

AI-ENHANCED ERUM: NEW EPISTEMIC AND ETHICAL CONSIDERATIONS

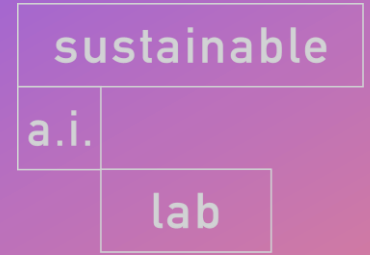


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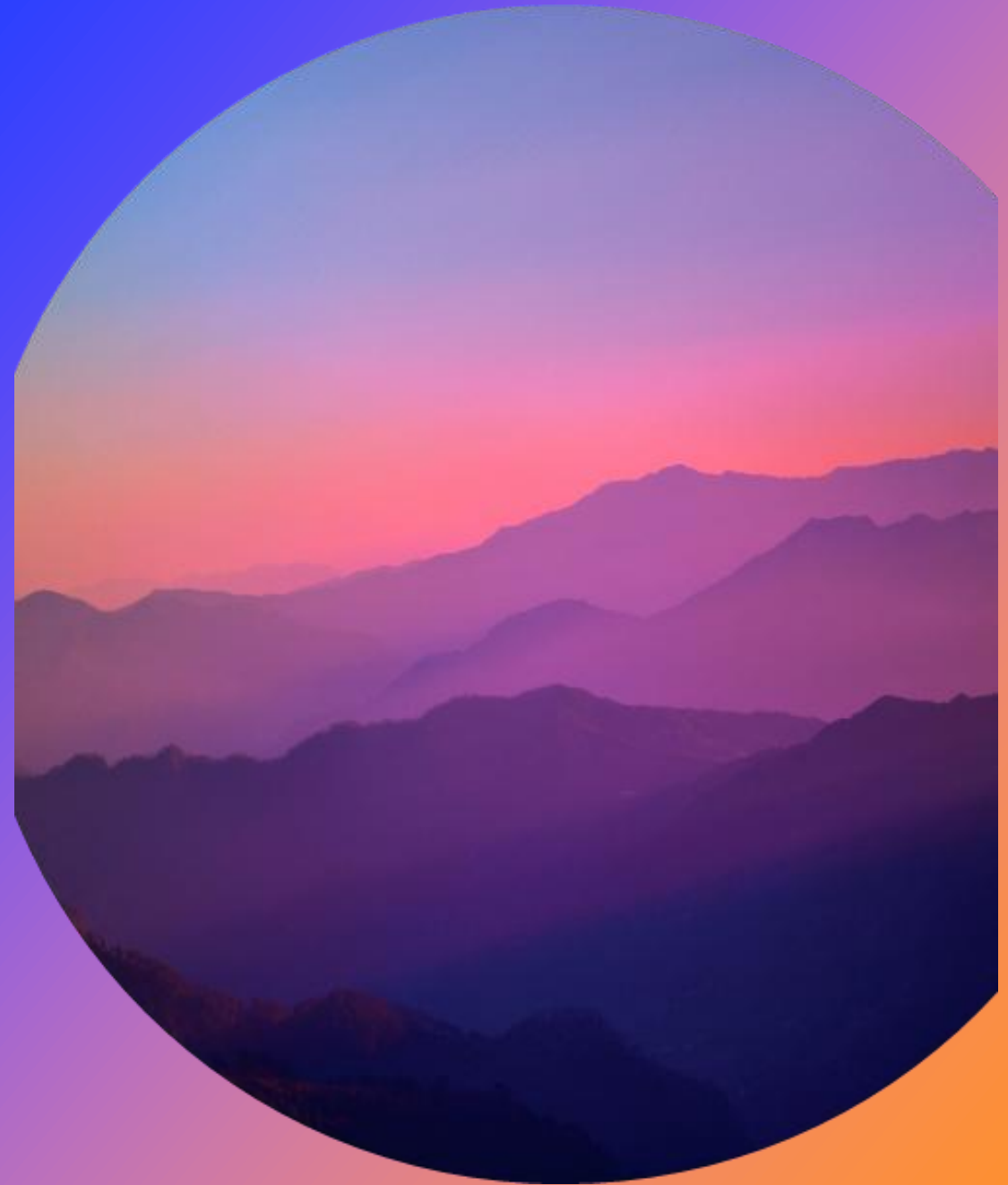
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MY BACKGROUND

Philosophy

- Can computers think? Can they be conscious?
- How should we decide between empirically equivalent hypotheses?
- How should ErUM scientists use AI in their research?





+ . OUTLINE

1. The Value of AI in ErUM
2. Ethical-Epistemic Problems
 - a) Fabrication (“hallucination”)
 - b) Model collapse
 - c) Belief bias (plausibility bias)
 - d) Lack of accountability
3. Best Practices



1. THE VALUE OF AI IN ERUM



1. THE VALUE OF AI IN ERUM

Focus: LLMs, especially LLM chatbots.

Research	Writing
Generate ideas	Grant proposals
Summarize literature or text	Abstracts and summaries
Write software	Write a manuscript
Design an experiment	Critique a manuscript



2. ETHICAL-EPISTEMIC PROBLEMS



2. ETHICAL-EPISTEMIC PROBLEMS

General ethical problems:

- Environmental impact.
- Exploitative labor conditions.

And general ethical-epistemic problems:

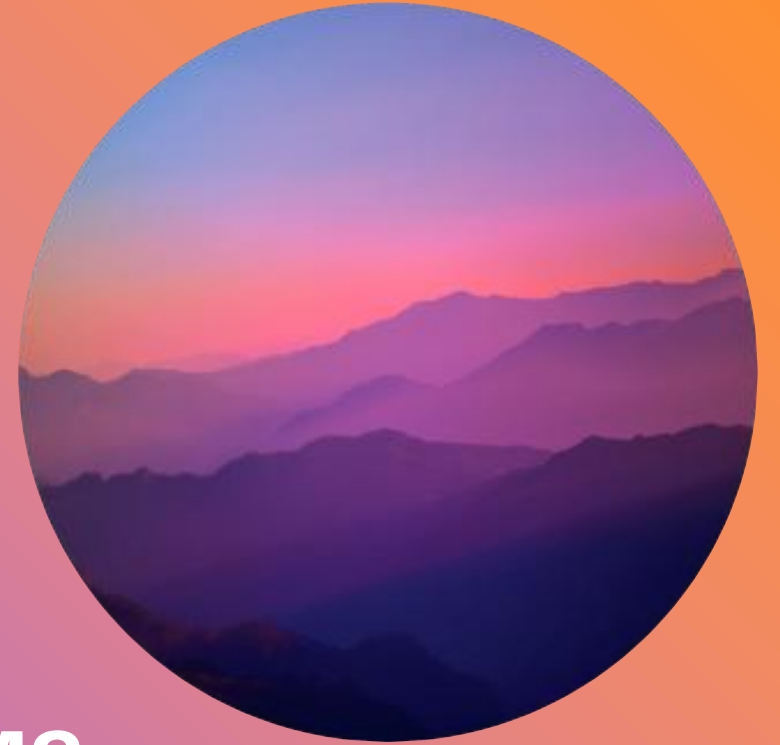
- Deskilling.
- Wrongful bias.



2. ETHICAL-EPISTEMIC PROBLEMS

Especially severe in ErUM:

- A) Fabrication: LLMs will generate fabricated data or other claims.
- B) Model collapse: LLMs will be trained on LLM-generated ErUM data.
- C) Belief bias: LLMs will activate humans' belief or plausibility bias in ErUM.
- D) Lack of accountability: LLM-generated research will be less accountable.



2. ETHICAL-EPISTEMIC PROBLEMS:

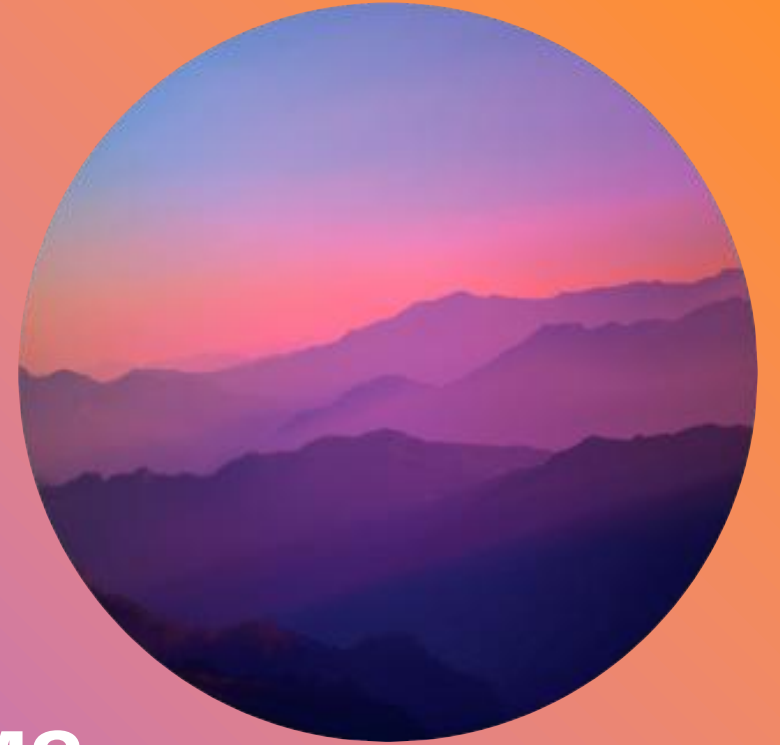
A) FABRICATION



2. ETHICAL-EPISTEMIC PROBLEMS

(A) Fabrication

- Other fields: Creative; evidence presented in text; evidence can be checked by other parties; experiment can be cheaply replicated.
- ErUM: Replication can be very expensive in money and expertise. Datasets are not easily shared and understood: 10s of petabytes of data, multimodal instrumentation, event reconstruction pipelines, hundreds of algorithms, custom software, security issues, data embargoes.
- ErUM: Small anomalies can be momentous.



2. ETHICAL-EPISTEMIC PROBLEMS:

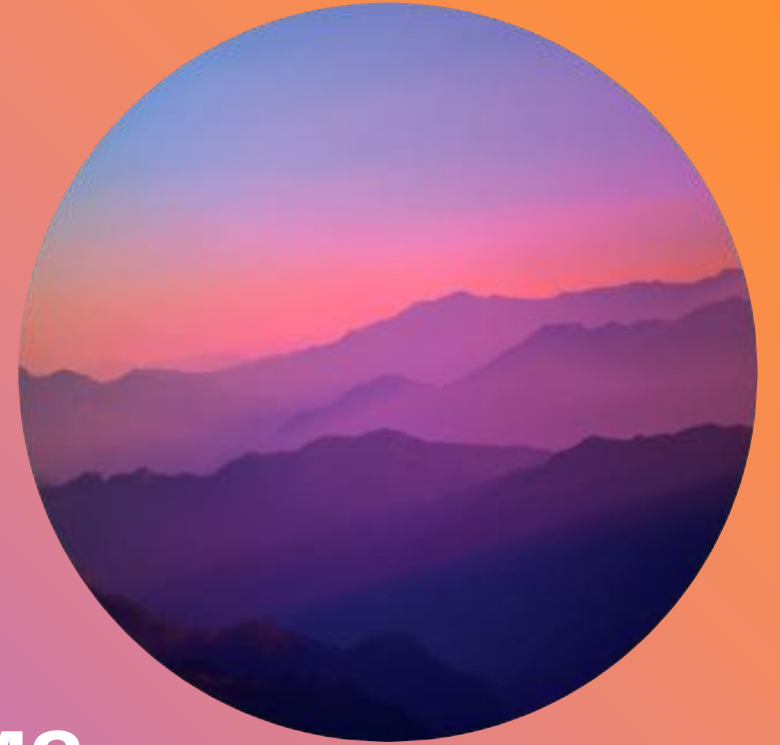
B) MODEL COLLAPSE



2. ETHICAL-EPISTEMIC PROBLEMS

(B) Model collapse:

- LLMs trained on LLM-generated data.
- ErUM: Human-written interpretations are relatively rare anyway, given difficulty in generating and understanding data.
- ErUM: Experimental results are “reprocessed” in popular media, e.g. TED talks, Wikipedia.



2. ETHICAL-EPISTEMIC PROBLEMS:

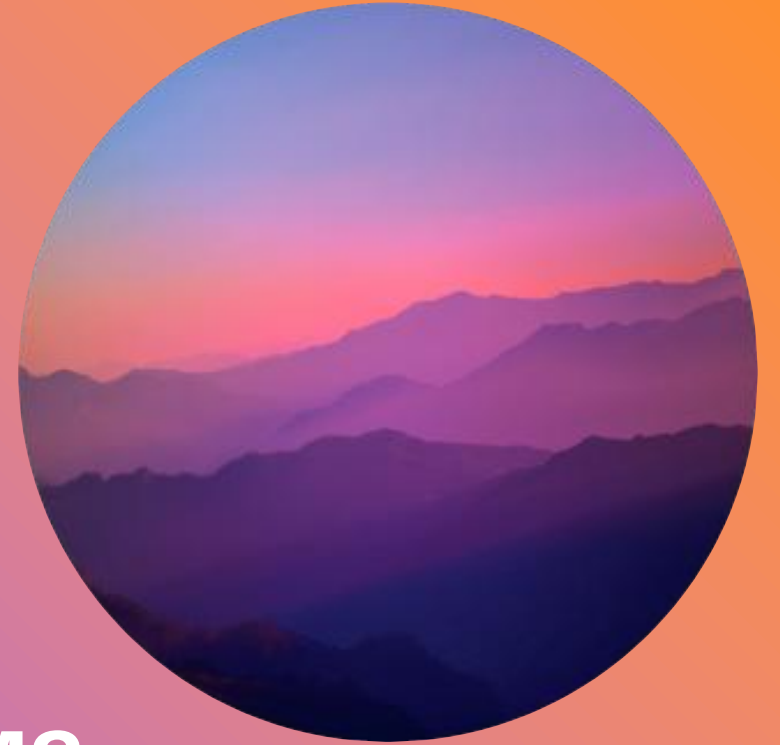
C) BELIEF OR PLAUSIBILITY BIAS



2. ETHICAL-EPISTEMIC PROBLEMS

(C) Belief or plausibility bias

- Bias to believe plausible conclusions without checking evidence.
- LLMs are optimized for plausibility and pleasance.
- Tropes and sound bites are already common in popular and semi-popular discussions of ErUM topics.



2. ETHICAL-EPISTEMIC PROBLEMS:

D) LACK OF ACCOUNTABILITY



2. ETHICAL-EPISTEMIC PROBLEMS

(D) Lack of accountability

- ErUM: Wide-ranging international collaborations, sometimes hundreds or thousands of researchers across many countries and time zones.
- Multiple working languages, AI translation tools.
- LLMs “smooth over” technical concepts.
- Mistranslations, miscommunication, semantic drift, errors creep in without clear sources.



2. ETHICAL-EPISTEMIC PROBLEMS

A note about sustainability:

- ErUM can be expensive and energy-intensive.
 - Wasted research threatens environmental sustainability.
- Public trust in science is key for funding and the mission of science.
 - Uncritical AI use threatens social sustainability.



3. BEST PRACTICES



3. BEST PRACTICES

- AI-provenance tagging
- Independence in summaries
- AI-verification workflows
- Epistemic qualifiers
- General caution



CONCLUSION

We should take advantage of the power of AI in ErUM. But we must be aware of its limitations and dangers, in general and in the case of ErUM in particular.



THANK YOU!

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