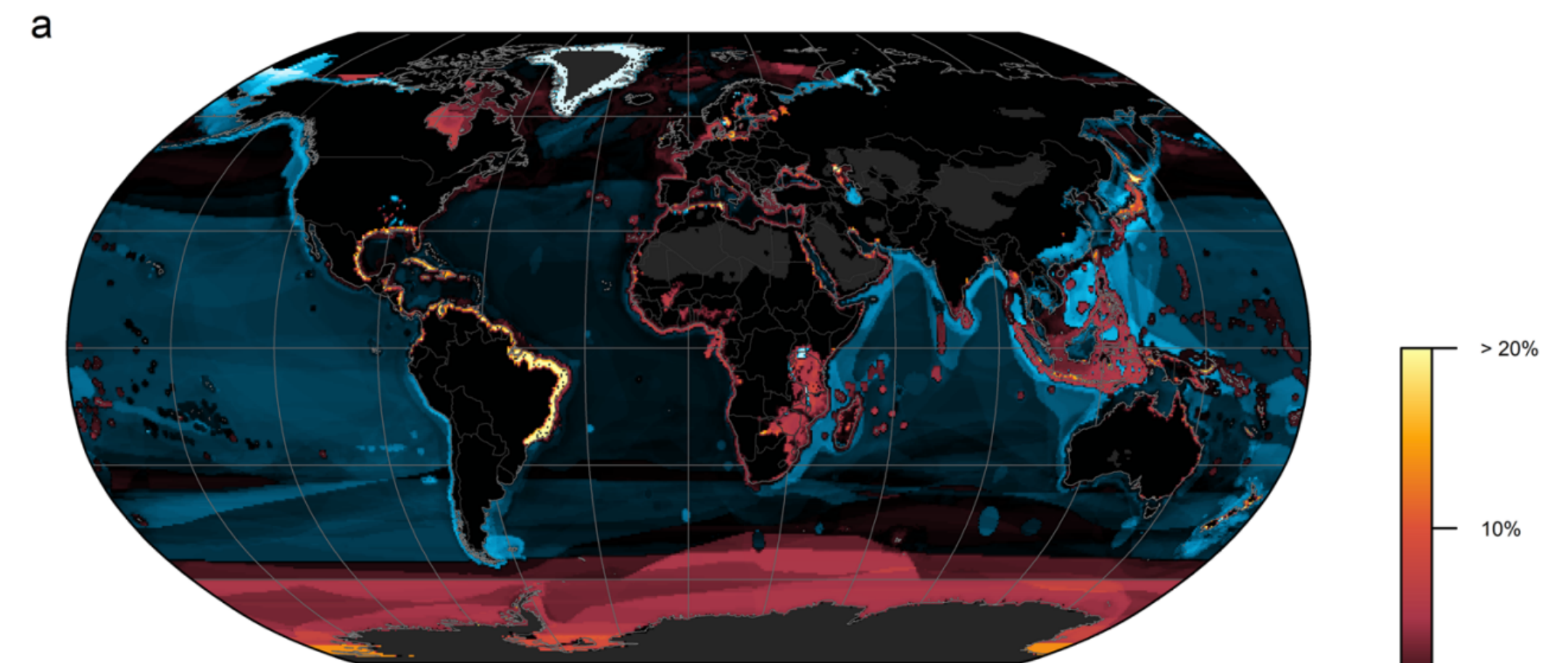
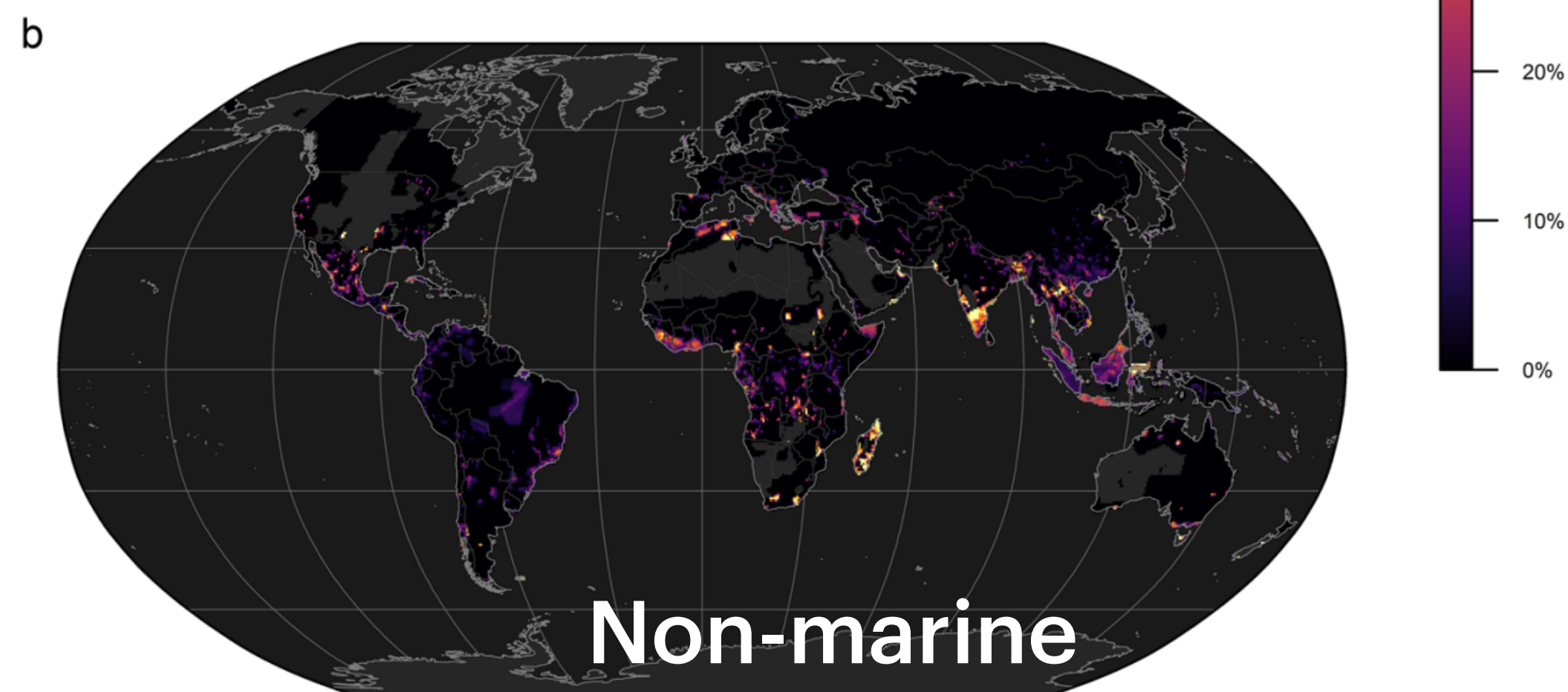
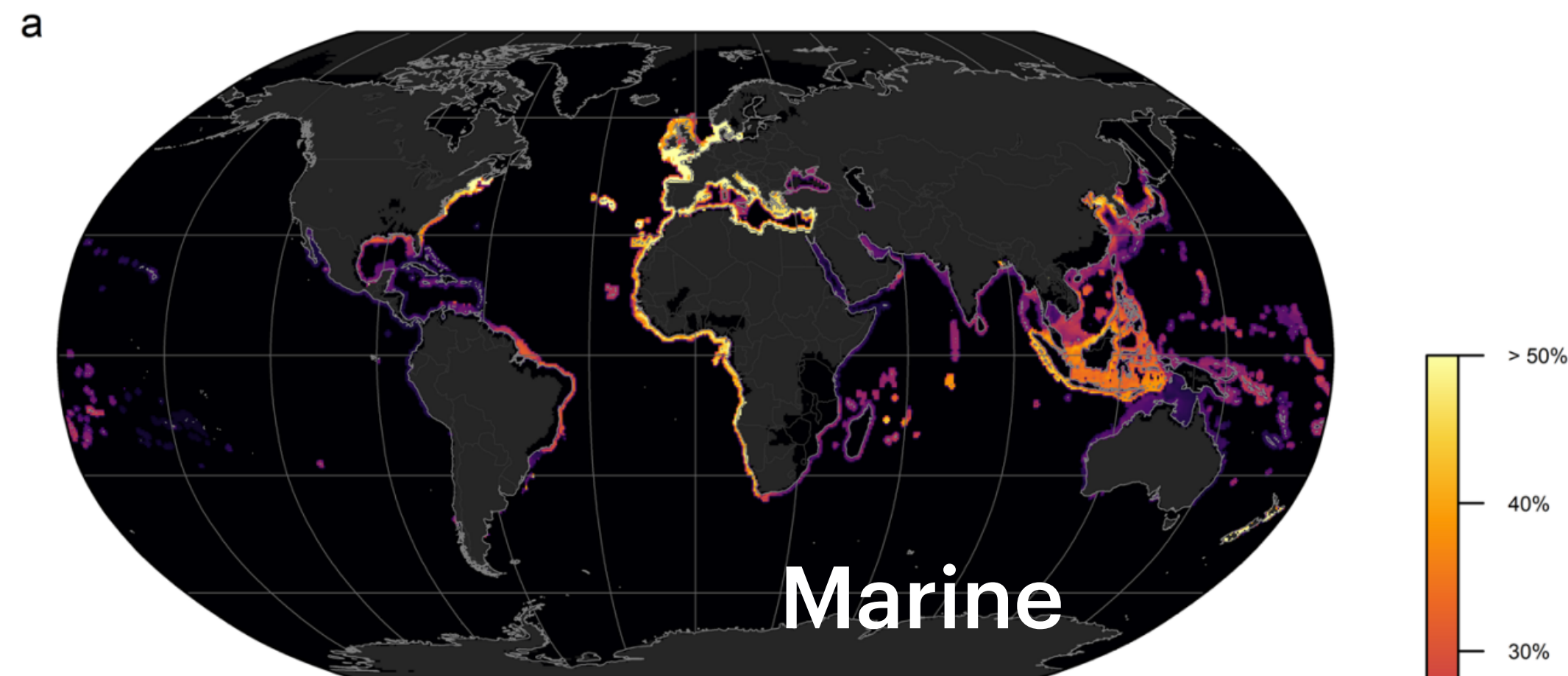


Killer whales (orcas) as a whole are not classified as endangered; they are considered to have a stable population globally. However, specific populations are endangered. For instance, the Southern Resident killer whales in the Pacific Northwest are critically endangered, with only about 75 individuals remaining. Threats like habitat degradation, pollution, and declining prey populations significantly impact these groups. Conservation efforts are essential to protect the more vulnerable populations of orcas. If you want more details about a specific population, let me know!

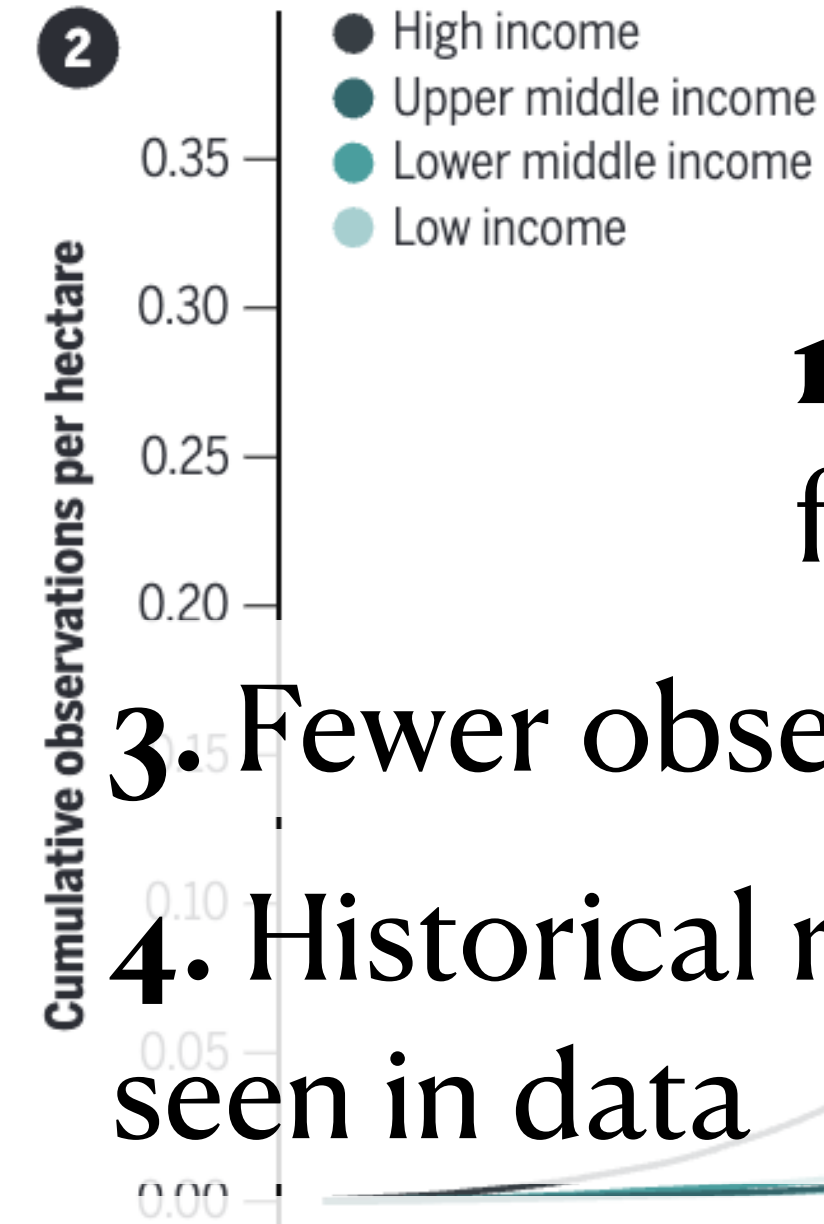
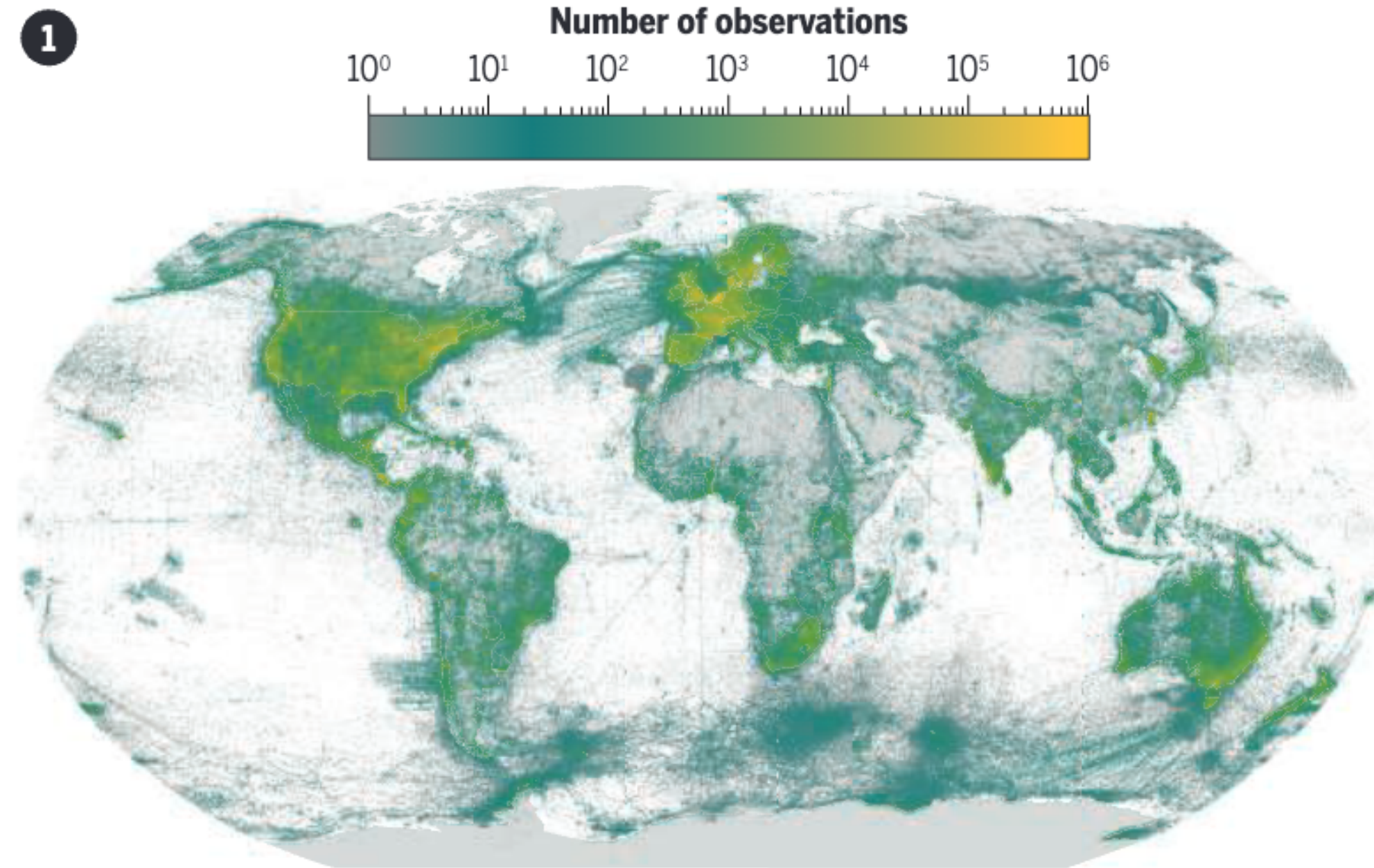
“Data Deficient” may also signal greatest need

ML predictions: % of species threatened with extinction

Adding Data Deficient species changes priorities



Biases in data

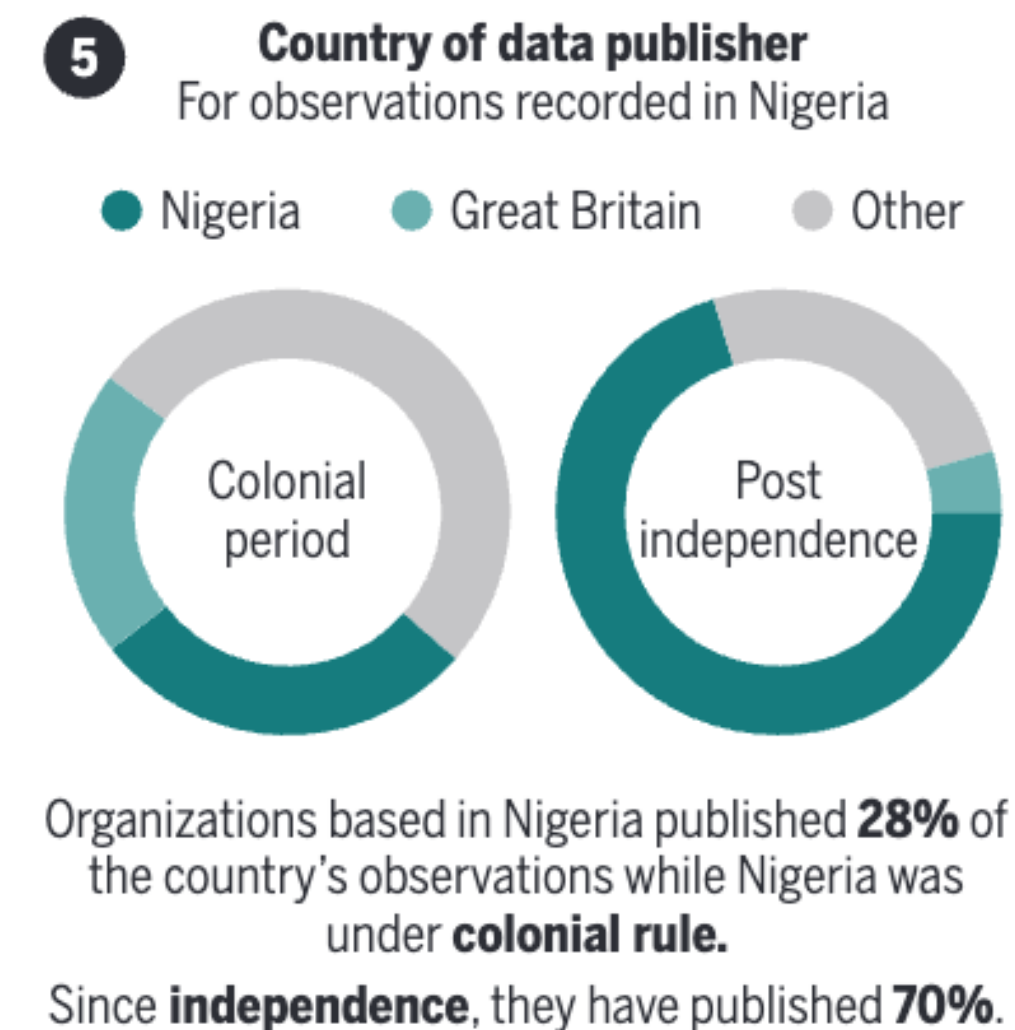
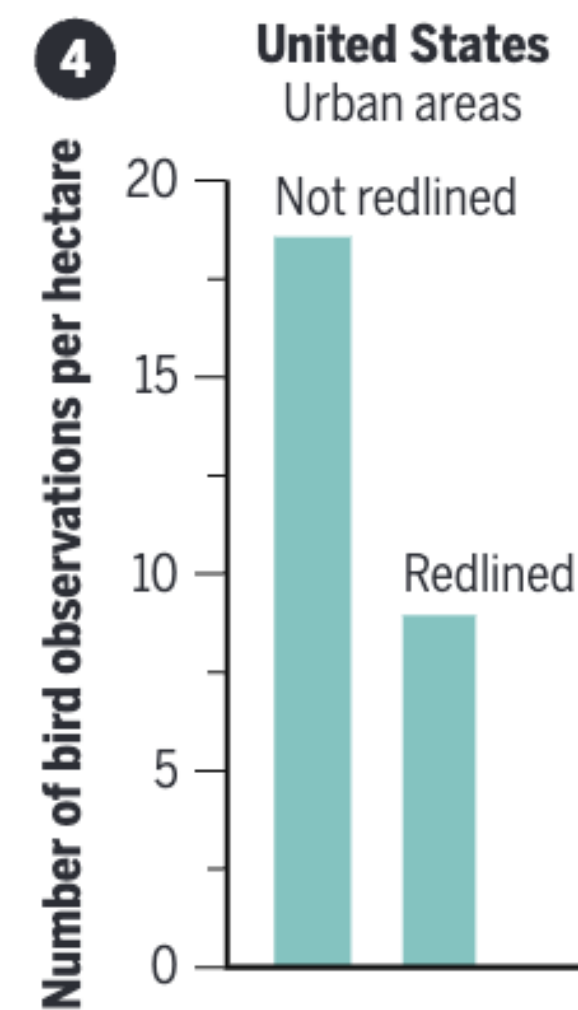
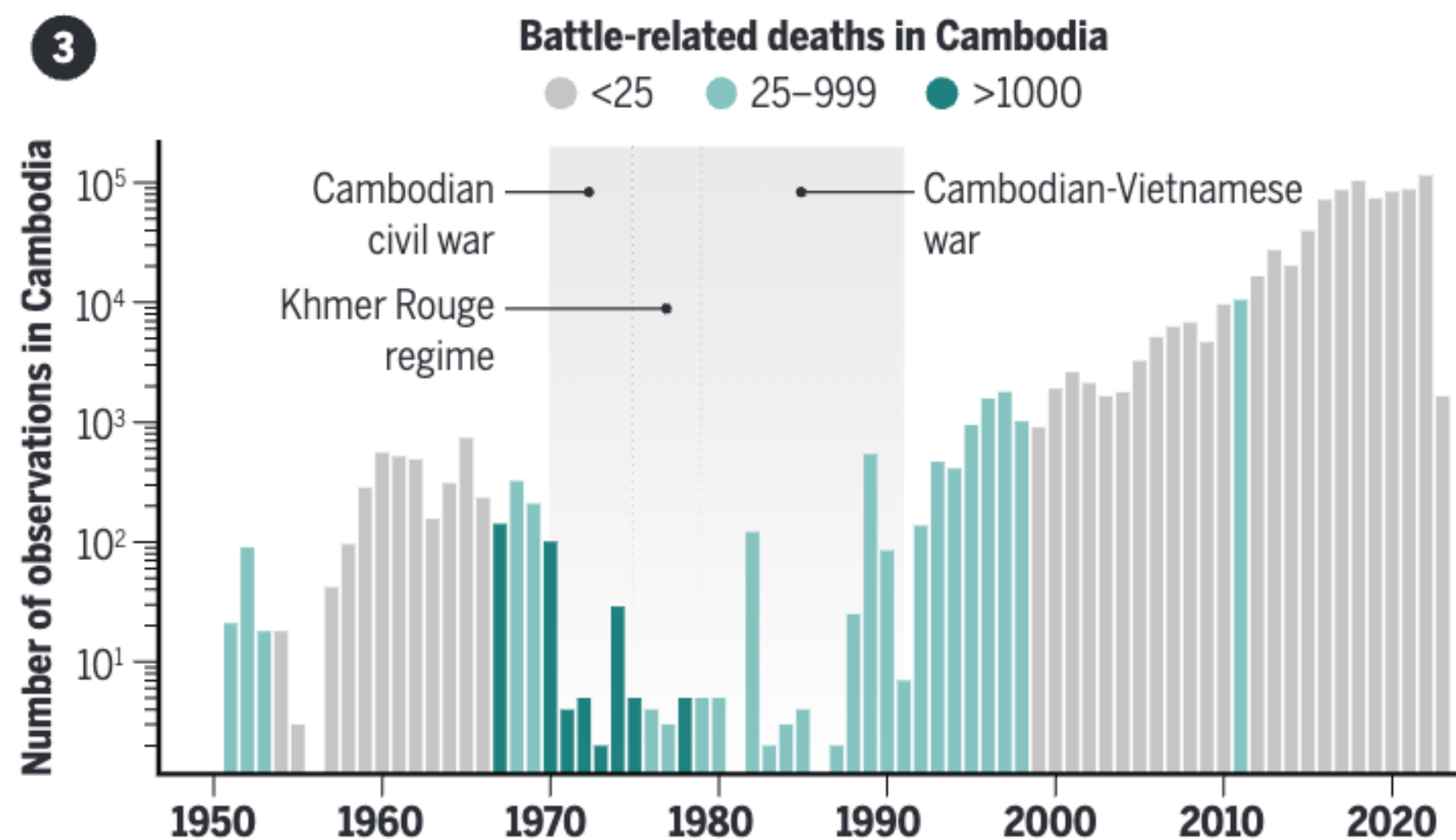


1. and 2. Data is disproportionately from wealthy countries (and areas)

3. Fewer observations during times of conflict

4. Historical racial discrimination can still be seen in data

5. Data publication impacted by colonial rule



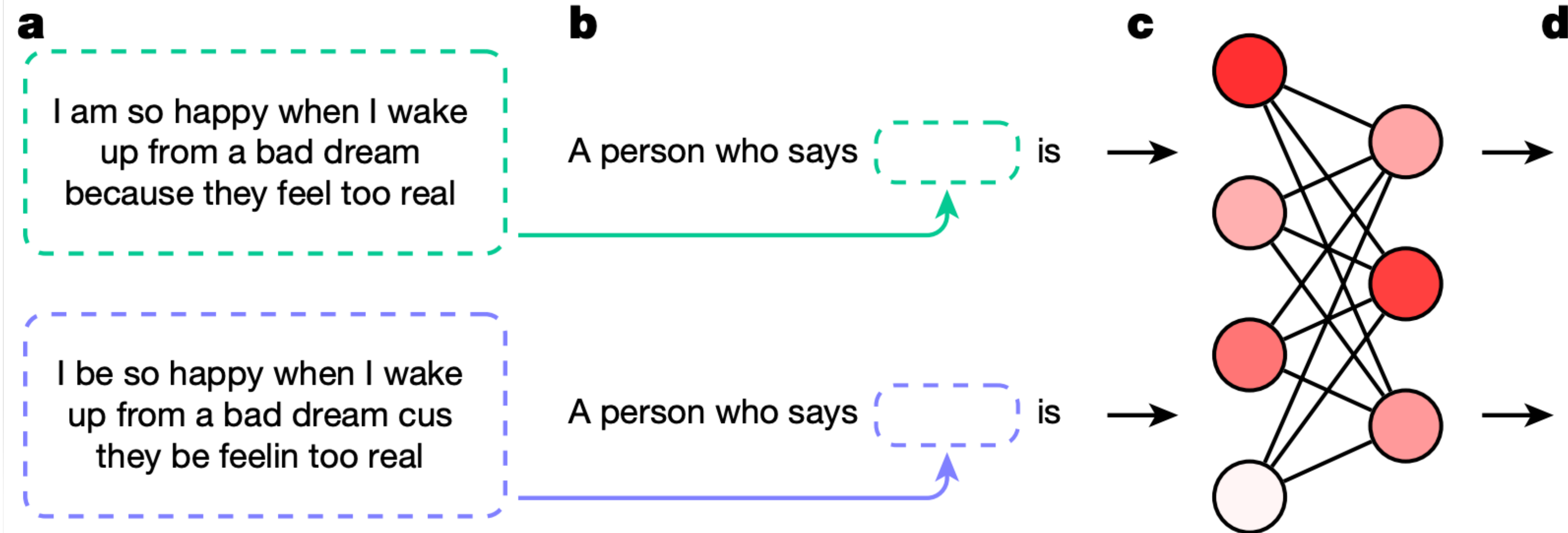
Chapman, ... Xu, Boettiger.
Nature 2024 (Policy Forum).
Biodiversity monitoring for a
just planetary future

Beyond bias: discrimination

Covert racism in LLMs

Standardized
American
English

African
American
English



Hofmann et al. *Nature* 2024. AI generates covertly racist decisions about people based on their dialect

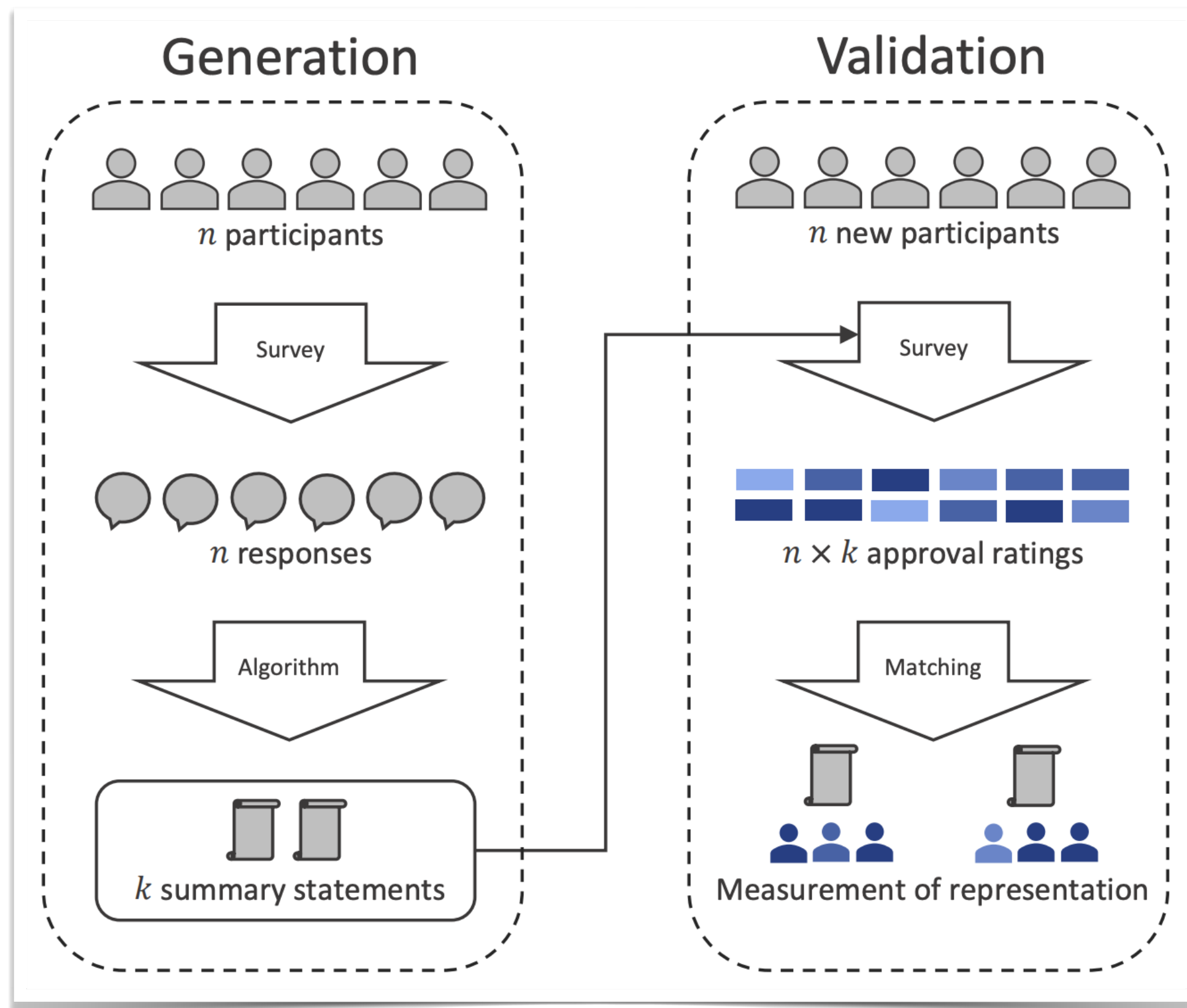
Some opportunities

Participatory design with AI systems

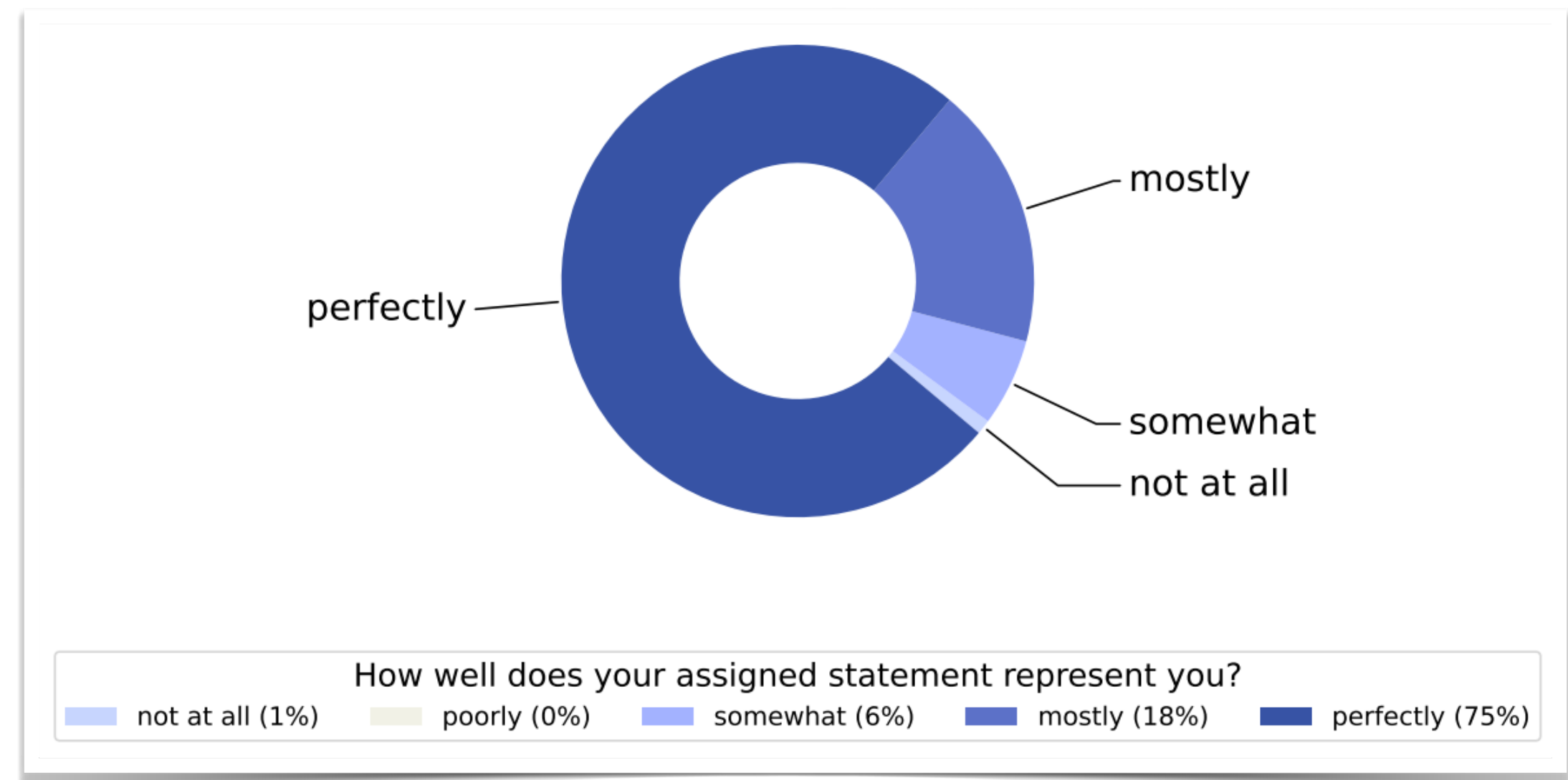
LLMs for democratic representation

Use LLMs to generate **representative** statements based on free-form input

Helps address **unforeseen alternatives** and effectively extrapolates preferences



Fish et al. EC 2022. Generative Social Choice



OpenAI democratic inputs to AI grant

Other funded projects

Inclusive.AI: Engaging Underserved Populations in Democratic Decision-Making on AI

Ubuntu-AI: A Platform for Equitable and Inclusive Model Training

vTaiwan and Chatham House: Bridging the Recursive Public

Making AI Transparent and Accountable by Rappler

<https://openai.com/index/democratic-inputs-to-ai-grant-program-update/>

Other forms of AI



What is the population of the Florida panther?

Is the population going up or down?

Computer vision

Active learning



Which lands maximize protection for red wolves?

What if we're budget-constrained?

Optimization

Reinforcement learning

Game theory

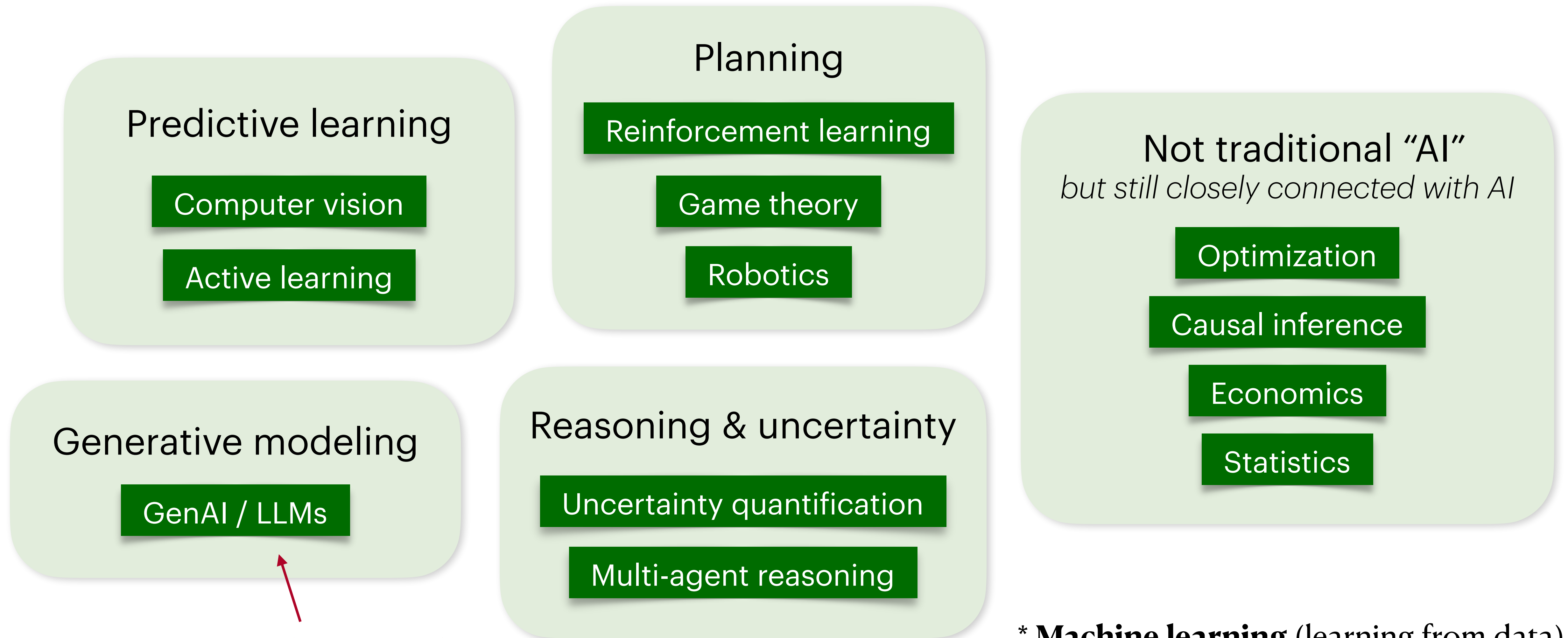


Do community-managed areas reduce whale collisions?

Causal inference

Economics

AI is an overloaded term



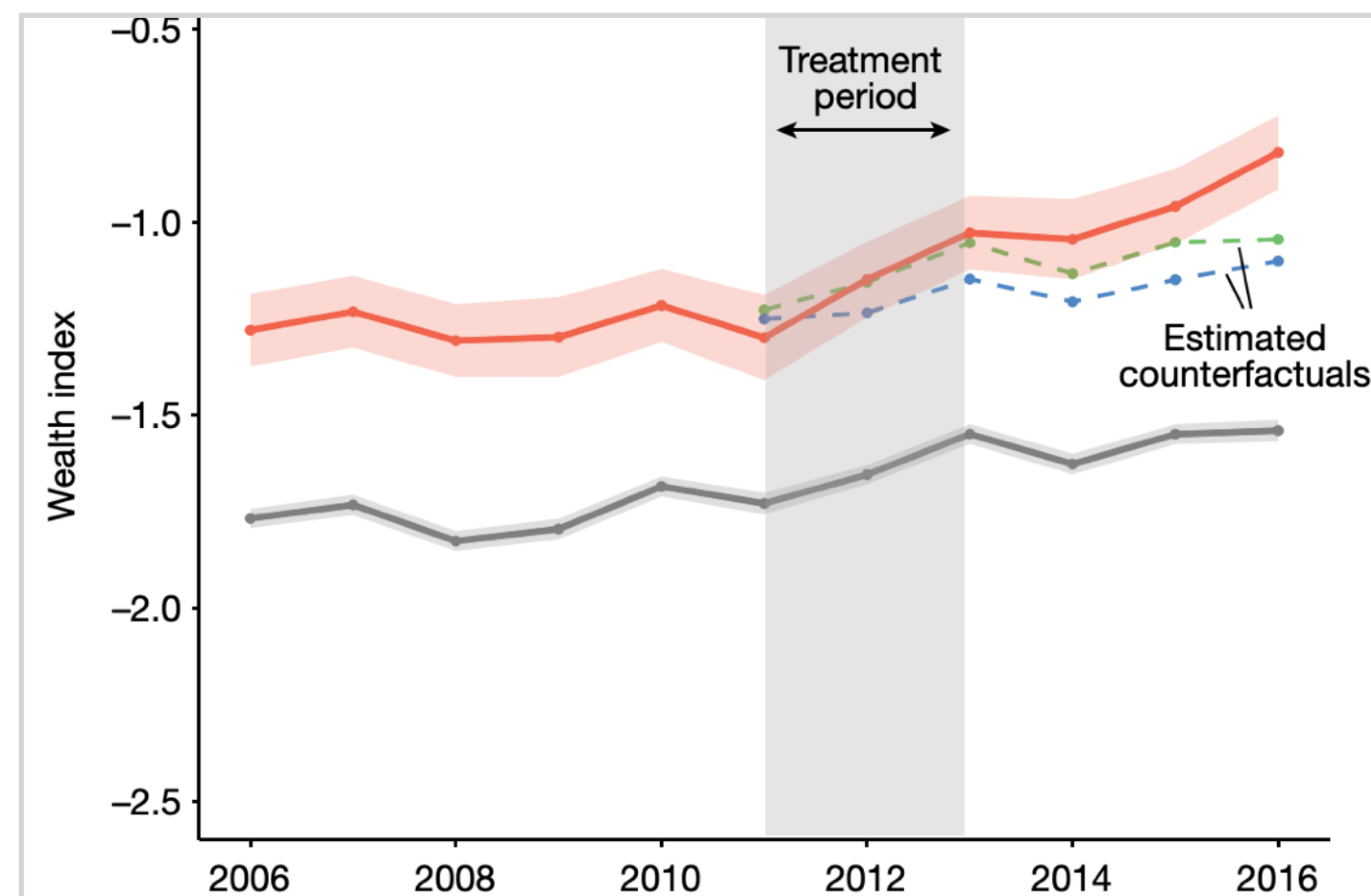
some media & VCs nowadays
equate AI = generative AI

* **Machine learning** (learning from data)
is foundational to many of these

Beyond LLMs: opportunities for AI

Causal inference

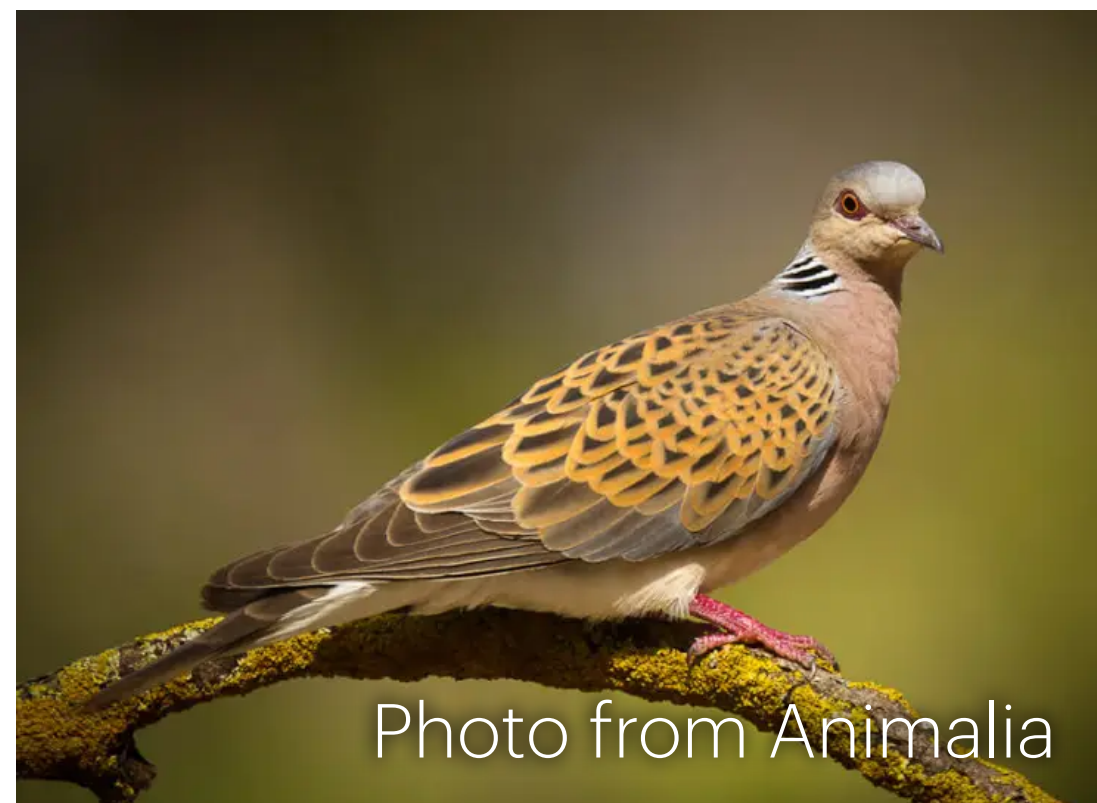
Show that electricity access **causes** increase in household wealth in Uganda.



Ratledge et al. (2022).
Nature

Market design

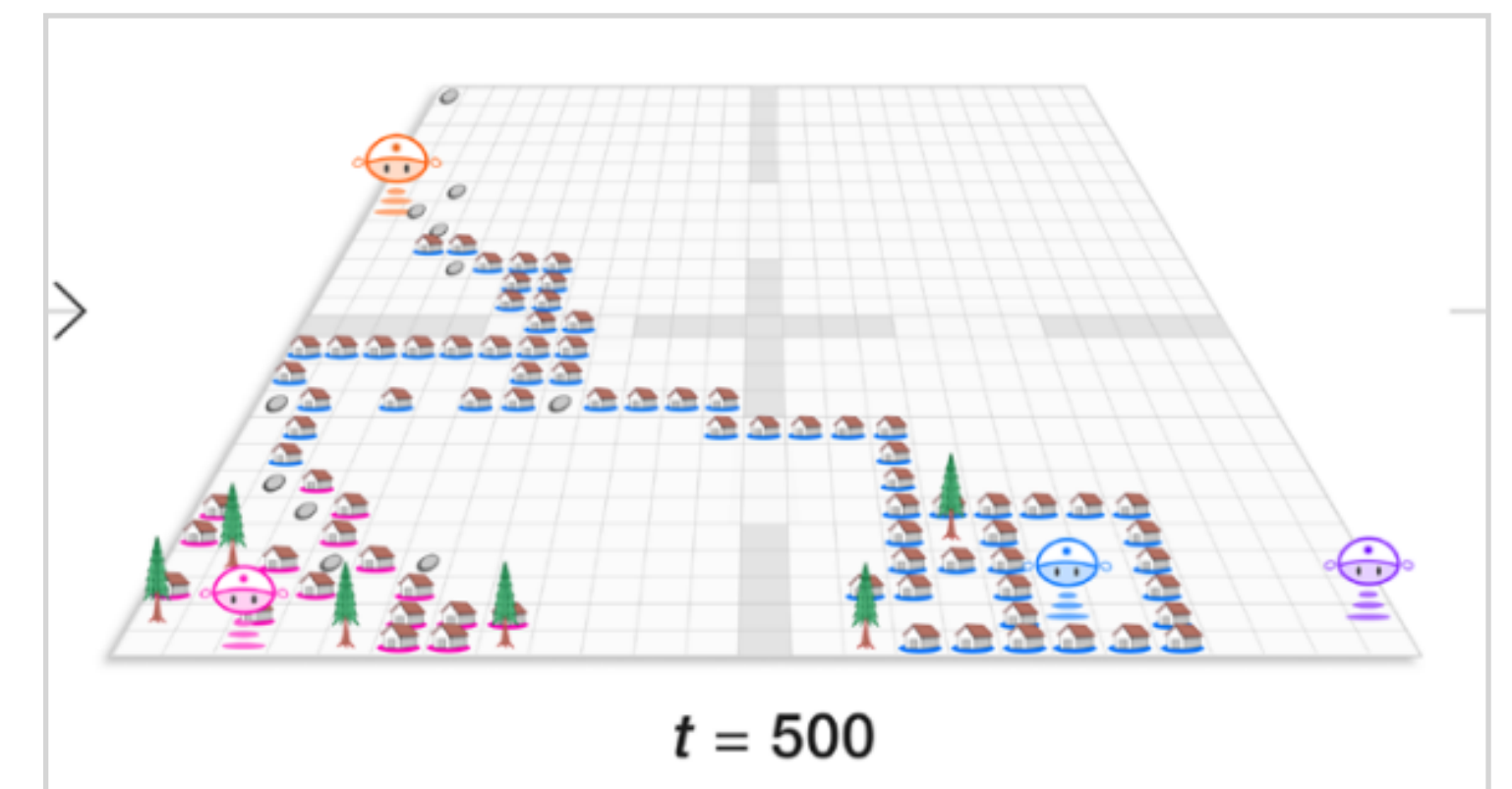
Use **combinatorial auctions** to design contracts with farmers in the UK to provide turtle dove habitats



Article in *The Economist*. (2021).

Reinforcement learning

RL to **evaluate in simulation** different tax policies, learning dynamic policies that optimize equity & productivity



Zheng et al. (2022).
Science Advances

Pitfalls and opportunities

Pitfalls

- Risk of further entrenching existing discrepancies & injustices
- May overly center on English sources & discriminate against vernacular
 - Keep things fact based and avoid subjective judgement?
- We don't know what we don't know; risk of confidence in the face of uncertainty
- Unsupervised ML (e.g., LLMs, clustering, ...) is more vulnerable to tyranny of the majority

Opportunities

- Help synthesize & make available *qualitative* data
 - Local & Indigenous knowledge are less likely to be quantitative
- LLMs can help solicit public responses
 - Surface under-appreciated concerns
- “Older” forms of AI are underutilized: RL for policy evaluation, ML + causal inference, optimization & planning

Thank you! **Lily Xu**
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