

Climate Decision Making in the Age of GenAI



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

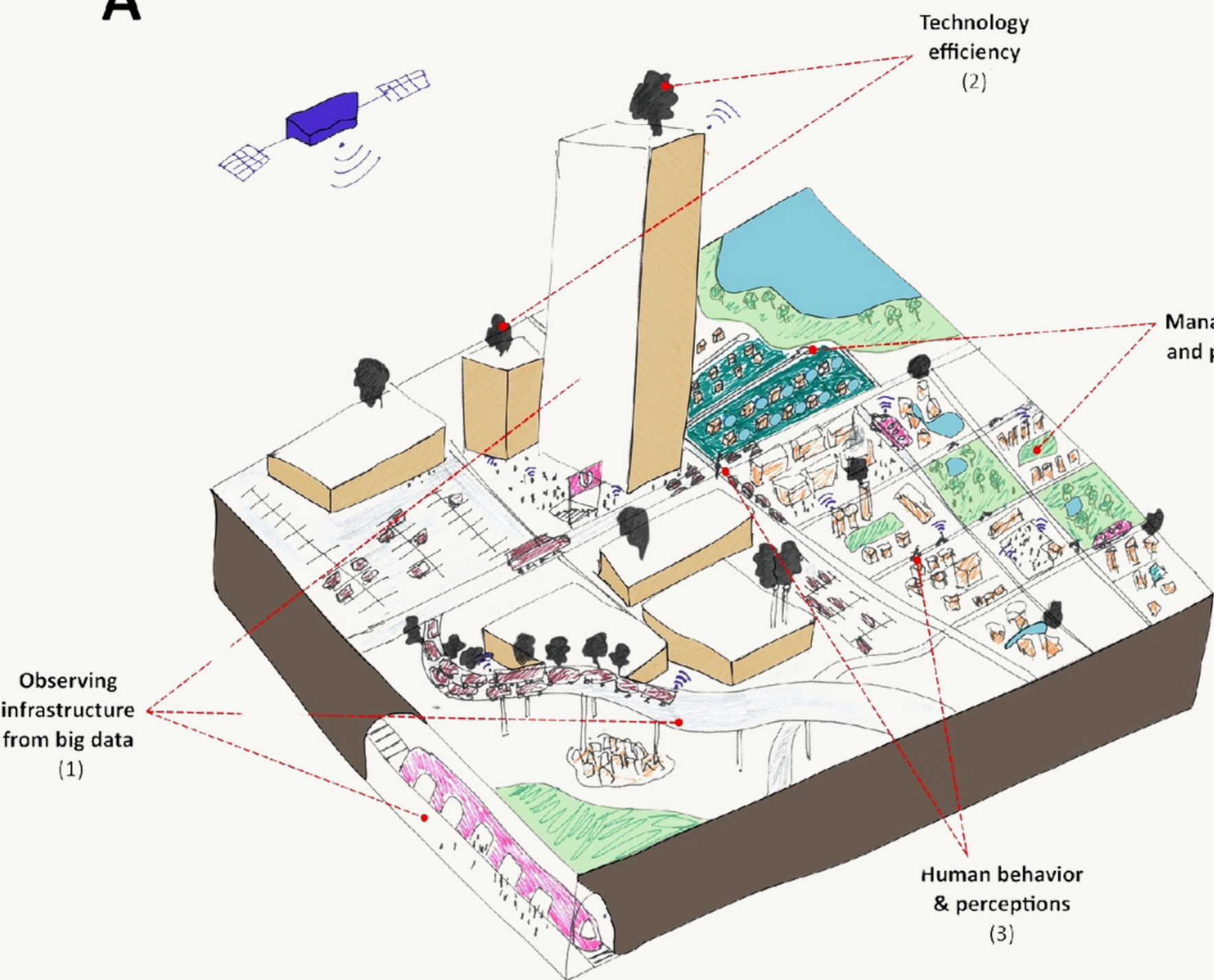
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University of North Carolina at Chapel Hill | Data-Driven EnviroLab
January 13, 2026



Data
Driven
EnviroLab

AI can aid climate action across a range of dimensions

A



**TRANSFORMING
COMPLEX SYSTEMS**

- Integrated management of energy systems, multi-modal transport, urban ecosystem
- Prediction of investment risks in low-carbon projects

**INNOVATING TECH +
RESOURCE EFFICIENCY**

- Generation of sustainable design options
- Maximization of asset use and efficiency over lifetime

**NUDGING BEHAVIORAL
CHANGE**

- Modelling social behavior, pattern analysis, prediction
- Facilitating environmental behavior through data analytics and AI assistants

**MODELLING CLIMATE
SYSTEMS + POLICY**

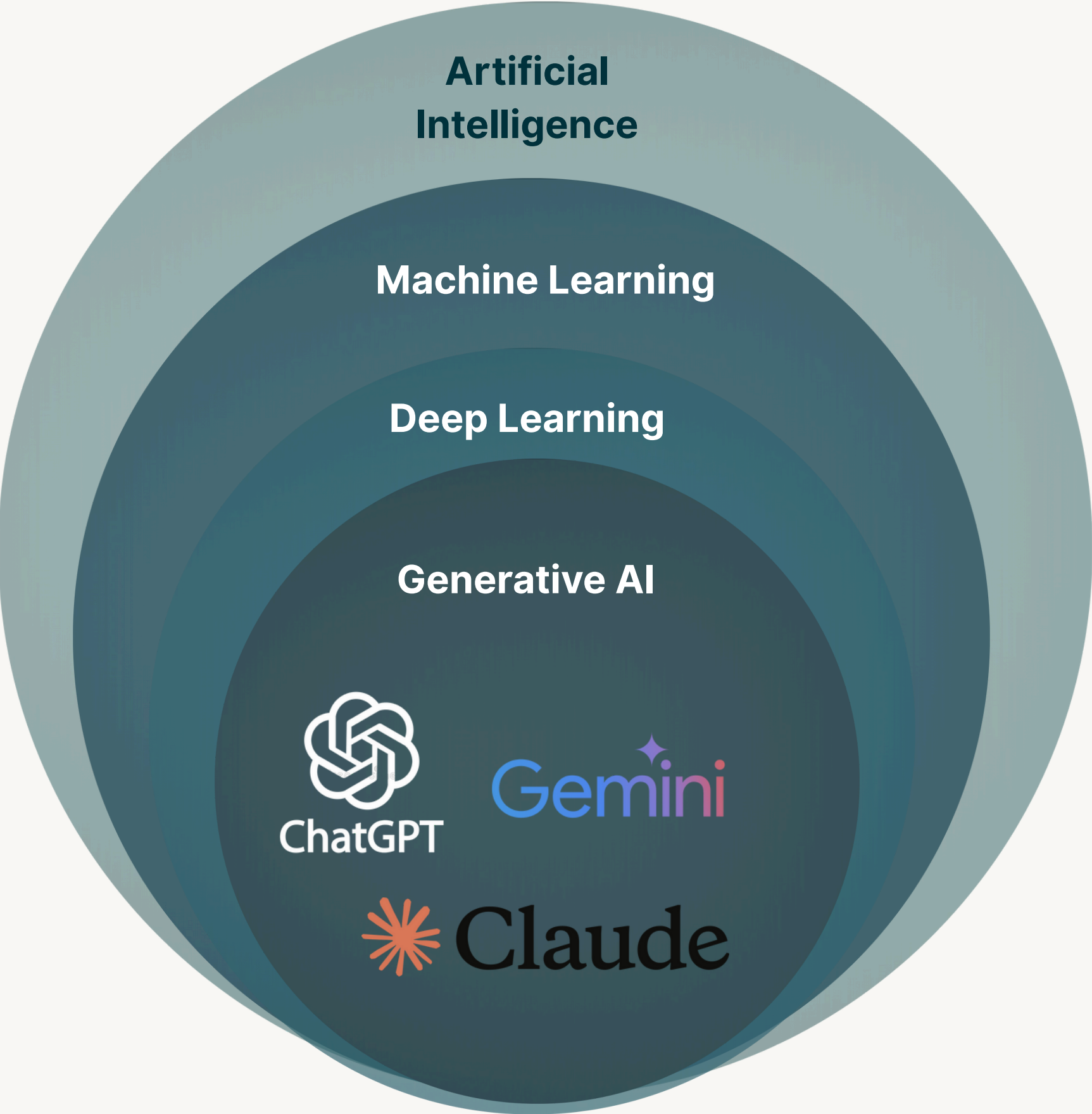
- Forecasting extreme weather and climate change scenarios
- Modelling effects of climate change and effectiveness of policy scenarios

**MANAGING ADAPTATION +
RESILIENCE**

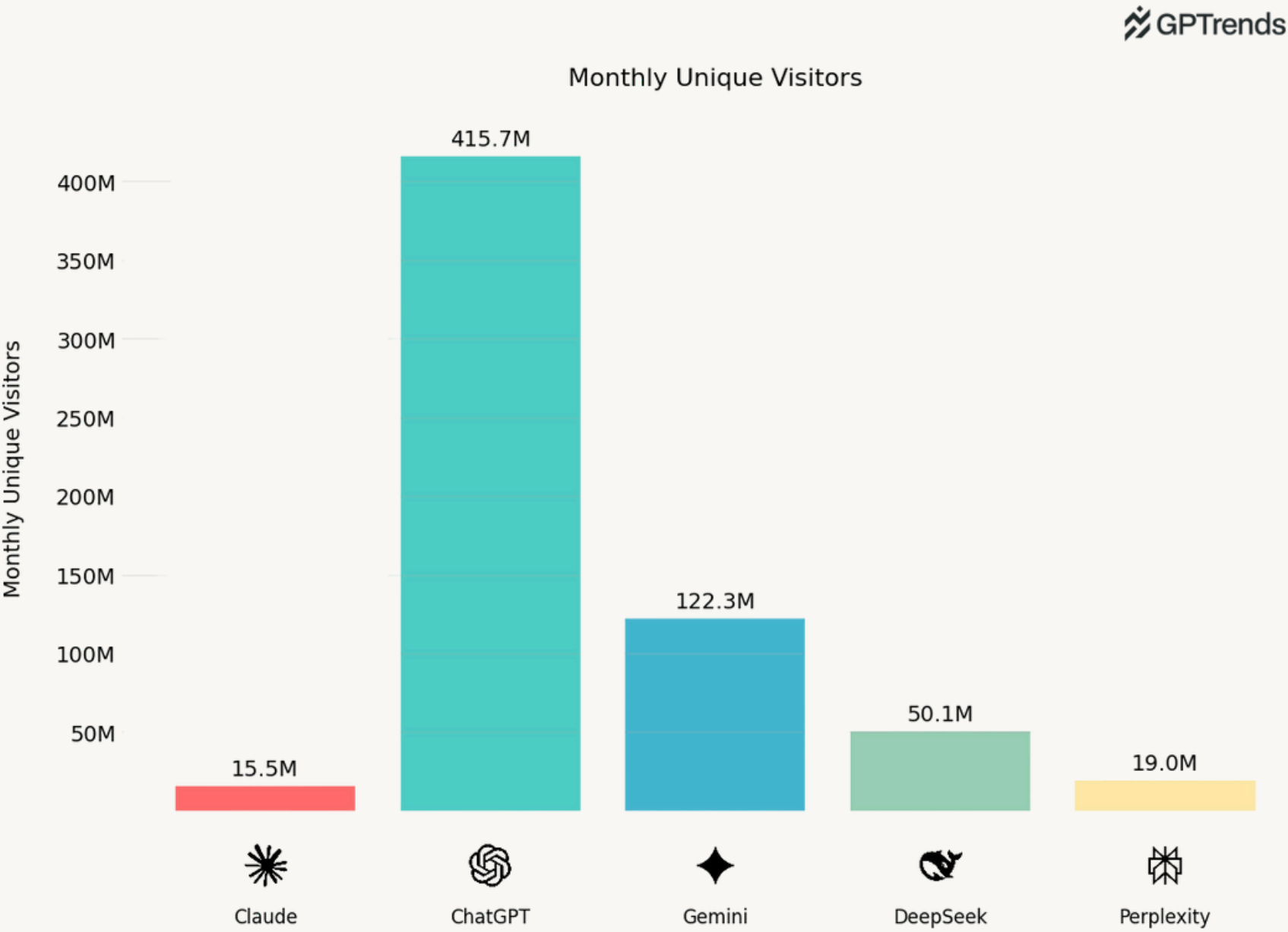
- Forecasting climate impacts and early warning systems
- Management of financial and human climate risk
- Strategic planning and climate adaptation

Sources Stern, N., Romani, M., Pierfederici, R., Braun, M., Barraclough, D., Lingeswaran, S., ... & Niemann, N. (2025). Green and intelligent: the role of AI in the climate transition. npj Climate Action, 4(1), 1-7.; Milojevic-Dupont, N., & Creutzig, F. (2021). Machine learning for geographically differentiated climate change mitigation in urban areas.

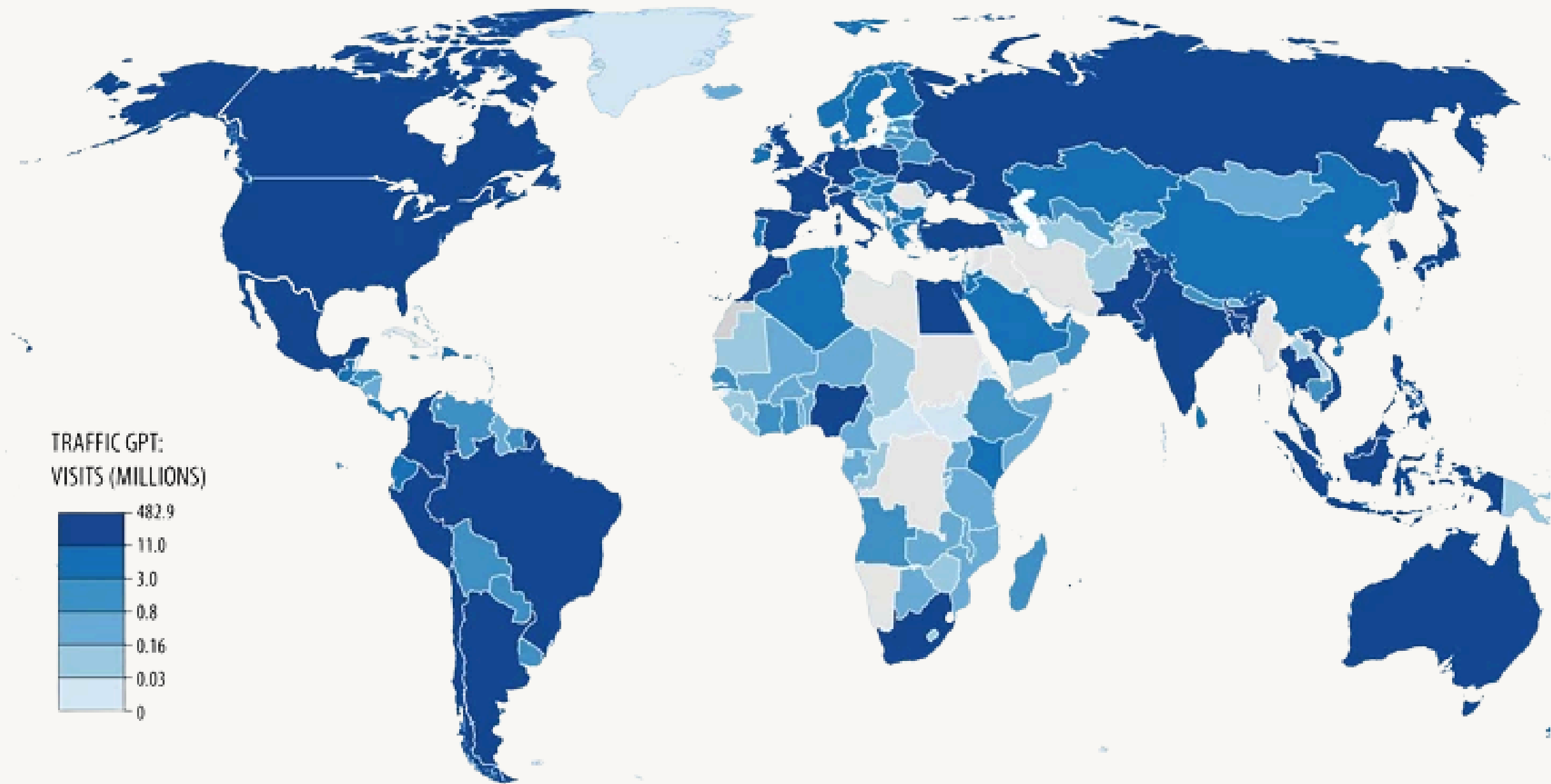
Use of GPT and GenAI chatbots usage surging



Mid-2025 - user statistics



Use of GPT and GenAI chatbots usage is surging



48264 | 2024

A majority of Americans say they interact with AI at least several times a week

% who say they interact with artificial intelligence (AI) ...

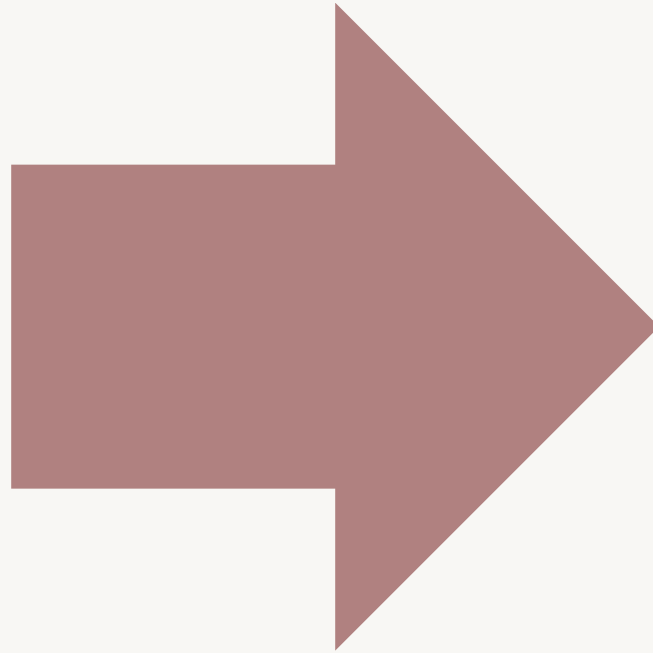
	Almost constantly/ Several times a day	About once a day	Several times a week	Less often
U.S. adults	31	15	17	38
Men	33	16	17	33
Women	28	14	16	42
White	31	15	17	37
Black	27	18	13	41
Hispanic	29	13	16	42
Asian*	39	19	18	24
Ages 18-29	33	20	21	26
30-49	37	16	14	33
50-64	30	13	18	39
65+	19	11	16	54
Postgrad	46	16	17	21
College grad	39	17	19	25
Some college	30	15	17	37
HS or less	20	14	14	51
Rep/Lean Rep	28	15	18	40
Dem/Lean Dem	33	15	16	35

* Estimates for Asian adults are representative of English speakers only.
Note: Respondents who did not give an answer are not shown. White, Black and Asian adults include those who report being only one race and are not Hispanic. Hispanic adults are of any race.
Source: Survey of U.S. adults conducted June 9-15, 2025.
"How Americans View AI and Its Impact on People and Society"

PEW RESEARCH CENTER

Challenges in applying GenAI Chatbots for climate information-seeking

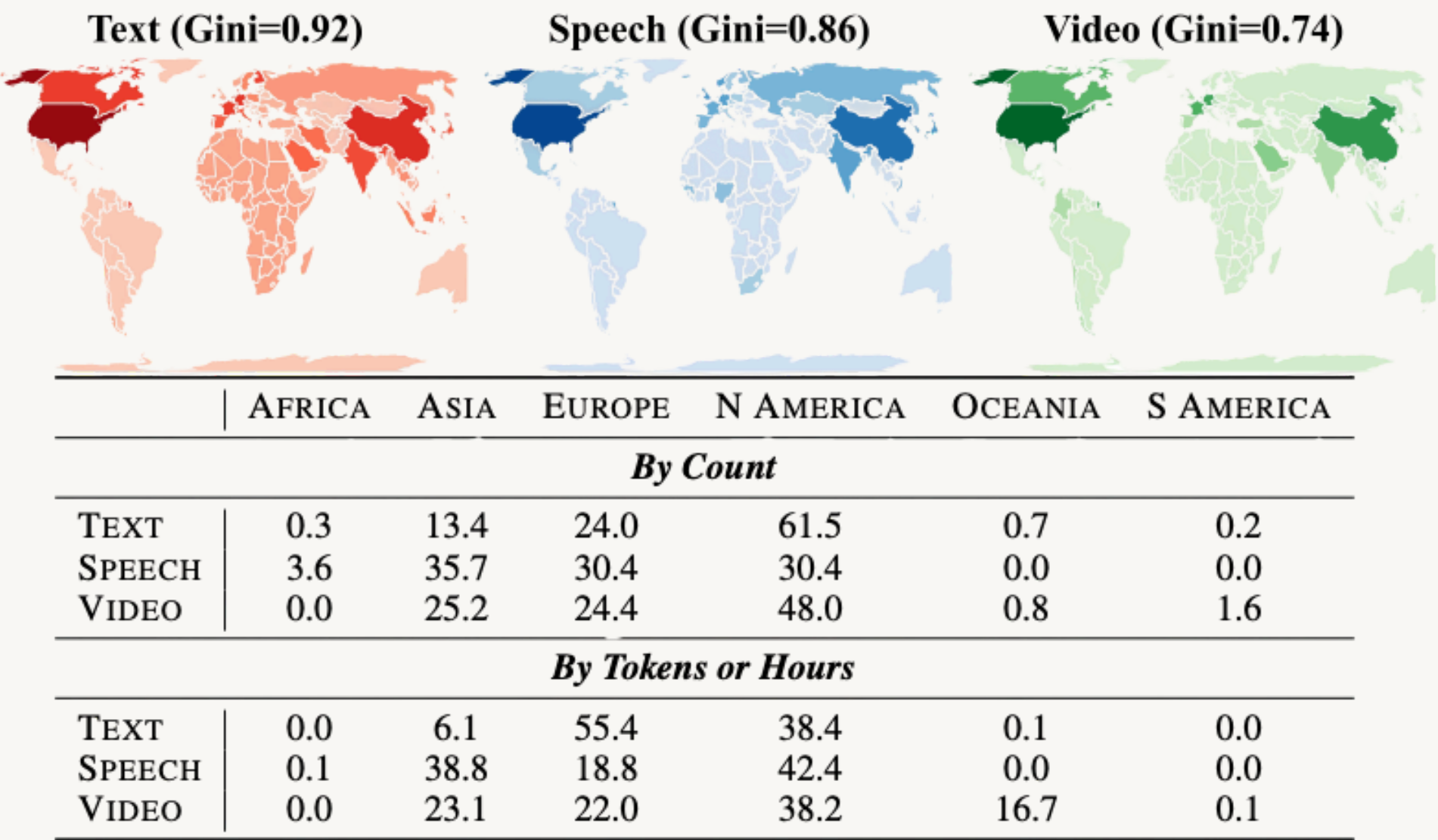
- Uncertain, geographically biased training data, skewed heavily towards Global North



Training data heavily skewed towards Global North

Across 4000 public datasets between 1990-2024, spanning 608 languages, 798 sources, 659 organizations, and 67 countries used for AI training:

90% of training data came from North America; fewer than 4% from Africa



Challenges in applying GenAI Chatbots for climate information-seeking



- Uncertain, geographically biased training data

- Ranking/prioritization of sources

Liu, et al. (2024). Lost in the middle: How language models use long contexts. Transactions of the Association for Computational Linguistics, 12, 157-173.

- Hallucination/embellishment

Huang, et al. (2025). A survey on hallucination in large language models: Principles, taxonomy, challenges, and open questions. ACM Transactions on Information Systems, 43(2), 1-55.

- Confirmation bias

Bo, J. Y., Kazemitabaar, M., Deng, M., Inzlicht, M., & Anderson, A. (2025). Invisible Saboteurs: Sycophantic LLMs Mislead Novices in Problem-Solving Tasks. arXiv preprint arXiv:2510.03667.

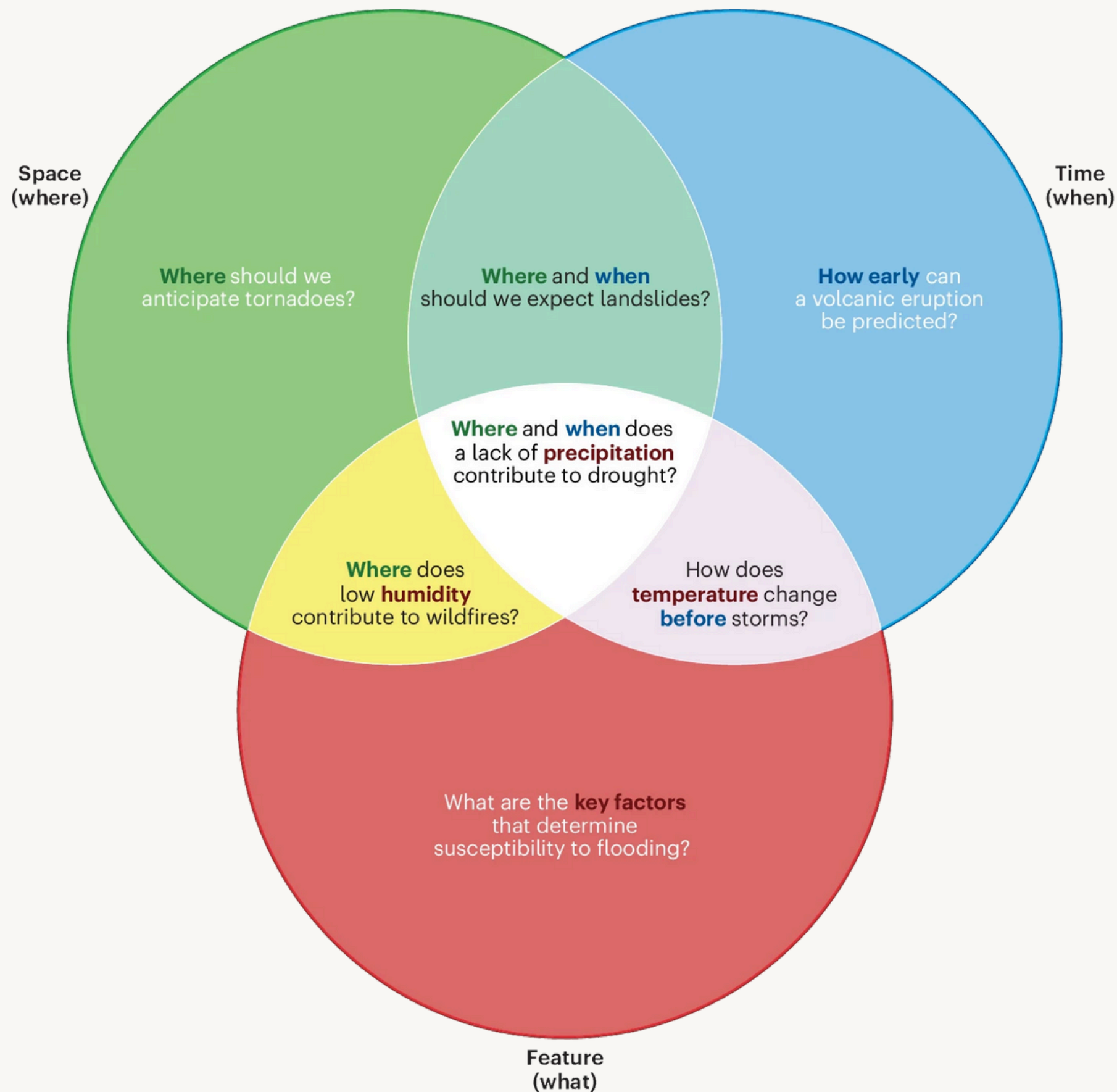
- Summary creep

Peters, U., & Chin-Yee, B. (2025). Generalization bias in large language model summarization of scientific research. Royal Society Open Science, 12(4), 241776.

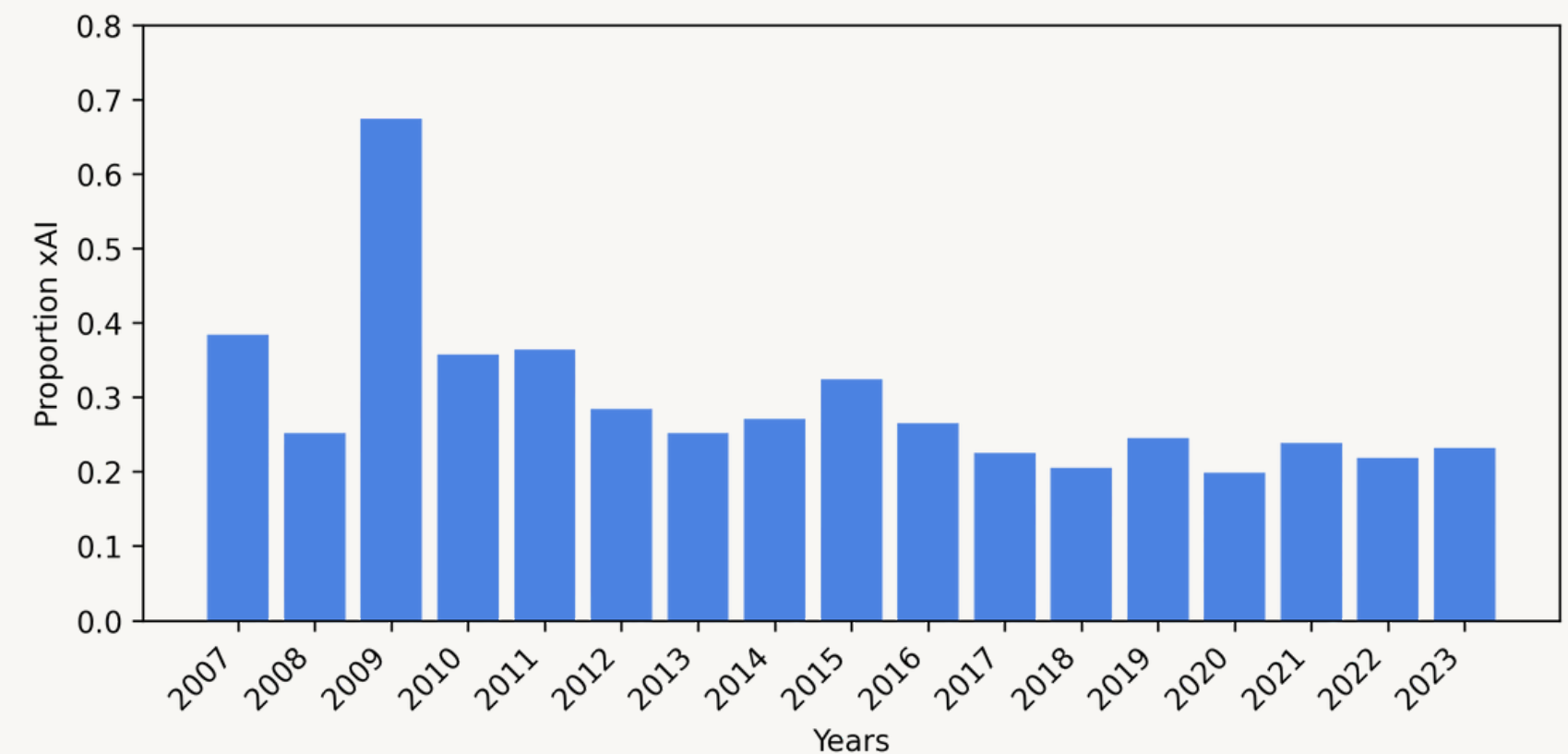
- Computational challenges

Li, X., et al. (2024). Evaluating mathematical reasoning of large language models: A focus on error identification and correction. arXiv preprint arXiv:2406.00755.

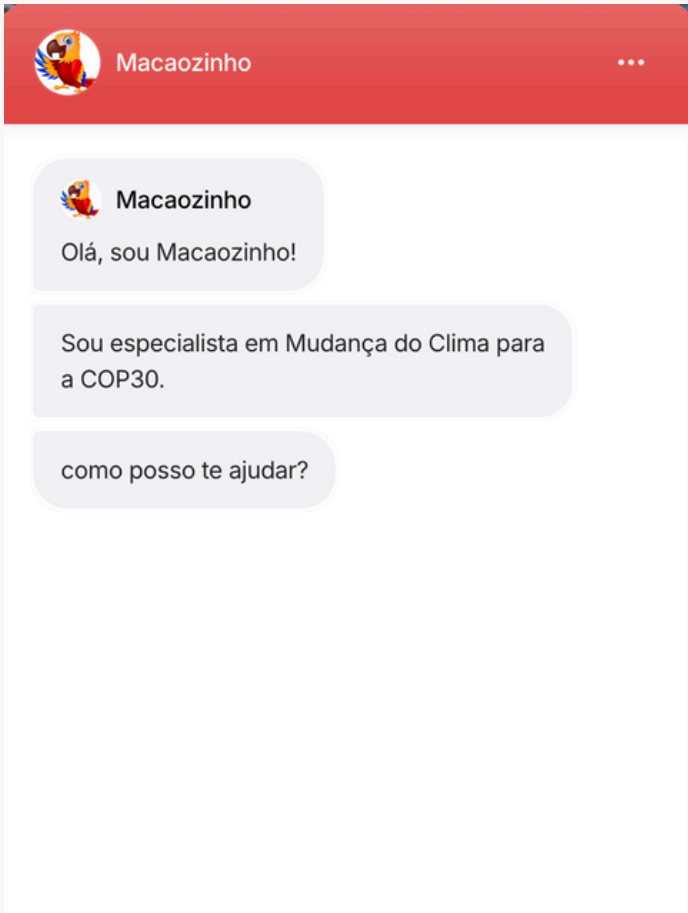
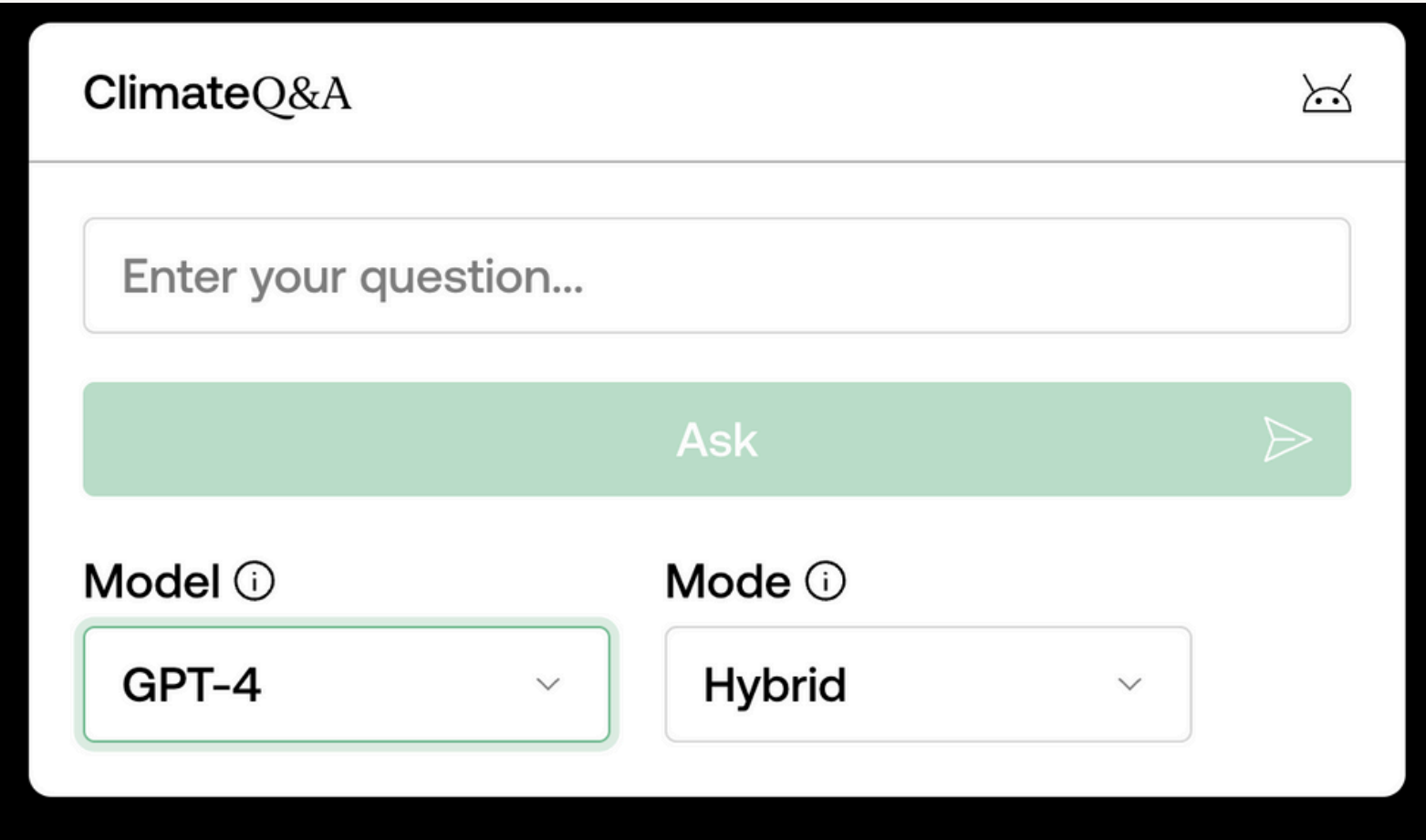
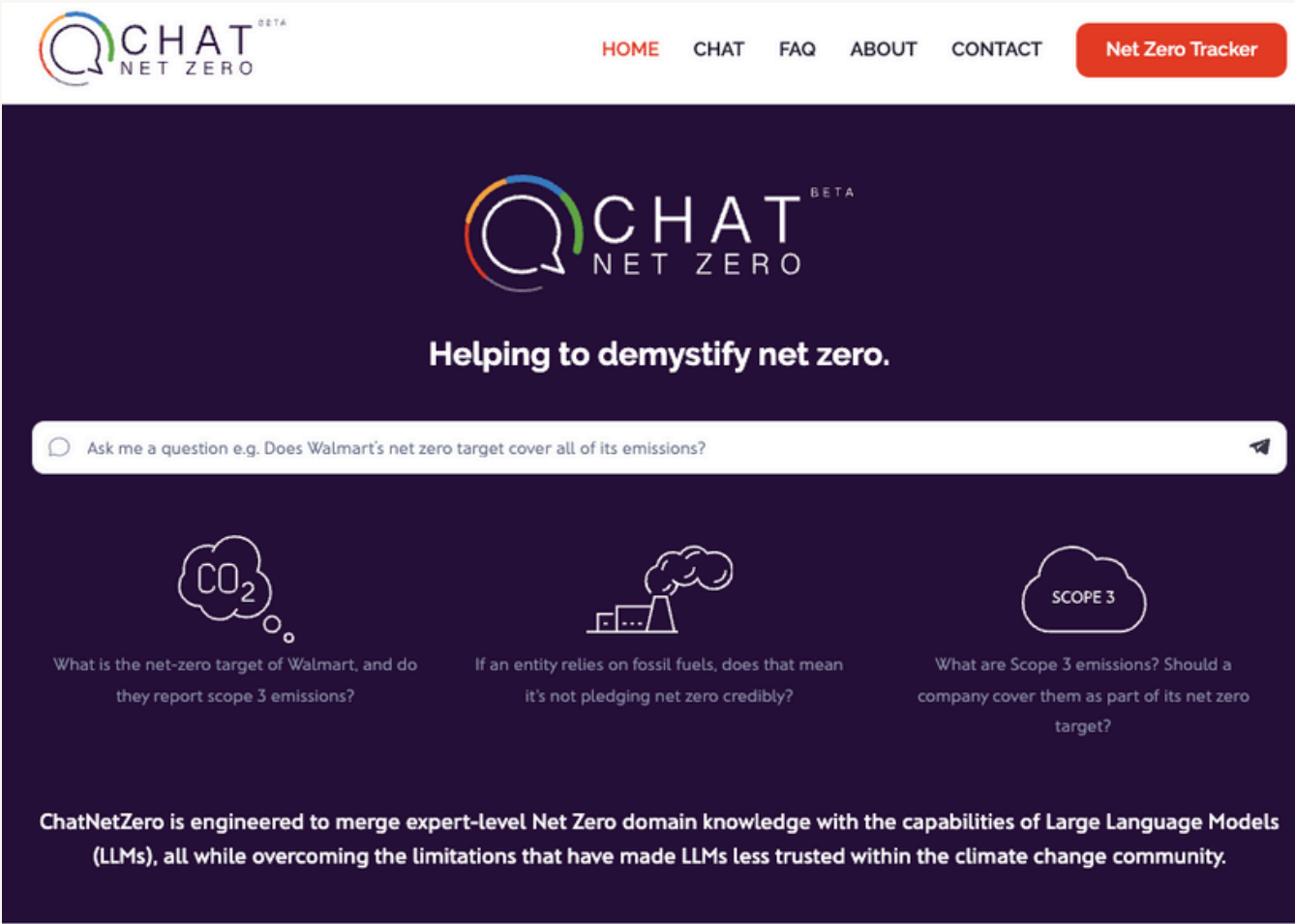
Explainable AI (XAI) still limited in the climate/geosciences



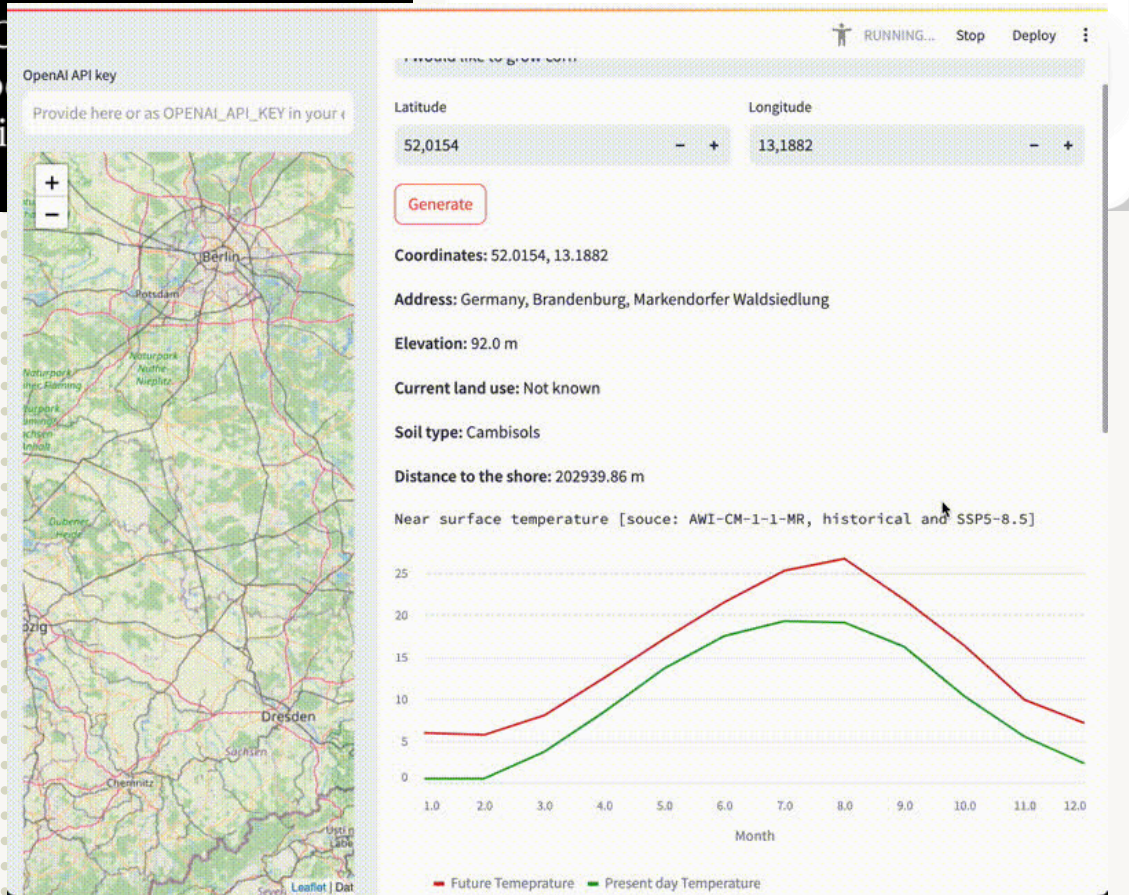
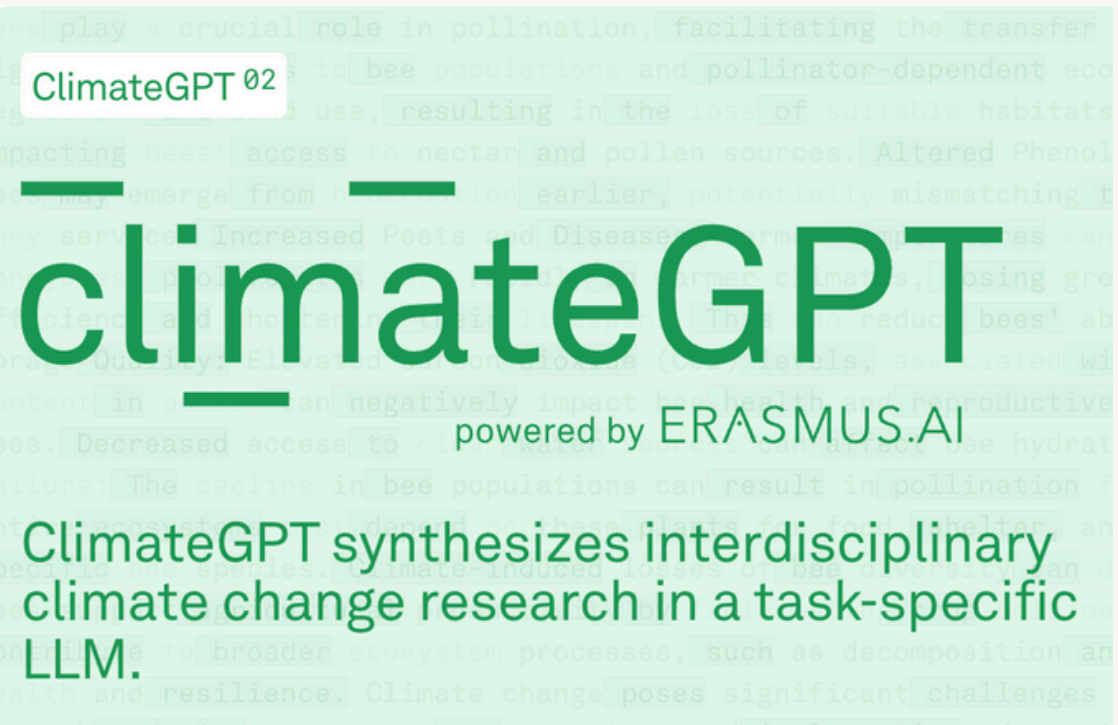
Of 2.3 million arXiv abstracts from 2007 to 2022, only 6.1% mention XAI, compared with 25.5% that mention AI. This share has stayed steady, with most XAI papers coming from geoinformatics and geophysics.



Climate Chatbots aim to make GenAI usage more credible



Warning! Please note that ChatClimate is not endorsed by IPCC. chatClimate is hallucinating, may occasionally provide incorrect instructions or biased content and may occasionally generate inappropriate information.



Generic Chatbots tend to have lower factual accuracy, embellish

1. How does Walmart’s climate goals compare with Amazon’s and other large retail stores?
 2. How many nations in the world have a net zero target enshrined in law?
 3. How many companies rule out the use of offsets / credits for their net zero targets?
 4. Does 3M or Pfizer have any conditions on the use of offsets?
 5. How do the United States, China, Wal-Mart, Apple and California compare in terms of their decarbonization efforts
 6. How does Foxconn’s climate goals compare with Fast Retailing’s? Limit response to 100 words and use your most recent information, including databases and searching online.
 7. How does VakifBank and Saudi Aramco compare in terms of their climate policy’s end target status? Limit response to 100 words and use your most recent information, including databases and searching online.
 8. How does Reliance Industries and Emaar Properties compare in terms of their climate interim targets? Limit response to 100 words and use your most recent information, including databases and searching online.

Figure 3: Domain-specific questions posed to each LLM for evaluating factual accuracy of responses.

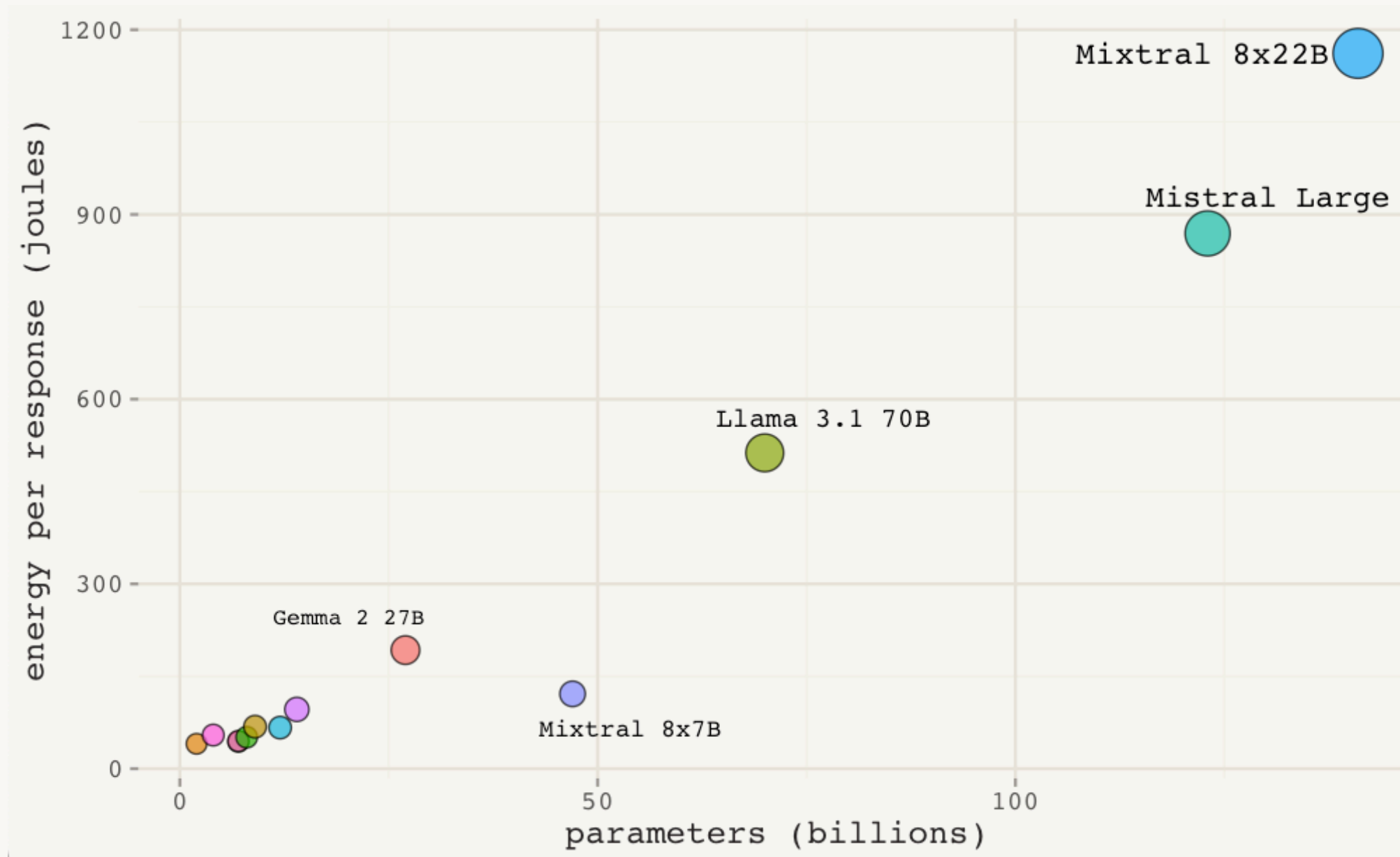
Model	Step 1	Step 2
ChatNetZero	0.70	0.81±0.30
ChatClimate	0.20	0.17±0.39
GPT	0.40	0.40±0.40
Gemini	0.30	0.28±0.40
Coral	0.30	0.42±0.40

Table 1. Factual evaluation – ratio of true statements over total number of statements generated.

Model	Embellishment ratio
ChatNetZero	0.12±0.16
ChatClimate	0.33±0.34
GPT	0.65±0.28
Gemini	0.61±0.38
Coral	0.23±0.30

Table 2. Embellishment ratio – non-factual statements over total number of statements generated.

Climate-AI applications must consider environmental footprint

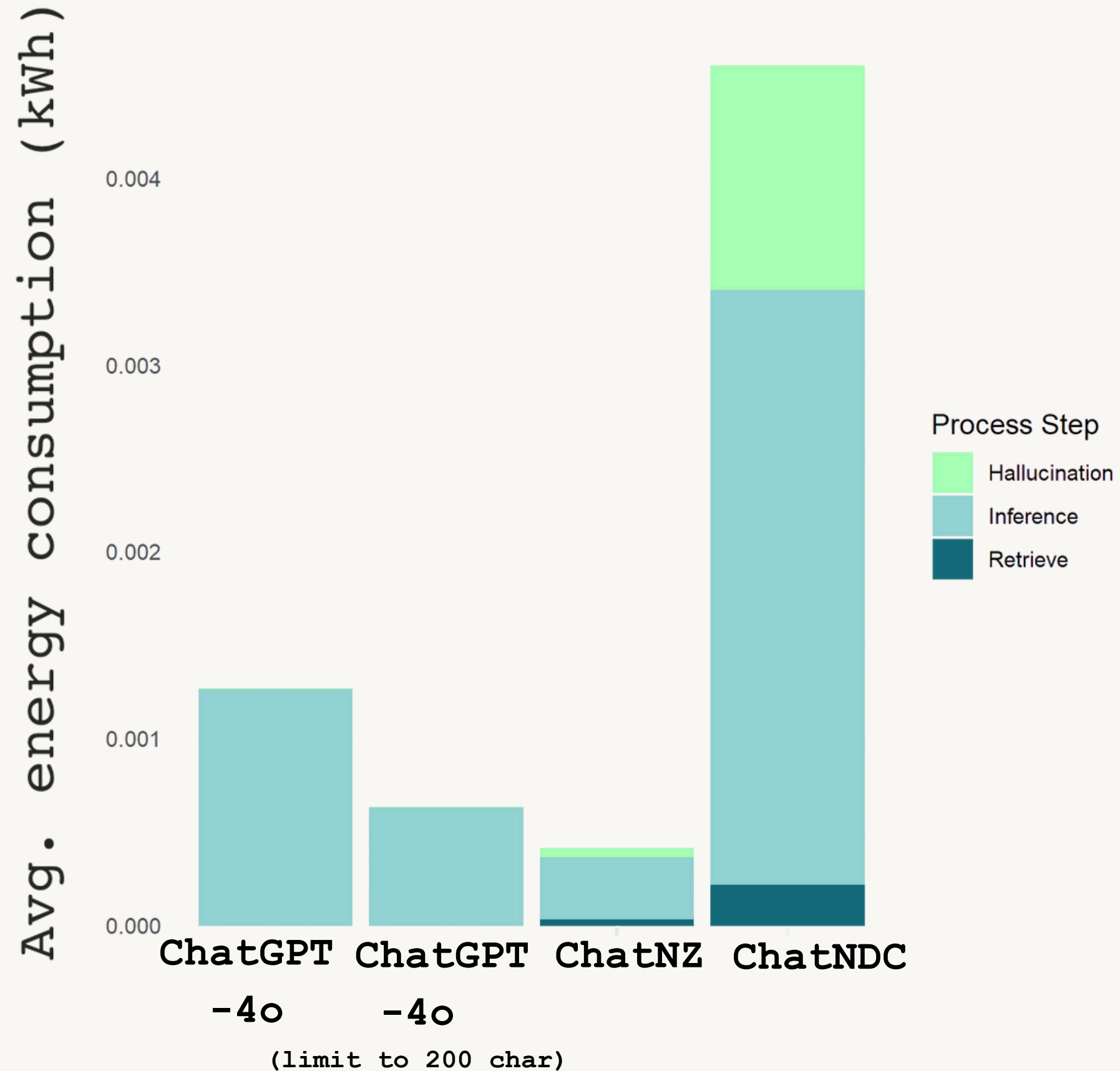


AI's data centers consume ~4.4% of all US energy but could consume as much as 22% of electricity by 2028.

These centers typically use electricity that's 48% more carbon-intensive than the U.S. average.

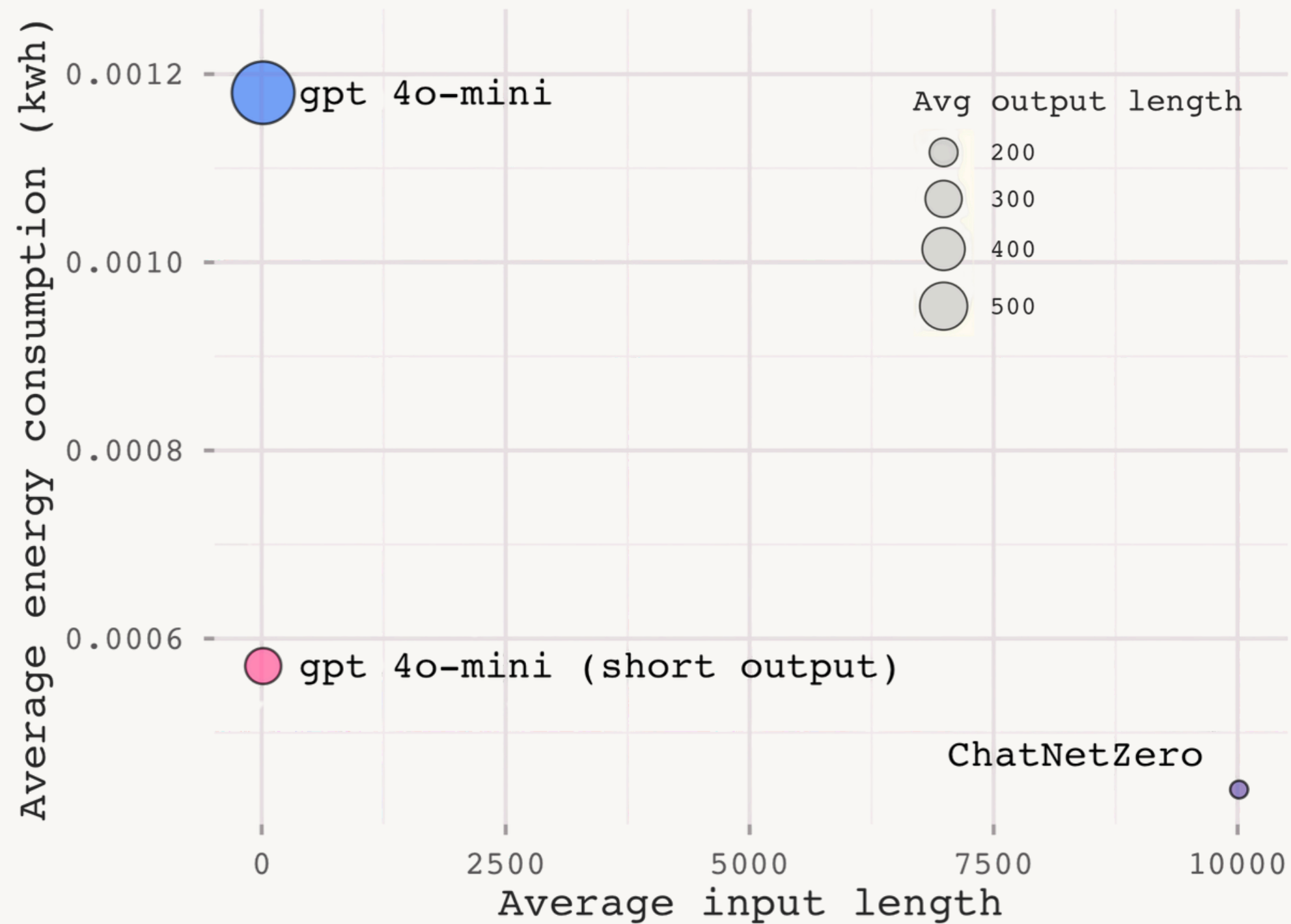
Training AI models only accounts for 10-20% of AI's energy use. Most comes from prompting or inference.

Climate-AI applications must consider environmental footprint



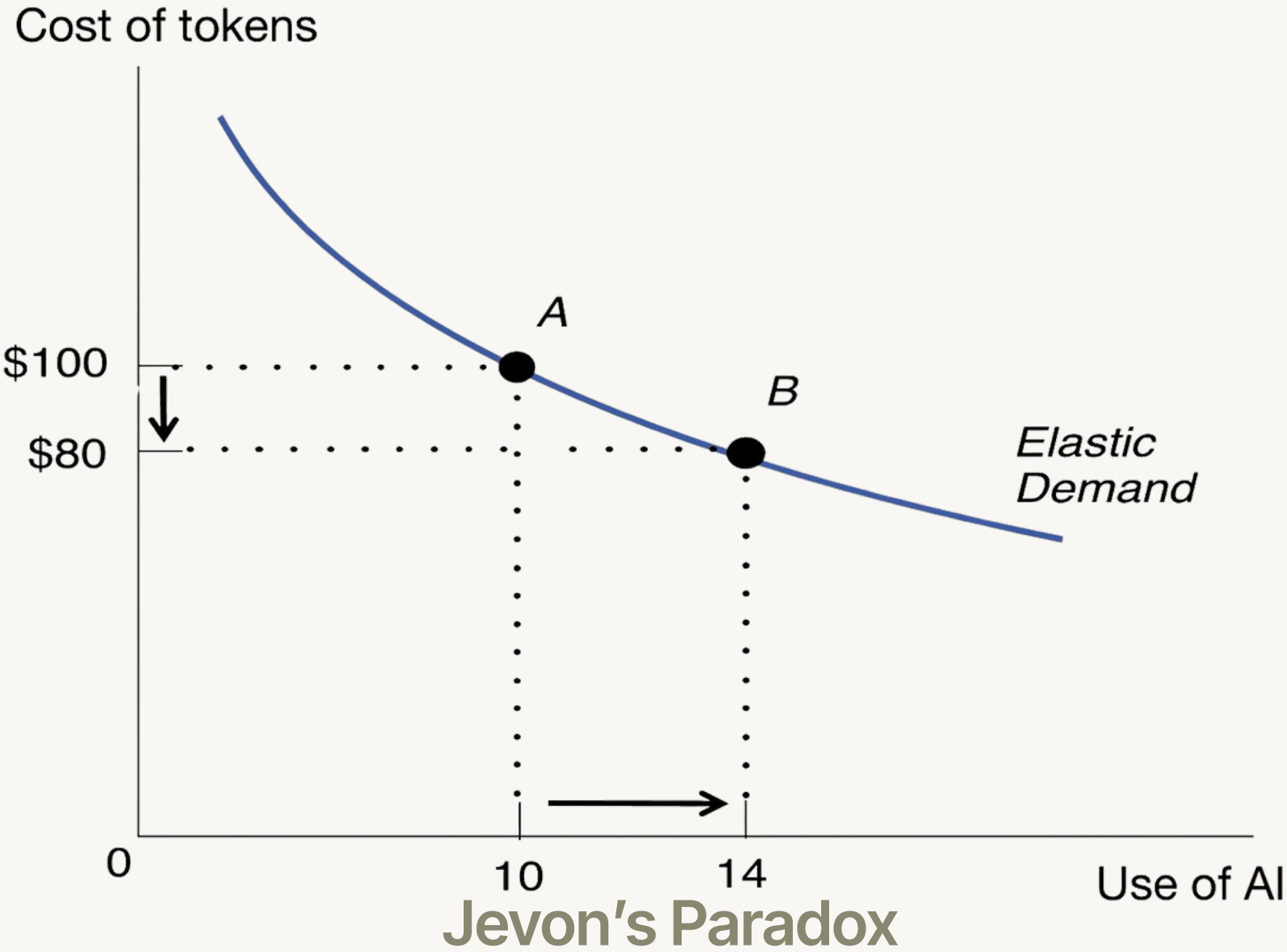
- Domain-specific (smaller LLMs) have lower energy consumption than generic models
- Agentic models are much more energy intensive
- ChatNDC's agentic hallucination check is 61% faster, but uses 25x more energy than ChatNetZero's non-LLM algorithm

Climate-AI applications must consider environmental footprint

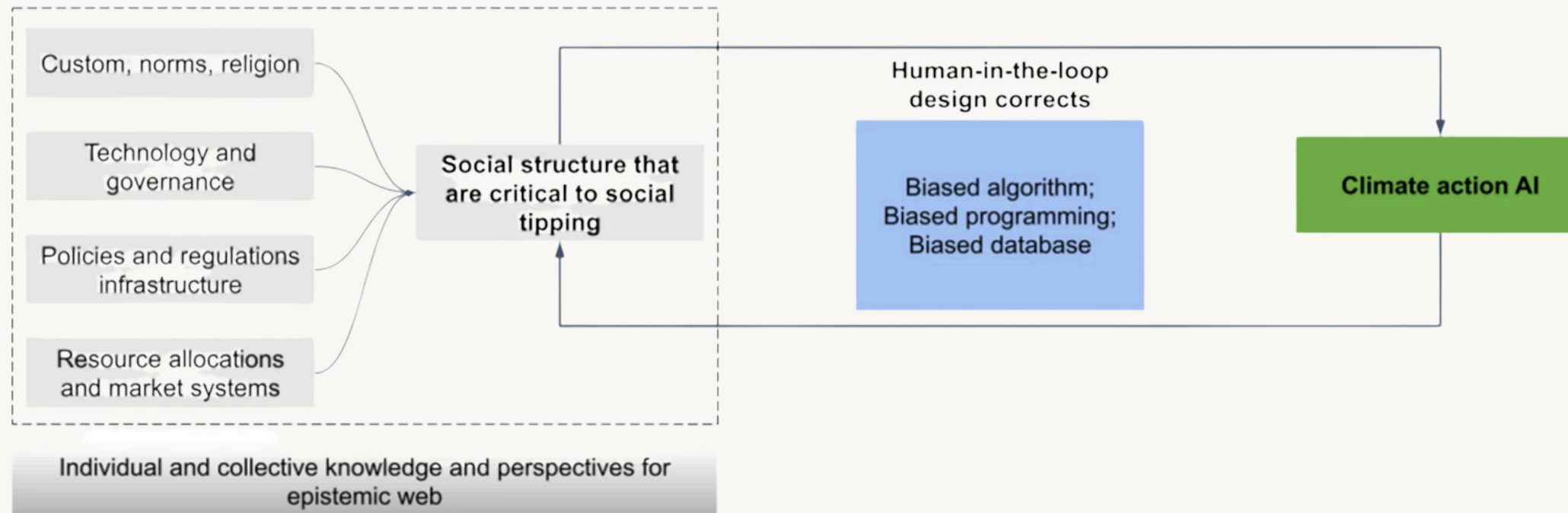


- With the same input length, ChatGPT produces about 2.6 times more output and uses about twice the energy.
- Even though ChatNetZero's input is over 600 times longer than gpt-4o-mini, it still shows lower average energy use.

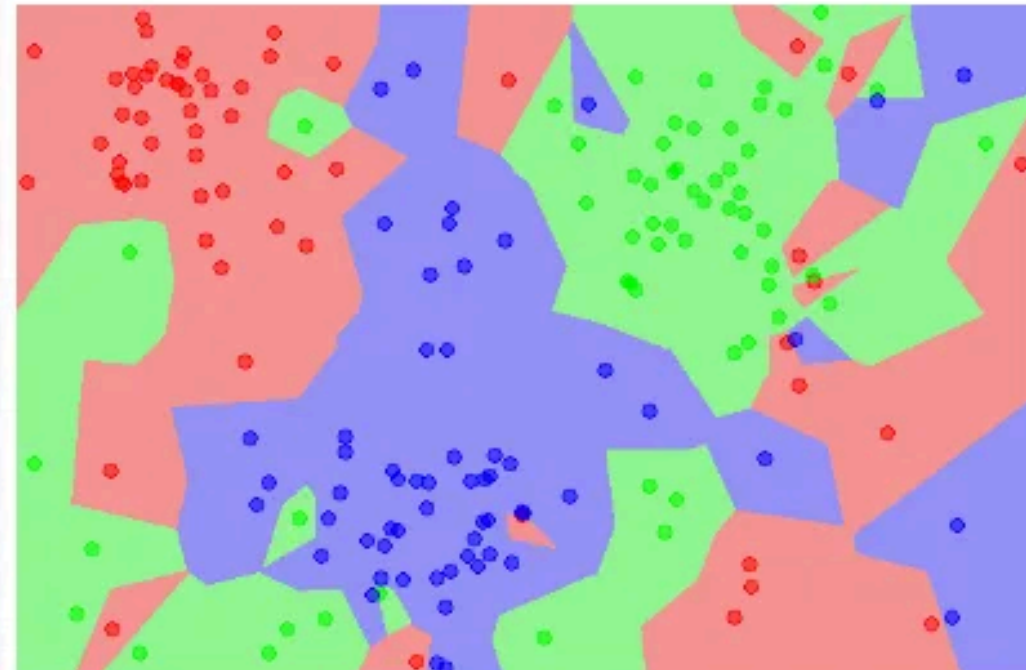
Jevon's Paradox: Rebound effect of increasing AI and energy usage




Trustworthy climate AI must have humans in the loop




For just, equitable AI usage for climate, human involvement is essential - from diverse data and community input to transparent oversight - so we avoid harms like algorithmic redlining, where biased models reinforce existing inequalities instead of solving them.



Governance systems for AI needed so climate AI tools can be trusted

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ISO/IEC 42001:2023

Information technology — Artificial intelligence — Management system

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About this register

In the Algorithm Register of the government, Dutch government organizations publish information about algorithms that they use in their work. The register focuses on impactful algorithms (including high-risk AI systems) and gives the visitor insight into how these algorithms work. Do you work for the government? [Register your algorithm](#).



State of North Carolina

JOSH STEIN
GOVERNOR

September 2, 2025

EXECUTIVE ORDER NO. 24

ADVANCING TRUSTWORTHY ARTIFICIAL INTELLIGENCE THAT BENEFITS ALL NORTH CAROLINIANS

WHEREAS, artificial intelligence (“AI”) is a transformational and rapidly evolving technology impacting countless facets of North Carolina’s economy and communities – presenting extraordinary opportunities and new risks for North Carolinians; and

WHEREAS, the State of North Carolina is committed to better serving all North Carolinians by effectively and responsibly deploying AI; and

WHEREAS, the Governor is committed to ensuring that all North Carolinians benefit from the growth and use of AI; and

WHEREAS, AI presents transformative opportunities to enhance government operations and drive economic growth; and

WHEREAS, North Carolina is committed to fostering innovation, advancing AI-driven industries, and preparing its workforce for the evolving technological landscape and is uniquely positioned to achieve these goals as a top state for business and a national hub for world-class academic and training institutions; and

WHEREAS, the responsible and ethical deployment of AI is essential to ensure transparency, accountability, and the protection of civil liberties in government operations and decision-making; and

WHEREAS, the Governor affirms that the civil rights, privacy, and security of all North Carolinians are paramount as use of AI expands in our economy, schools, health care systems, government, and daily life; and





THANK YOU!

We've launched a new Center for Climate Leadership and AI-driven Integrity in Mitigation (CLAIM). Sign up for our newsletter to stay up to date:



ddl@unc.edu
datadrivenlab.org