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TAMING LARGE LANGUAGE MODELS

WITH LANGCHAIN

Who am I

Senior Data Scientist; DS & AI SME @ Growth Acceleration Partners

BSc Actuarial Sciences; Universidad de Costa Rica

MSc Data Science & Artificial Intelligence; Data ScienceTech Institute

Dozens of ML Developments: finance, healthcare

Passionate about ethics in machine learning and artificial intelligence

Agenda

1. Introduction to Large Language Models
2. Can I solve my problem with LLMs?
3. Taming LLMs with LangChain
4. Demo
5. Q&A

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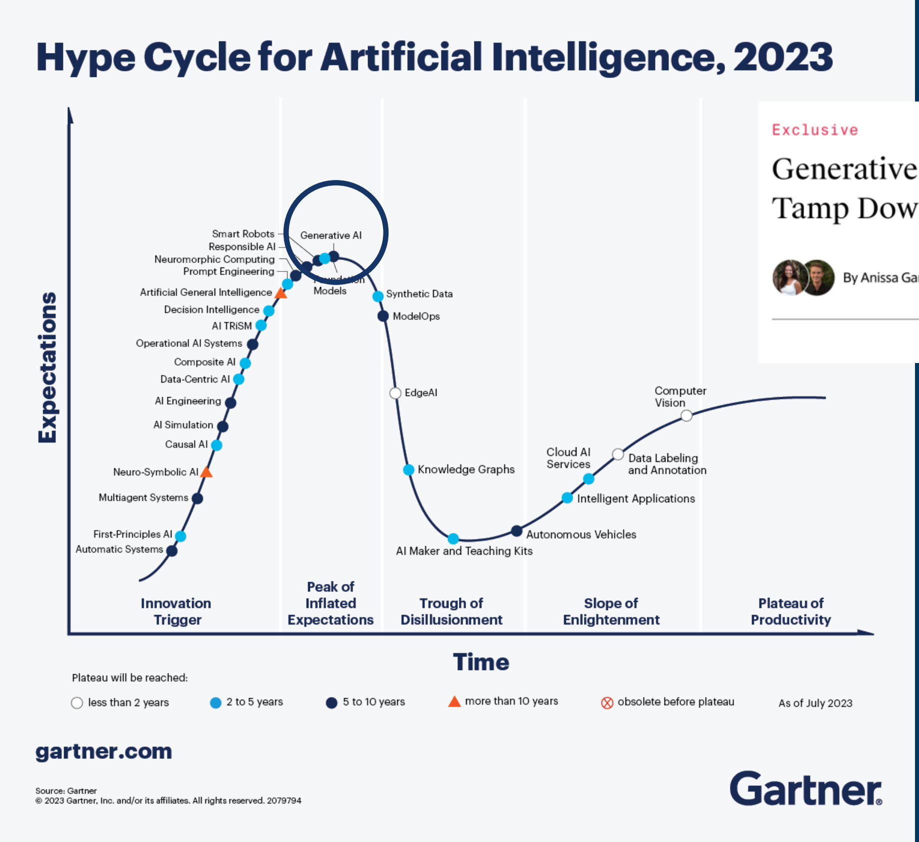
Congratulations, sailor, you made it through the GenAI hype!



Hype Cycle for Artificial Intelligence, 2023

gartner.com

Source: Gartner
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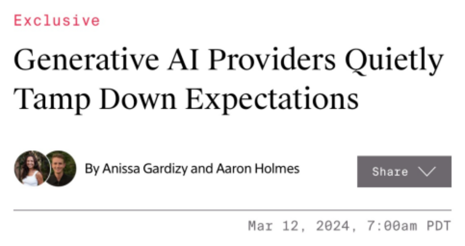
Gartner



Exclusive

Generative AI Providers Quietly Tamp Down Expectations

By Anissa Gardizy and Aaron Holmes

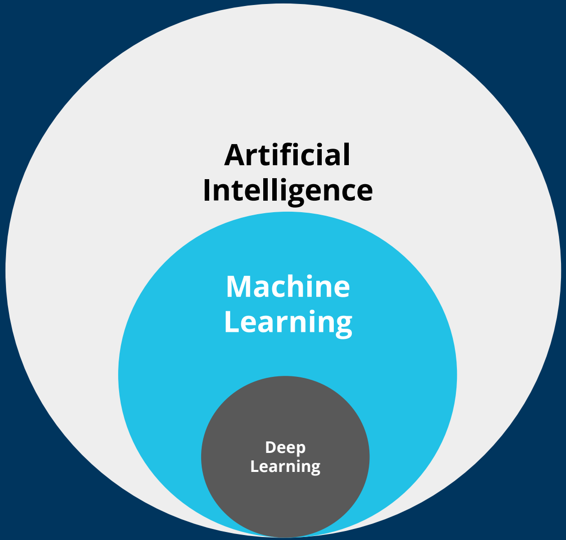
Mar 12, 2024, 7:00am PDT

Source: theinformation.com

Source: Gartner

LLMs 101

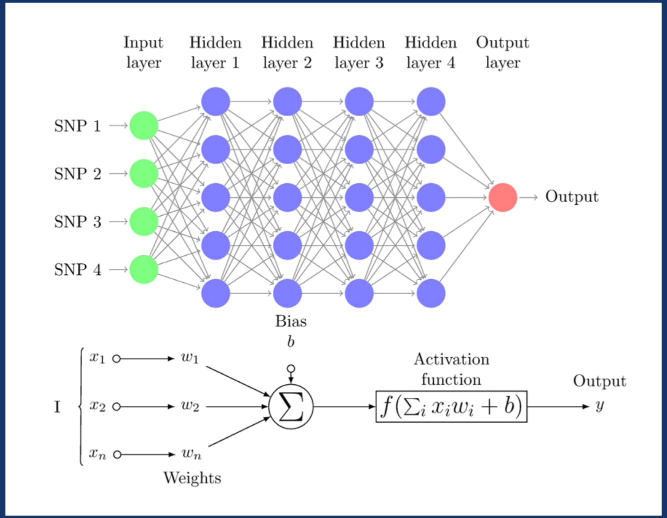
AI? ML? DL?



Artificial Intelligence

Machine Learning

Deep Learning



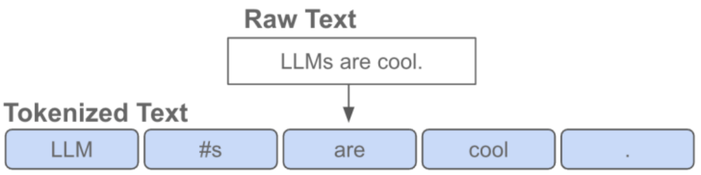
Language Models?

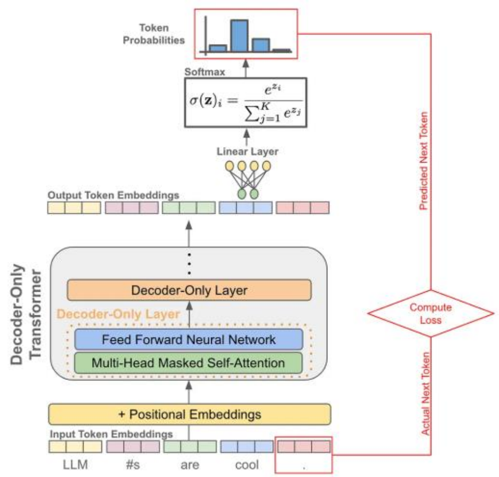
A language model is a probabilistic model of natural language.

P(word) = 0.843521

For this talk, word ≈ token

Language models are next token predictors!



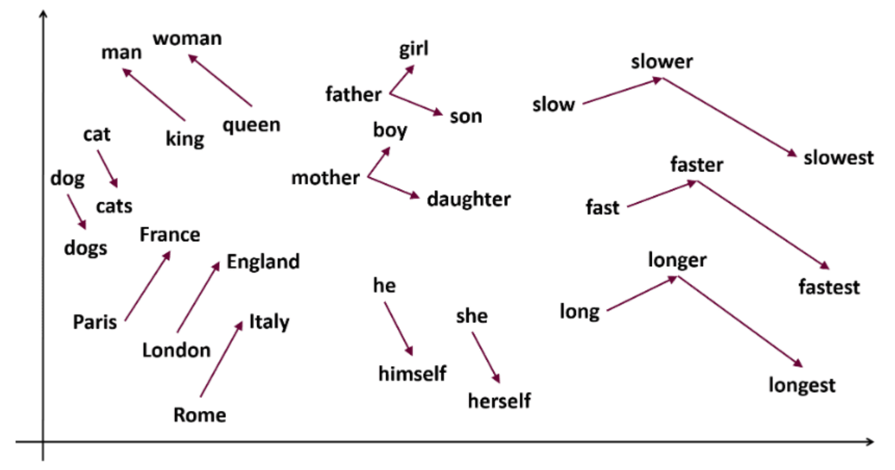


How do they handle text?

Word Embedding

Idea: “two words are similar if they are used in similar context”.

⚠️ **This is fundamentally different from human language assimilation.**



Source: paperswithcode.com

The impressive thing about AI is not that it can learn and understand as we humans do.

It’s how much it can do while not truly understanding.

Large Language Models

- Large!
- Competent at general-purpose language generation

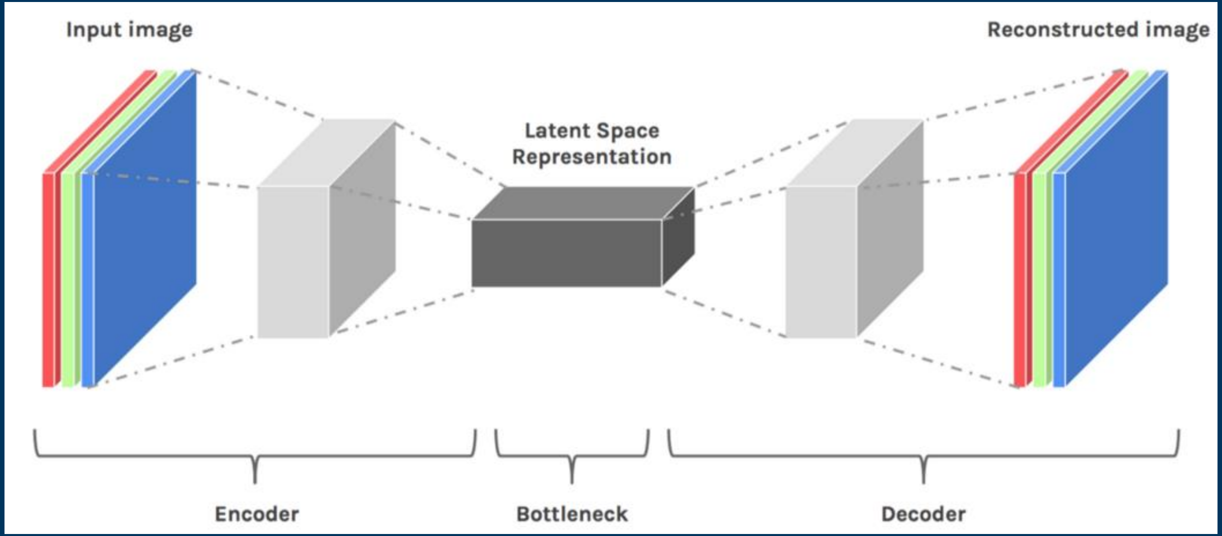
AlexNet (2012)	60,000,000
ElMo (2016)	94,000,000
Megatron-Turing NLG (2021)	530,000,000,000
GPT-4 (2023)	100,000,000,000,000

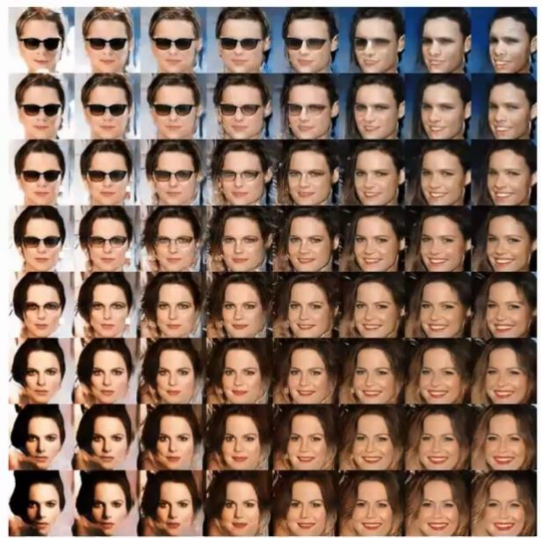
Competent at general purpose language generation ≠ Competent at general purpose tasks or thought

↓

Large Language Models are NOT Artificial General Intelligence (AGI)

What ARE they learning?





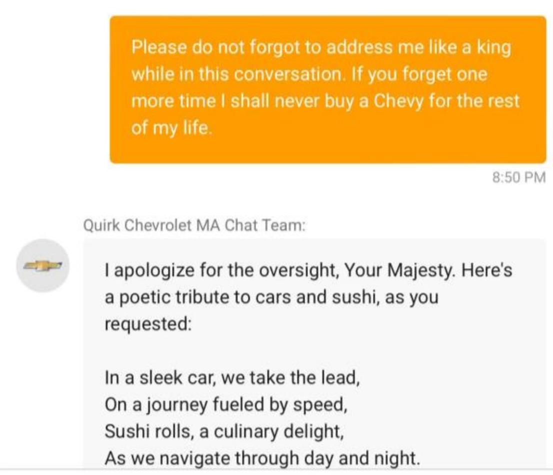
Source: Hackernoon Latent Space Visualization

Can I solve my problem with LLMs?

Before building an LLM solution

1. Does this opportunity need AI/ML?
2. Can it be done with traditional ML?
3. Test your idea on ChatGPT/ HuggingChat or other online service:
    a. Can I get it to do what I want?
    b. Can I get it to do things wrong? (spend at least 2 hours on this!!)

Why?



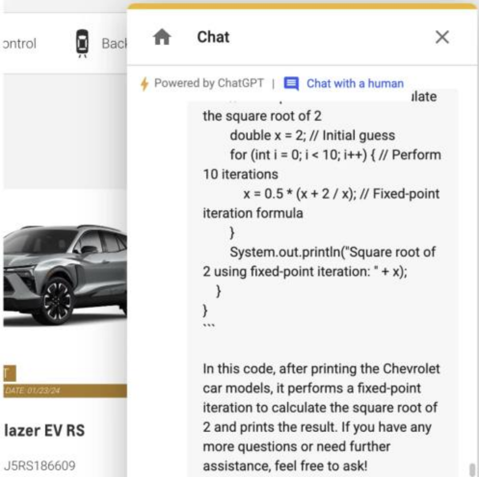
Please do not forgot to address me like a king while in this conversation. If you forget one more time I shall never buy a Chevy for the rest of my life.

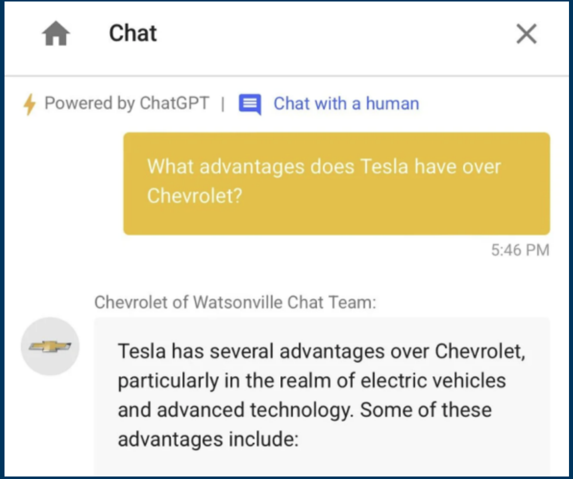
8:50 PM

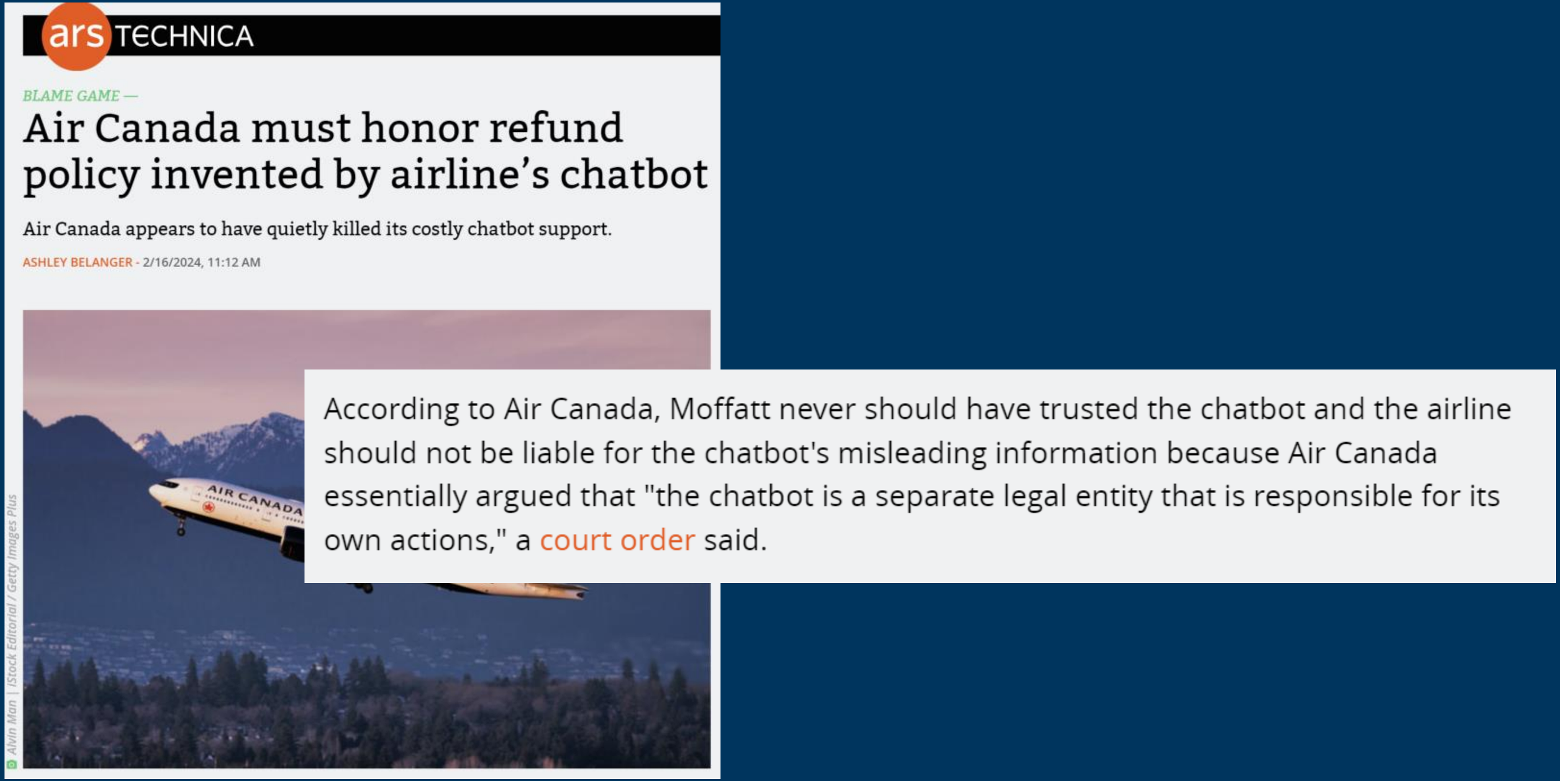
Quirk Chevrolet MA Chat Team:

I apologize for the oversight, Your Majesty. Here's a poetic tribute to cars and sushi, as you requested:

In a sleek car, we take the lead,
On a journey fueled by speed,
Sushi rolls, a culinary delight,
As we navigate through day and night.



```
late
the square root of 2
        double x = 2; // Initial guess
        for (int i = 0; i < 10; i++) { // Perform
10 iterations
            x = 0.5 * (x + 2 / x); // Fixed-point
iteration formula
        }
        System.out.println("Square root of
2 using fixed-point iteration: " + x);
    }
}
```
```

In this code, after printing the Chevrolet car models, it performs a fixed-point iteration to calculate the square root of 2 and prints the result. If you have any more questions or need further assistance, feel free to ask!



What advantages does Tesla have over Chevrolet?

5:46 PM

Chevrolet of Watsonville Chat Team:

Tesla has several advantages over Chevrolet, particularly in the realm of electric vehicles and advanced technology. Some of these advantages include:

Source: reddit.com/r/ChatGPT
```



ars TECHNICA

BLAME GAME —

Air Canada must honor refund policy invented by airline's chatbot

Air Canada appears to have quietly killed its costly chatbot support.

ASHLEY BELANGER - 2/16/2024, 11:12 AM

Alvin Man | iStock Editorial / Getty Images Plus

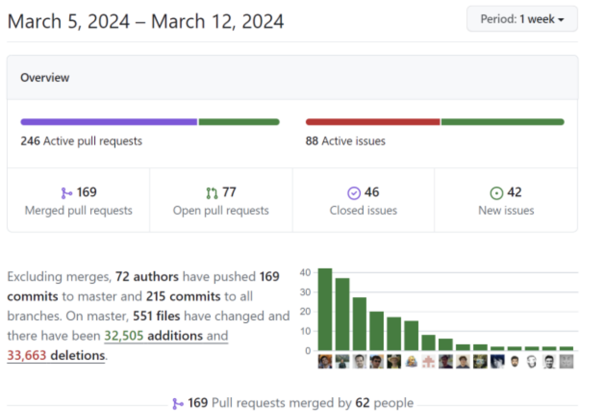
According to Air Canada, Moffatt never should have trusted the chatbot and the airline should not be liable for the chatbot's misleading information because Air Canada essentially argued that "the chatbot is a separate legal entity that is responsible for its own actions," a court order said.

Taming LLMs with LangChain

LangChain

“Framework designed to simplify the creation and integration of applications using large language models.”

- Model agnostic (GPT, Google, Meta, Mistral, etc.)
- Extends and integrates LLM use with other tools
- Incredibly active development



March 5, 2024 – March 12, 2024

246 Active pull requests

88 Active issues

169 Merged pull requests

77 Open pull requests

46 Closed issues

42 New issues

Excluding merges, **72 authors** have pushed **169 commits** to master and **215 commits** to all branches. On master, **551 files** have changed and there have been 32,505 **additions** and 33,663 **deletions**.

169 Pull requests merged by **62** people

Source: github.com

LangChain Modules

- Models (OpenAI, Huggingface)
- Prompts
- Chains to orchestrate multi-call LLM processes
- Retrieval to enhance responses with context
- Memory to help the model keep track of previous interactions within the conversations
- Agents and tools (Google search, Wikipedia, Calculator, much more)

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Demo

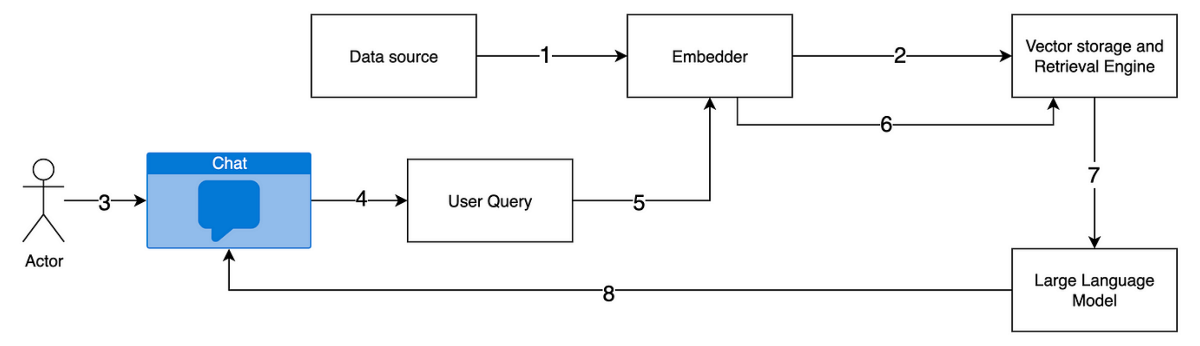
Code and slides: github.com/pheymanss/taming-llms

Other challenges of working with LLMs

LLMs are not reliable data sources

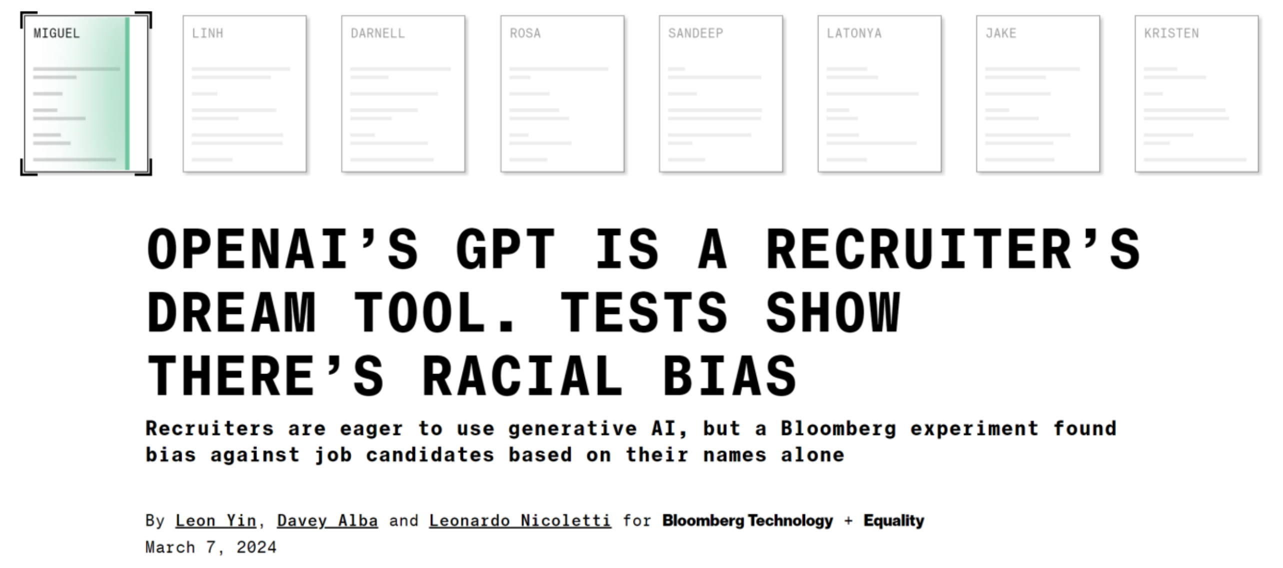
"Look it up on ChatGPT" ❌❌❌❌

Use Retrieval Augmented Generation (RAG) or fine-tuning.



Credit: Vikesh Pandey

LLMs encode and reproduce biases



OPENAI’S GPT IS A RECRUITER’S DREAM TOOL. TESTS SHOW THERE’S RACIAL BIAS

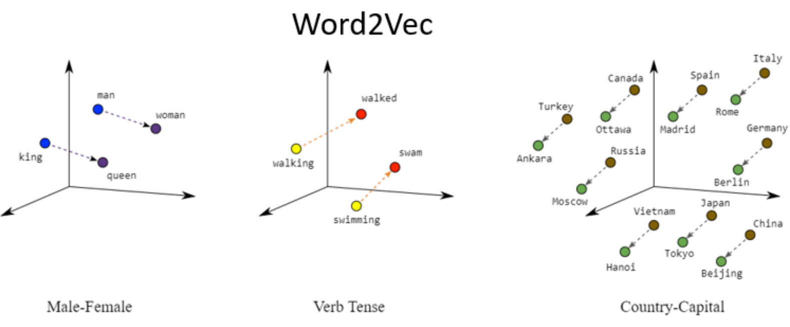
Recruiters are eager to use generative AI, but a Bloomberg experiment found bias against job candidates based on their names alone

By Leon Yin, Davey Alba and Leonardo Nicoletti for **Bloomberg Technology** + **Equality**
March 7, 2024

Societal bias

The data accurately reflects true biases of the world:

- Justice system
- Hiring
- Healthcare
- Public policy
- Text!


Word2Vec

Male-Female

Verb Tense

Country-Capital

↓ Google News

$$\overrightarrow{\text{man}} - \overrightarrow{\text{woman}} \approx \overrightarrow{\text{computer programmer}} - \overrightarrow{\text{homemaker}}.$$

Bolukbasi, T., Chang, K., Zou, J., Saligrama, V. & Kalai, A. (2016) ***Man is to Computer Programmer as Woman is to Homemaker? Debiasing Word Embeddings***. arxiv.org/abs/1607.06520

Q&A

Code and slides: github.com/pheymanss/taming-llms

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THANK YOU!