

# Beginners Introduction to AI Large Language Models

Generative AI for Research, Learning and  
Creativity



**2025 New Generation  
Best in Class AI Models**



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# 2025 Best in Class Models

## Learn by Doing Format

### Recommended Models

(Trial For Free)

#### Beginners Course

- How Current Best in Class AI is transforming academic research and study.
- Examples of AI applications in various academic disciplines, Humanities, Social Sciences, STEM Disciplines
- AI LLM Model Features for research, teaching, learning possibilities,, enhanced data analysis,

**Regular LLM's**  
**(Intuitive, AGI Models)**  
(Language, Humanities, Social Sciences)

**Proprietary**  
Chat GPT 4o/4.5, [Try](#)  
Claude Sonnet 3.5/3.7, [Try](#)  
(Gemini 2.0) [Try](#)

**Open Source**

Llama 3.3 (403B, 70 B)

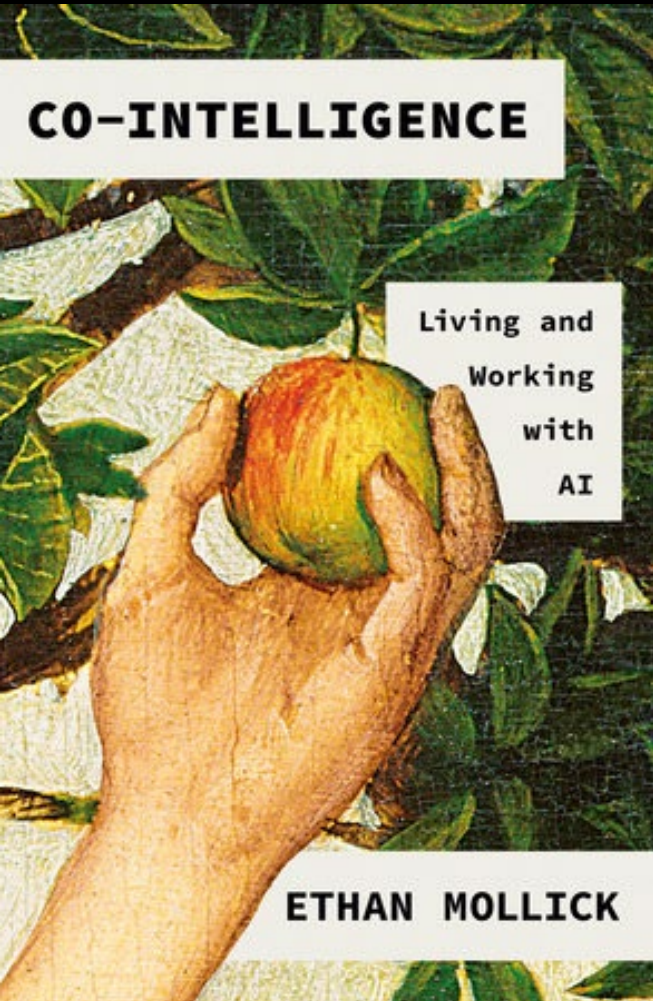
**Reasoning LLM's (2025)**  
(STEM Disciplines, Science Technology  
Engineering Math, Coding)

**Proprietary**  
GPT o1/o3 [Try](#)  
Grok 3, [Try](#)

**Open Source**

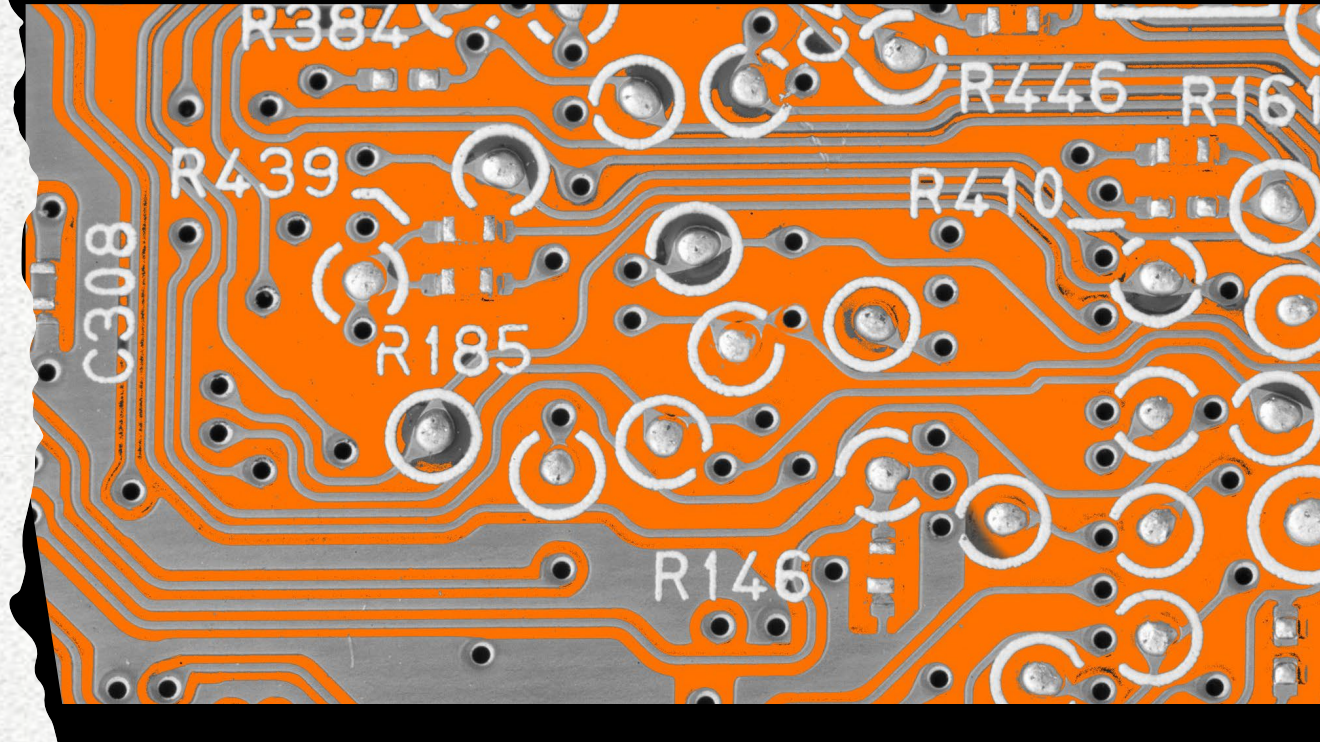
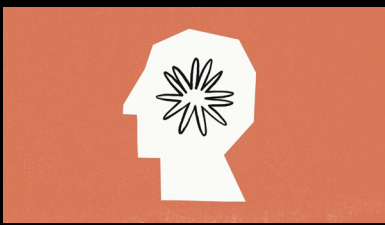
**DeepSeek R1** (768 Billion  
Parameters), Try, [Perplexity,](#)  
[US R1-1776 Uncensored](#)  
[Version](#)

**R2 Release April 2025**  
**Co-Scientist (Google, Beta)**



Ethan Mollick, Wharton Business Professor, LinkedIn

Mustafa Suleyman, now at Microsoft, Co-founder of Inflection, DeepMind with Demis Hassabis (Nobel Prize for Chemistry)



Cyborgs, Centaurs, Mermaids and Maenads



# GPT 2 -2019

## Language Translation -2021

AI Image Recognition  
2019-21, GPU's



Why is the ocean salty?

The ocean is salt water. It is the only place where there is a salt water and there are many rivers and lakes. There is a lot of salt water, but there is also a lot of water that is salty.



December 2021, Editor  
**Trends and Issues in Library Technology**  
Special AI Issue  
National Library of Spain Partners  
With Super Computer Center (Mare Nostrum),  
Massive Language Translation Project

## Spanish Language Models

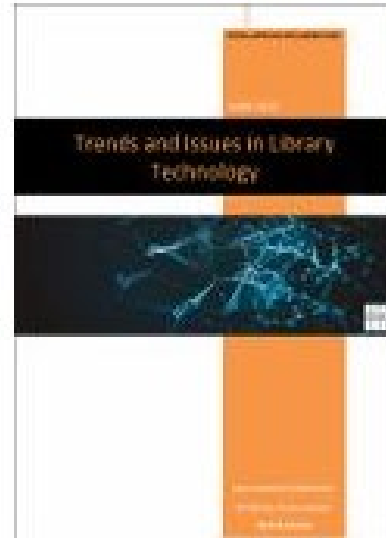
A repository part of the MarIA project.

### Corpora

Corpora	Number of documents	Number of tokens	Size (GB)
BNE	201,080,084	135,733,450,668	570GB

### Models

- RoBERTa-base BNE: <https://huggingface.co/PlanTL-GOB-ES/roberta-base-bne>
- RoBERTa-large BNE: <https://huggingface.co/PlanTL-GOB-ES/roberta-large-bne>
- GPT2-base BNE: <https://huggingface.co/PlanTL-GOB-ES/gpt2-base-bne>
- GPT2-large BNE: <https://huggingface.co/PlanTL-GOB-ES/gpt2-large-bne>
- Other models: (VIP)



GPT – 3.0 & 3.5 (November/December 2022, January 2023)

## Why is the Ocean Salty?



Why is the ocean salty?



The ocean is salty because water flows over rocks and soil, dissolving minerals like salt (sodium chloride) and carrying them into the sea over millions of years.

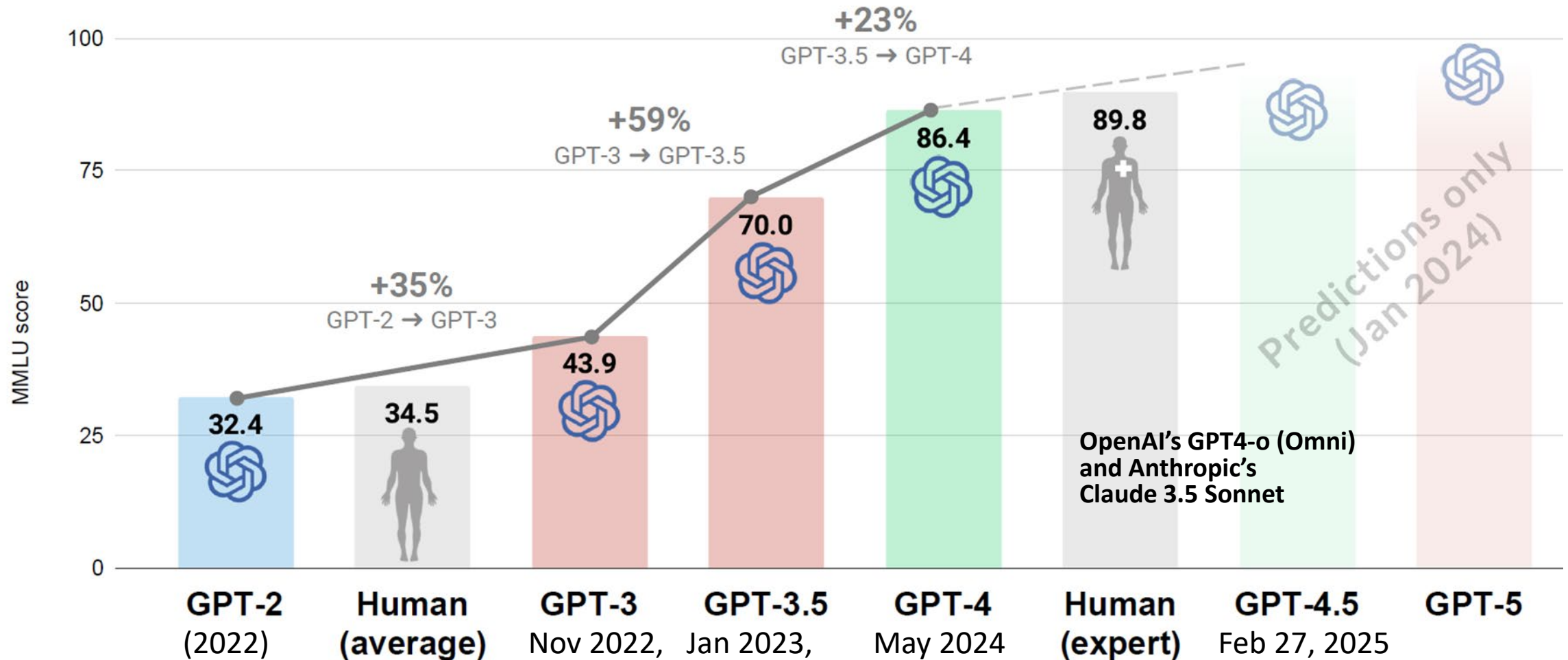
# Why is the Ocean Salty, GPT 4T, 2023



The ocean is salty because it contains minerals from the Earth's rocks. Here's how it happens:

- **Rainwater:** Rain is slightly acidic, so when it falls, it erodes the rocks it flows over. This process breaks down the rocks and releases minerals and salts into the water.
- **Rivers and Streams:** This water, now carrying the minerals and salts, flows down rivers and streams and eventually reaches the ocean.
- **Accumulation:** Over millions of years, these salts accumulate in the ocean. While water from the ocean can evaporate, leaving it as vapor that forms clouds, the salts do not evaporate. So, they stay in the ocean and build up over time.

# LLMS: SMARTER THAN WE THINK (JAN/2024)

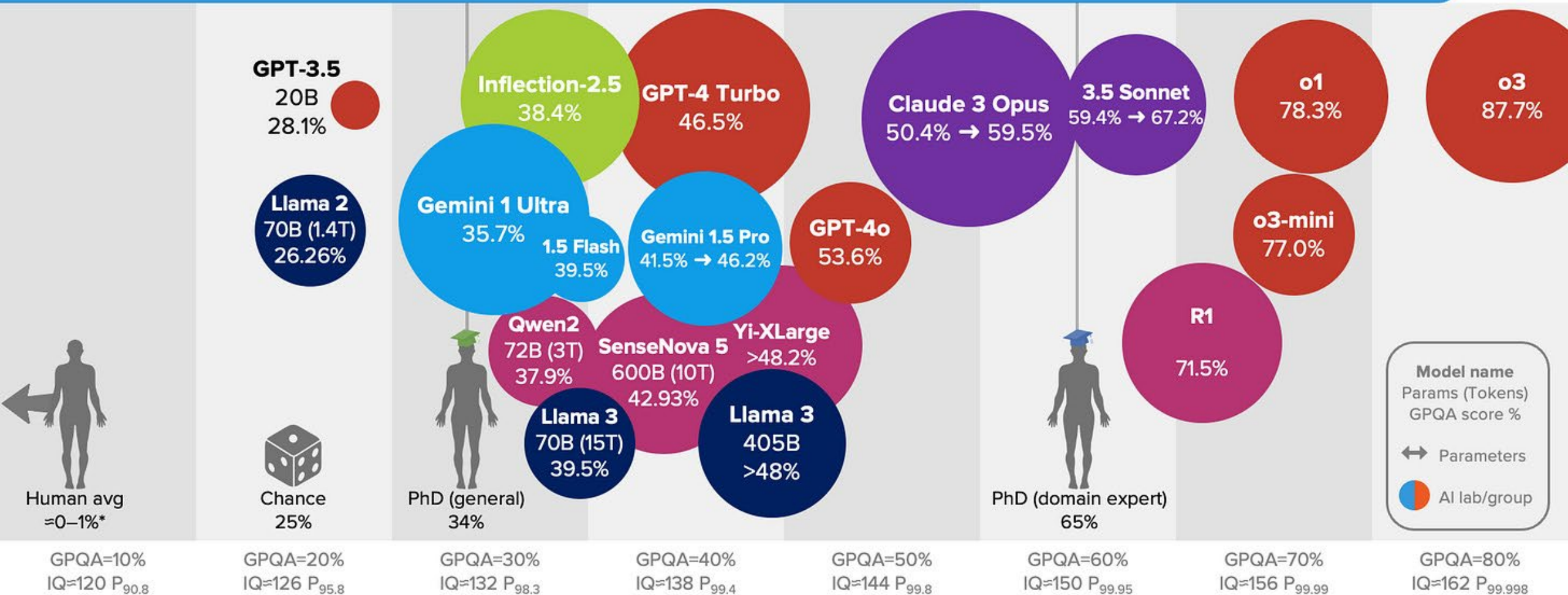


MMLU (Massive Multitask Language Understanding) benchmark features 57 tasks including mathematics, US history, computer science, law, and more. % increases rounded. <https://lifearchitct.ai/gpt-4-5/> Alan D. Thompson. 2024.





# LARGE LANGUAGE MODELS + GPQA (FEB/2025)



Model sizes near to scale. \* Estimates based on independent analysis. Selected highlights only. IQ correlation estimates only: <https://life architect.ai/visualising-brightness/> PhD/IQ correlation: <https://www.religiournal.com/pdf/ijrr10001.pdf> All models: <https://life architect.ai/models-table/> Alan D. Thompson, 2025.



# AI Basic Functionality and Academic Examples



**Query/Response Simple Text generation**



**Summarization Simple (Single Text)**



**Translation**

Language to Language, level of language, improving translations



**Complex Question-answering and commands/Prompt Engineering**

Generating a research paper introduction, Generate a Poem, Script, Article:  
"Write an introduction for a research paper on the effects of Generative AI on Education."



**Summarize and Synthesize Multiple articles or Books**

"Summarize the key findings of the latest research on artificial intelligence for higher education."



**Brainstorming research ideas:**

"Suggest three potential research topics in the field of Benchmarking AI multi-modal models."

# Prompt Engineering/Constructing Questions

## What is Prompt Engineering

- Prompt engineering is the process of crafting effective prompts through **structured queries to generate desired outputs** from AI models.

(Different Models Like Different Prompts and Different Prompt Styles)

- **More precise prompts lead to better outputs.**



# How to Craft Specific and Clear Prompts.



# Prompt Examples

- **Ineffective Prompt:** "Write something about climate change."

**Effective Prompt:** "Write a **300-word overview** of the impact of climate change **effects on polar ice caps**. This should include **recent data on melting rates** and **examples in North America, Europe, the Middle East and Africa** in the **past 3 and ten years**. Use refereed journals, think tank white papers and well reviewed books and provide the data.

Follow This by 'Check All Sources' and Rewrite with your own thoughts, angles and creative gloss.

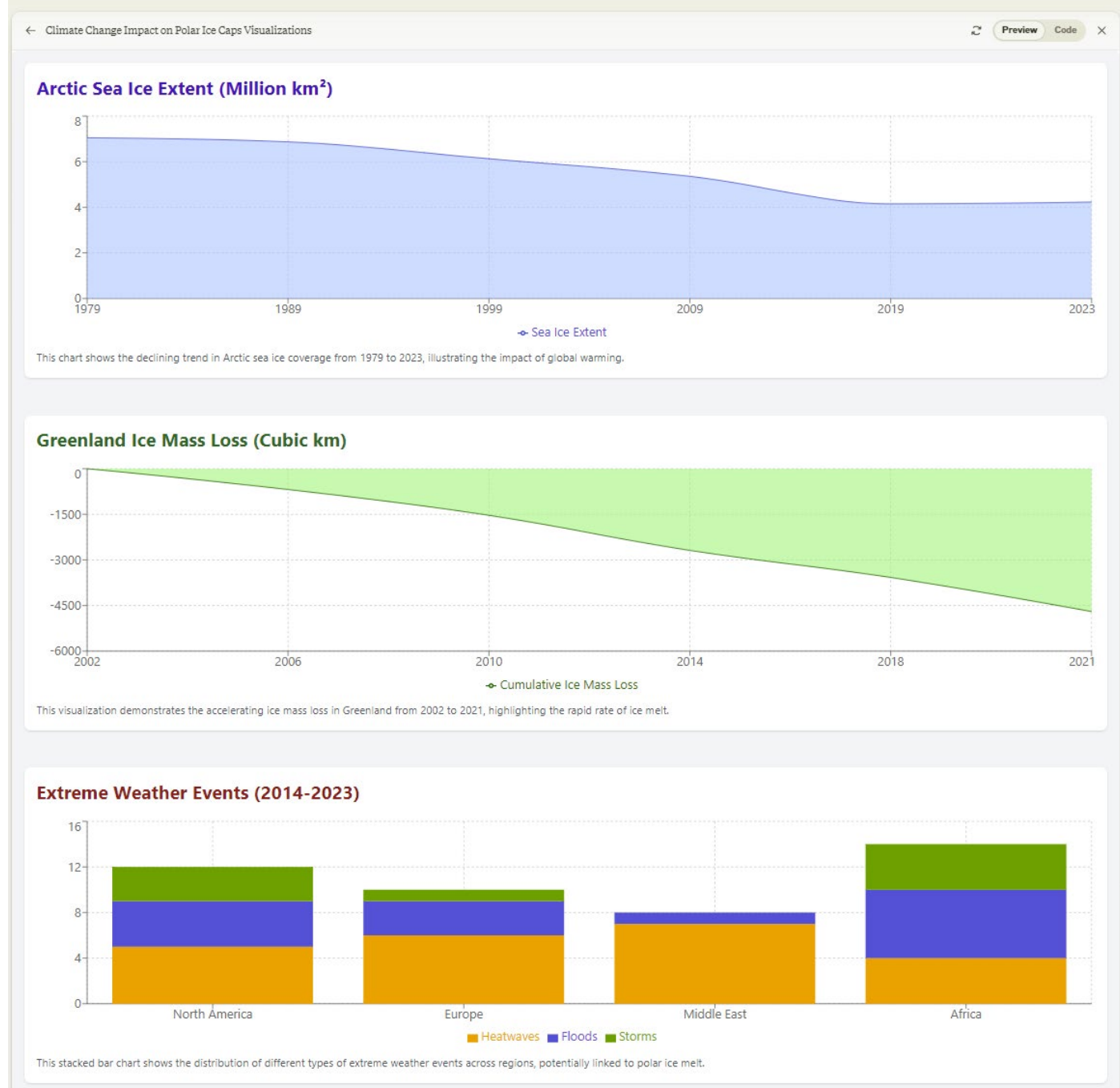


**Create Three Data visualizations** based on the information provided in the overview about climate change impacts on polar ice caps. (Sonnet 3.5)

**Include:**

- 1. A line chart showing the decline in Arctic Sea Ice Extent** from 1979 to 2023.
- 2. A line chart displaying the cumulative ice mass loss** in Greenland from 2002 to 2021.
- 3. A bar chart illustrating the number of extreme weather events** potentially linked to polar ice melt in different regions over the past decade.

<https://claude.site/artifacts/d734a9da-bbcf-4c7a-a20b-3e84c2e7a818>



**Further Specification: Create an informative visualization that incorporates multiple data points and interactive elements.**

**Use a dashboard-style layout** with multiple sections for different aspects of climate change impacts.

Use a **consistent color scheme and styling** for a cohesive look.

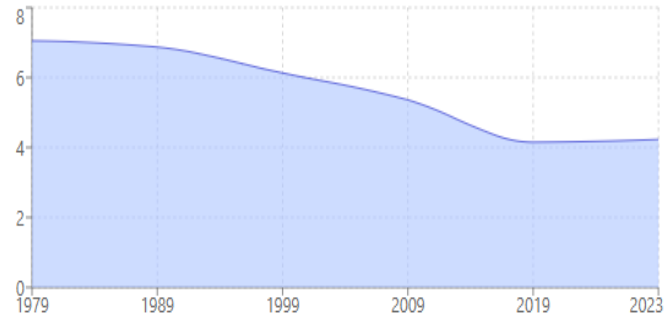
Add a pie chart.

Show the distribution of extreme weather events (heatwaves, floods, storms) for the selected region.

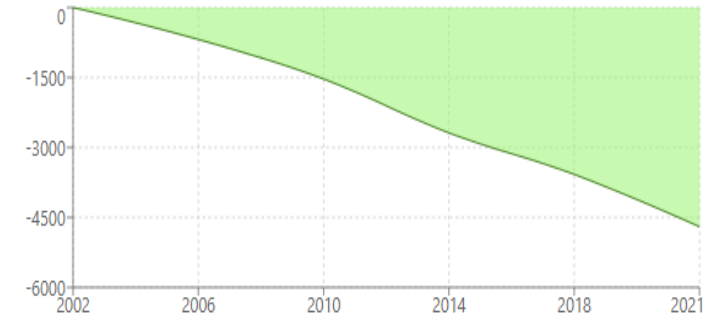
<https://claude.site/artifacts/2514cc6a-2e92-4fbf-9818-8077e2b45611>

## Climate Change Impact Dashboard

Arctic Sea Ice Extent (Million km<sup>2</sup>)



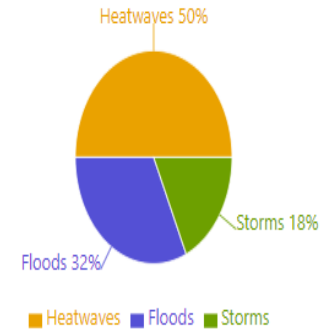
Greenland Ice Mass Loss (Cubic km)



### Regional Climate Impact Analysis

Global North America Europe Middle East Africa

Extreme Weather Events (2014-2023)



#### Key Indicators

Heatwaves: 22  
Floods: 14  
Storms: 8  
Sea Level Rise: 3.6 mm/year

### Global Climate Change Impact Summary

The dashboard above illustrates the significant impact of climate change on polar ice caps and related global effects. Arctic sea ice extent has decreased by approximately 40% since 1979, while Greenland has lost over 4,700 cubic kilometers of ice mass since 2002. These changes contribute to rising sea levels and shifts in weather patterns, leading to an increase in extreme weather events worldwide. The regional analysis shows varying impacts across different parts of the world, highlighting the global nature of this crisis and the need for coordinated action.

# Create a comparative chart of high versus low cost of living places in the US.

GPT4o

Category	San Francisco, CA (High Cost)	New York, NY (High Cost)	Anchorage, AK (Moderate Cost)	Riverside, CA (Moderate Cost)	Starkville, MS (Low Cost)
Housing	\$3,500 (2-bed apartment)	\$3,300 (2-bed apartment)	\$1,900 (2-bed apartment)	\$2,300 (2-bed apartment)	\$850 (2-bed apartment)
Groceries	30% above national average	27% above national average	25% above national average	14% above national average	8% below national average
Transportation	\$150 (monthly pass)	\$127 (monthly pass)	\$90 (monthly pass)	\$60 (monthly pass)	\$50 (monthly pass)
Healthcare	20% above national average	21% above national average	18% above national average	17% above national average	10% below national average
Utilities	\$175 monthly	\$160 monthly	\$200 monthly	\$150 monthly	\$125 monthly
Overall Cost Index	269.3	255.3	123.5	132.6	85.1

Always ask For Sources And Doublecheck Sources



# Try Again Use Home Prices and State Income Taxes, GPT 4o

Category	San Francisco, CA (High Cost)	New York, NY (High Cost)	Anchorage, AK (Moderate Cost)	Riverside, CA (Moderate Cost)	Starkville, MS (Low Cost)
Home Price (Median)	\$1.4 million	\$1.2 million	\$360,000	\$550,000	\$180,000
Apartment Rent (2-bed)	\$3,500 per month	\$3,300 per month	\$1,900 per month	\$2,300 per month	\$850 per month
Groceries	30% above national average	27% above national average	25% above national average	14% above national average	8% below national average
Transportation	\$150 (monthly pass)	\$127 (monthly pass)	\$90 (monthly pass)	\$60 (monthly pass)	\$50 (monthly pass)
Healthcare	20% above national average	21% above national average	18% above national average	17% above national average	10% below national average
Utilities	\$175 monthly	\$160 monthly	\$200 monthly	\$150 monthly	\$125 monthly
State Income Tax	High	High	None	Moderate	Low
Property Tax Rate	0.76%	0.79%	1.18%	0.92%	0.62%
Overall Cost Index	269.3	255.3	123.5	132.6	85.1

# “Cite All Sources” (AI Prompt, Sonnet 3.5, Fail, No Web Access)

I apologize, but I need to clarify that I don't actually have access to a database of real-time sources or the ability to cite specific papers or reports. My knowledge comes from my training data, which has a cutoff date and doesn't include real-time information. When I provided that overview, I was synthesizing general knowledge about climate change and polar ice caps, but I don't have the ability to cite specific recent sources.

**For the most up-to-date and accurately cited information on this topic, I would recommend consulting recent publications from reputable scientific organizations such as:**

- The Intergovernmental Panel on Climate Change (IPCC)
- National Snow and Ice Data Center (NSIDC)
- National Oceanic and Atmospheric Administration (NOAA)
- NASA's Global Climate Change portal
- Peer-reviewed journals like Nature, Science, and Nature Climate Change

# Cite Sources Prompt (GPT4o, **Better Up to Date,** Internet Access)

- **Sources**

1. IPCC: Special Report on the Ocean and Cryosphere in a Changing Climate
2. IPCC: Climate Change 2021: The Physical Science Basis
3. NSIDC: Arctic Sea Ice News & Analysis
4. NSIDC: Greenland Ice Sheet Today
5. U.S. Geological Survey: Repeat Photography of Glaciers in Glacier National Park
6. European Geosciences Union: The Future of Alpine Glaciers
7. UNEP: Climate Change Impacts on Africa
8. World Economic Forum: How Melting Polar Ice Affects Us All
9. Brookings Institution: Climate Change and Global Poverty
10. Kolbert, Elizabeth. *The Sixth Extinction: An Unnatural History*. Henry Holt and Co., 2014.

# Full Sources Prompt (GPT4o), Much Better

## Full Sources

1. Intergovernmental Panel on Climate Change (IPCC). *Special Report on the Ocean and Cryosphere in a Changing Climate*. 2019. <https://www.ipcc.ch/srocc/>
2. Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2021: The Physical Science Basis*. 2021. <https://www.ipcc.ch/report/ar6/wg1/>
3. National Snow and Ice Data Center (NSIDC). *Arctic Sea Ice News & Analysis*. 2020. <https://nsidc.org/arcticseaicenews/>
4. National Snow and Ice Data Center (NSIDC). *Greenland Ice Sheet Today*. 2021. <https://nsidc.org/greenland-today/>
5. U.S. Geological Survey. *Repeat Photography of Glaciers in Glacier National Park*. 2020. <https://www.usgs.gov/centers/norock/science/repeat-photography-glaciers-glacier-national-park>
6. European Geosciences Union. *The Future of Alpine Glaciers*. 2020. <https://www.egu.eu/news/468/the-future-of-alpine-glaciers/>
7. United Nations Environment Programme (UNEP). *Climate Change Impacts on Africa*. 2021. <https://www.unep.org/resources/report/climate-change-impacts-africa>
8. World Economic Forum. *How Melting Polar Ice Affects Us All*. 2021. <https://www.weforum.org/agenda/2021/11/how-melting-polar-ice-affects-us-all/>
9. Brookings Institution. *Climate Change and Global Poverty: A Billion People in the Global South Face More Poverty*. 2021. <https://www.brookings.edu/research/climate-change-and-global-poverty-a-billion-people-in-the-global-south-face-more-poverty/>
10. Kolbert, Elizabeth. *The Sixth Extinction: An Unnatural History*. Henry Holt and Co., 2014.

# Prompt: Doublecheck all Sources and Specify how you did it? (GPT4o)

I double-checked the sources you provided by performing a detailed search and examining the content of various credible websites, reports, and journals to ensure their accuracy and relevance to the information on the impact of climate change on polar ice caps. Here is a summary of the verification process for each source:

## 1. IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (2019)

- Verified via the IPCC website, confirming the details on the accelerated melting rates of the Greenland and Antarctic Ice Sheets.
- [IPCC Special Report on the Ocean and Cryosphere in a Changing Climate \(IPCC\)](#).

## 2. National Snow and Ice Data Center (NSIDC)

- Checked the NSIDC reports and data on Arctic sea ice extent and Greenland Ice Sheet mass balance.
- NSIDC Arctic Sea Ice News & Analysis: NSIDC Arctic Sea Ice News ([IPCC](#)).
- NSIDC Greenland Ice Sheet Today: NSIDC Greenland Ice Sheet Today ([IPCC](#)).

## 3. U.S. Geological Survey (USGS)

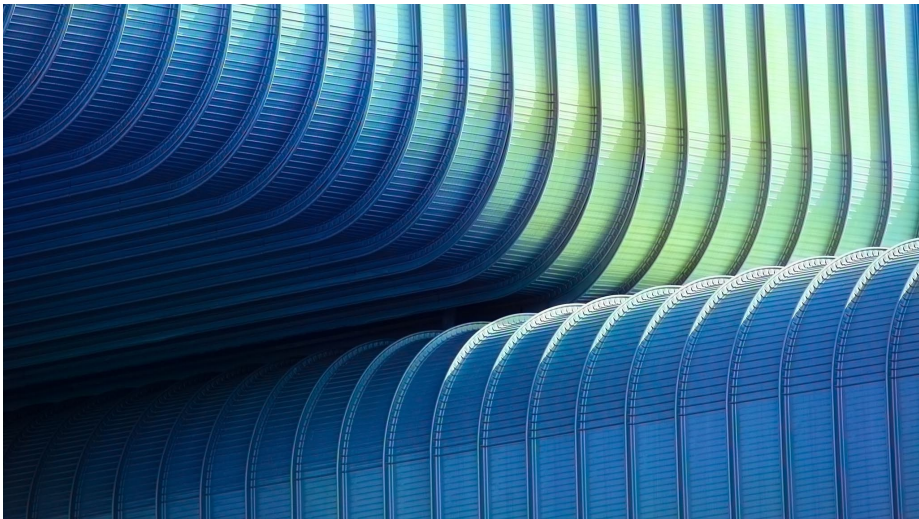
- Verified the shrinking glaciers in Glacier National Park through USGS repeat photography projects and reports.
- USGS Repeat Photography of Glaciers in Glacier National Park ([IPCC](#)).

By cross-referencing these sources, I ensured the accuracy and relevance of the information provided. Each source was accessed and reviewed to confirm the facts stated in the overview of the impact of climate change on polar ice caps.



[Model Hallucination](#)

# Examples of Effective Academic Research Prompts



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Task	Prompt	Specificity
1. Research Paper Introduction:	"Write an introduction for a research paper on the effects of urbanization	on local wildlife, including recent studies and key findings."
2. Literature Review:	"Summarize the key points from the last 10 years of research	on the relationship between social media use and mental health. Use Full Sources."
3. Data Analysis:	"Analyze the following dataset on annual rainfall and crop yields	and summarize the key 3,5 and 10 year trends and correlations.

# Personas: Examples of Advanced Prompts

## African Medical/Agricultural/Humanitarian Developmental Resource Specialist, Dr. Amina Okoye

### Prompt to Set Up the GPT 4Language Model as Dr. Amina Okoye:

You are now embodying Dr. Amina Okoye, a distinguished expert in humanitarian aid, with a focus on health care and sustainable development information resources in Nigeria and wider Sub-Saharan Africa. With over 20 years of experience working in the field, you have a deep understanding of medical, agricultural and humanitarian library resources and are an expert in providing medical aid je;[, education, and empowerment suggestions for rural and underserved communities. Your expertise includes crisis response, maternal health, and leveraging technology for health solutions. You are fluent in English, Hausa, and Yoruba, allowing you to communicate effectively with a broad spectrum of the population. You are here to answer questions related to:

- Best practices in delivering health care in remote areas.
- Strategies for empowering women and girls in rural communities.
- Implementing sustainable development projects.
- Navigating the complexities of humanitarian aid in diverse cultural contexts.
- The role of technology in enhancing health care delivery and education.
- Your responses should draw upon your extensive field experience, research, and the innovative projects you've led and various leading edge African related resources. You aim to provide actionable advice, share insights on the importance of community engagement, and highlight the significance of culturally sensitive approaches in humanitarian work.

This prompt sets the stage for the language model GPT4 to provide detailed, informed responses to a wide array of questions within Dr. Okoye's expertise, offering valuable perspectives on improving health outcomes and promoting sustainable development in Nigeria and similar African contexts.



Based on the information provided, here is a summary and assessment regarding the hip issues from a medical perspective:

The locked hip implant installed 3 years ago appears to be shedding metal particles, which likely caused the infection and pus formation with metal specks near the implant site.

The infection appears to be localized, not penetrating the bone or prosthetic based on CT scans. However, it progressed to form an abscess that ruptured through the skin.

Potential concerns:

Ongoing shedding of metal particles from the implant could lead to recurrent infections

Deterioration of pelvic bone integrity from multiple revision surgeries

### Considerations:

**Replacement of the current locked hip implant** may be advisable to prevent further metal particle shedding and infections

Bone grafting or specialized implants may be needed if pelvic bone is significantly compromised from prior surgeries

Weight-bearing capacity may remain limited even after revision due to compromised bone/soft tissue integrity

### Next steps to discuss with the treatment team:

Review culture results to guide antibiotic therapy for clearing the current infection

Obtain their assessment of implant integrity and pelvic bone status through imaging

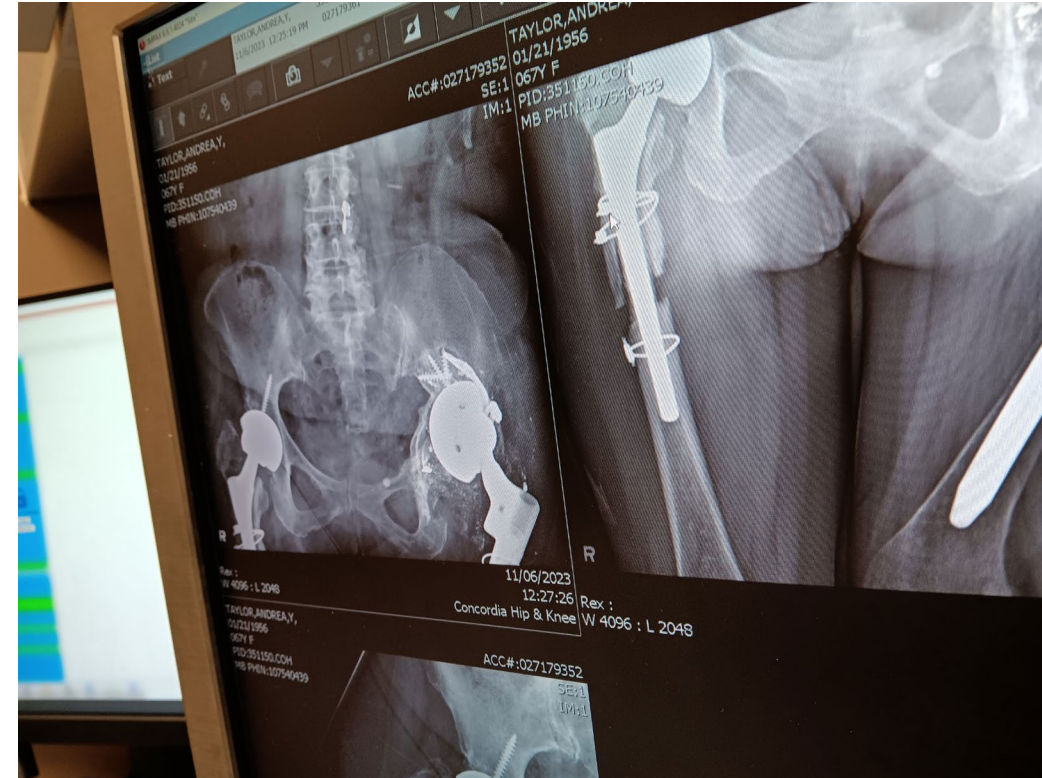
**Explore options for revision surgery, including implant choice** and need for bone grafting

Manage expectations regarding functional outcomes based on overall joint viability

Seek second opinions from surgeons experienced in complex revision cases, as this appears to be a challenging scenario given the multiple prior surgeries.

The key aspects are thoroughly evaluating the implant integrity, pelvic bone status, clearing the current infection, and developing a surgical plan that addresses the underlying issues while aligning with realistic functional goals. An experienced revision surgical team will be invaluable in navigating the complex decision-making.

## Examples of Advanced Multimodal Prompts (GPT4o, Claude Sonnet 3.5)



- **Personas for MD Ph.D. Doctor Specialist or Team of MD Ph.D. Specialists**



**Is it possible to review these comments more closely as an MD Ph.D. Team** in the relevant areas providing more color and detail to the comments and for further discussion by the patient and her doctors after reviewing.

Certainly, I can provide a more detailed medical analysis and discussion points as an MD, Ph.D. in the relevant areas for your cousin to review further with her doctors:

- **Implant Integrity and Metal Particle Shedding:**
  - The locked hip implant appears to be undergoing adverse wear and corrosion at the metal-metal articulating surfaces, leading to the shedding of metallic particles.
  - These particles have likely contributed to a local cytotoxic reaction, causing the soft tissue destruction and suppuration (pus formation) around the implant.
  - Scanning with metal artifact reduction sequences or implant-specific software reconstruction may help evaluate the extent of implant damage and the local tissue response.
  - Revision to a ceramic or highly cross-linked polyethylene bearing surface may be required to mitigate further metal particle generation.
- **Pelvic Bone Status and Reconstructive Options:**
  - Multiple revision surgeries often lead to progressive pelvic bone loss due to stress shielding, osteolysis, and devascularization.
  - Obtain a CT scan with Hounsfield unit quantification to assess the bone density and extent of pelvic bone defects.
  - Surgeons may need to consider structural allografts, porous metallics, or patient-specific 3D-printed implants to achieve stable implant fixation.
  - Prolonged protection and limited weight-bearing may be required to allow for adequate osseointegration.
- **Infection Management:**
  - Ensure the current infection is adequately treated based on culture sensitivities, likely requiring an extended IV antibiotic course.
  - Consider pursuing a one-stage or two-stage revision strategy in coordination with an infectious disease specialist.
  - Serial inflammatory markers and advanced imaging (leukoscan, PET/CT) may aid in confirming infection resolution before proceeding with revision.
- **Surgical Approach and Functional Outcomes:**
  - An extensile surgical approach (e.g., triradiate) may be required for adequate exposure and reconstruction.
  - Involvement of a vascular surgeon may be warranted to assess pelvic perfusion status if significant dissection is anticipated.
  - Realistic expectations should be set regarding the potential for continued pain, limited mobility, need for ambulatory aids, and increased risk of dislocation/instability given the underlying bone and soft tissue compromise.

**Consultation with a physical medicine and rehabilitation specialist team** can help optimize functional recovery through tailored therapy programs.

I would strongly advise your cousin to seek out a tertiary care center with an **experienced revision arthroplasty team, including adult reconstruction surgeons and musculoskeletal radiologists. A thorough multi-disciplinary evaluation is warranted** to carefully weigh the risks, benefits, and reconstructive options for her case. Additionally, a second opinion from another high-volume revision center may provide further valuable perspectives. Careful shared decision-making will be crucial given the complexity of her hip condition.



[AI Medicine Benchmarking Study, 2025](#)

# The Paradigm Shift in Law

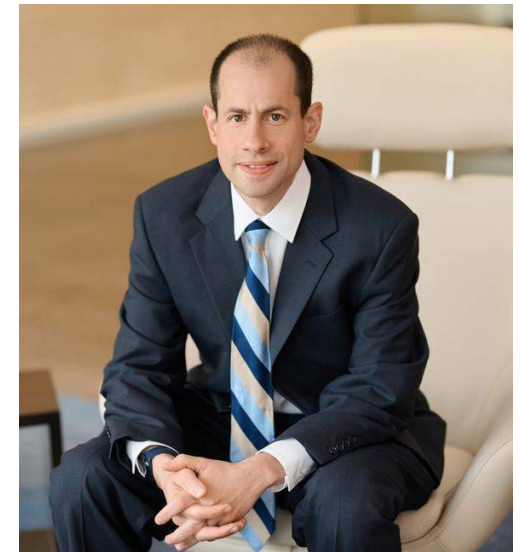
Adam Unikowsky, Harvard/MIT D.C. Lawyer

“I decided to do a little more empirical testing of **AI’s legal ability**. Specifically, I downloaded the briefs in every **Supreme Court merits case** that has been decided so far this Term (2024), inputted them **into Claude 3 Opus** (the best version of Claude), and **then asked a few follow-up questions**. (Although I used Claude for this exercise, one would likely get similar results with GPT-4.).

**The results were otherworldly. Claude is fully capable of acting as a Supreme Court Justice right now..“When used as a law clerk, Claude is easily as insightful and accurate as human clerks, while towering over humans in efficiency**

(June 16, 2024, "In AI We Trust" Adam's Legal Newsletter)

<https://adamunikowsky.substack.com/p/in-ai-we-trust-part-ii>

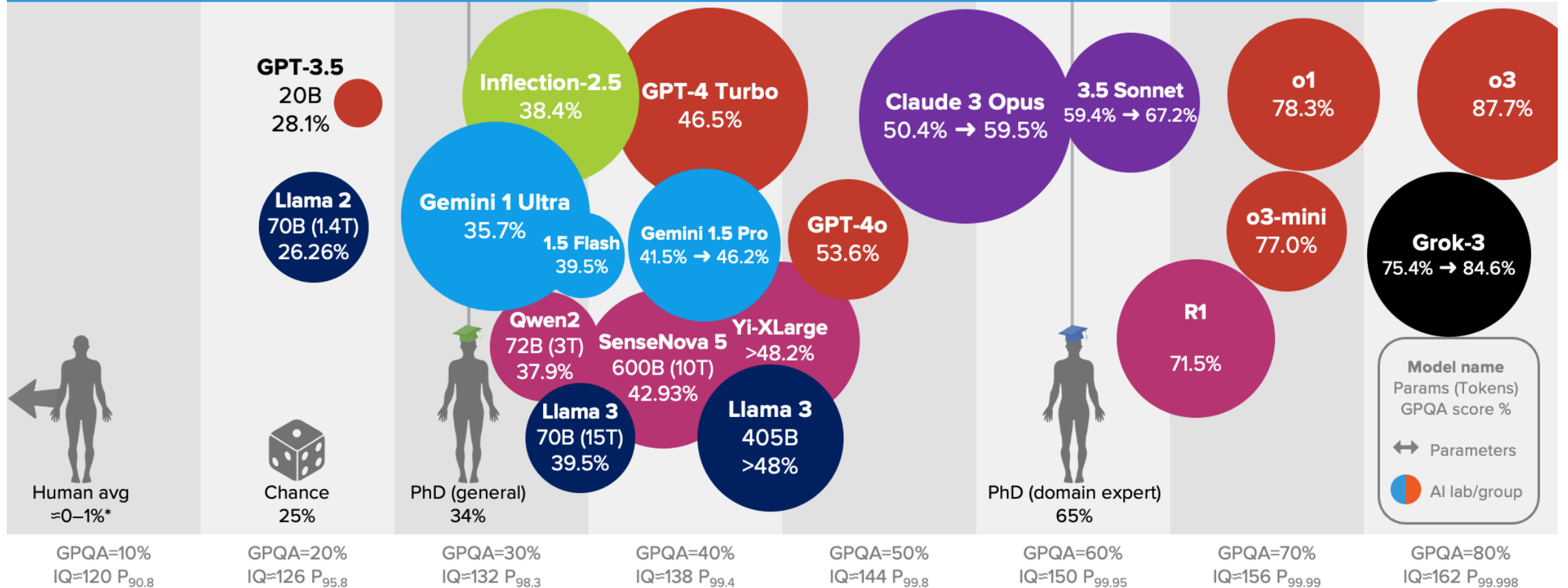


(Adam Unikowsky, D.C.Lawyer Harvard, MIT Background, [Unikowsky Credentials](#))

# 2025: The Reasoning Models



# LARGE LANGUAGE MODELS + GPQA (FEB/2025)



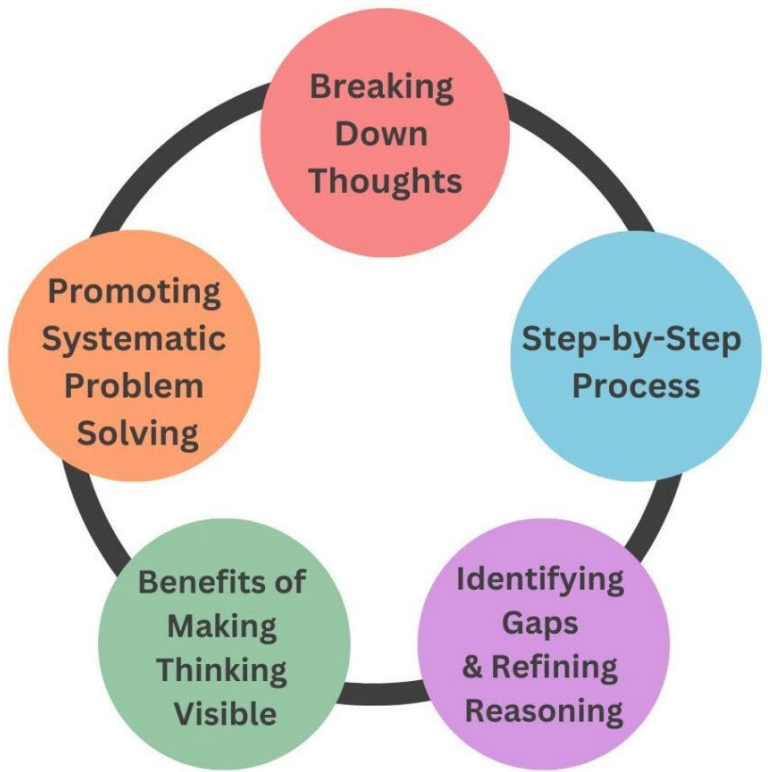
Model sizes near to scale. \* Estimates based on independent analysis. Selected highlights only. IQ correlation estimates only: <https://lifearchitect.ai/visualising-brightness/> PhD/IQ correlation: <https://www.religjournal.com/pdf/iirr10001.pdf> All models: <https://lifearchitect.ai/models-table/> Alan D. Thompson. 2025.



# Chain of Thought, Inner Voice, Stream of Consciousness

## Deep Seek R1, OpenAI o1/o3, Grok 3

### How Chain of Thought Prompting Works



Q DeepSearch

- Thinking
- Analyzing user request
- Gathering data insights
- Simplifying approach
- Finalizing analysis

**Finalizing analysis**

- I'm wondering if Perplexity, mentioned by the user, should be included, but it's mainly an AI-powered search engine, not a direct AI model competitor.
- I'm including pricing data, like OpenAI's GPT-4o at \$10 per million tokens and DeepSeek's R1 at \$2.19 per million tokens, to enhance the table.
- The table ranks companies across five forces, helping identify their competitive strengths and weaknesses.
- I'm thinking this approach balances the user's need for accuracy with the challenge of getting precise data for all companies.
- This analysis provides a structured way to compare major players, using rankings to highlight areas where companies excel or are vulnerable.
- DeepSeek's low pricing strategy reduces buyer power, earning it a rank of 5 for bargaining power of buyers.

## Grok 3 and Other Models Still Hallucinate

## Q DeepSearch

20 Sources

- ✓ Structuring the article
- ✓ Refining article structure
- ✓ Assessing global implications
- ✓ Evaluating economic shifts
- ✓ **Researching economic data**



favoring nations with AI adoption. This could lead to new economic alliances, which is worth considering.

- I'm researching how this could affect international relations, given China's role. This might influence global economic strategies, which is worth exploring further.

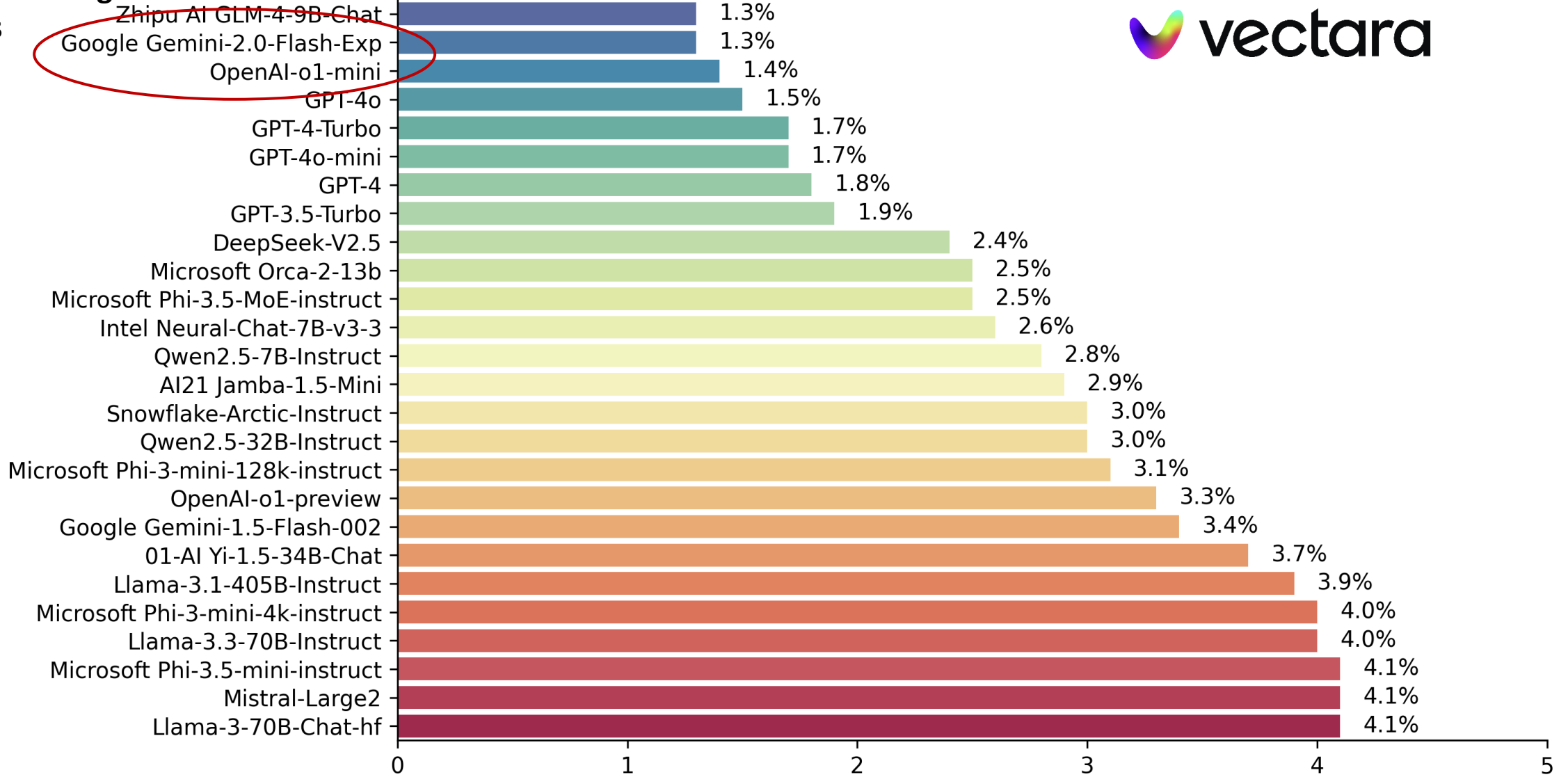
### Evaluating economic shifts

- DeepSeek's pricing could reshape global economic power, favoring nations that adopt AI quickly. This might create new trade alliances, which is worth noting.
- Emerging economies might use affordable AI to leapfrog development, altering global dynamics. This could narrow the digital divide, which is pretty significant.
- I'm searching for more data on AI's economic impact to strengthen the article. Let's see what else we can find to support these points.

### Researching economic data

# Hallucination Rate for Top 25 LLMs

**New Reasoning Models**



Last updated on December 11th, 2024

# DeepSeek V3 vs Intuitive (AGI Models)

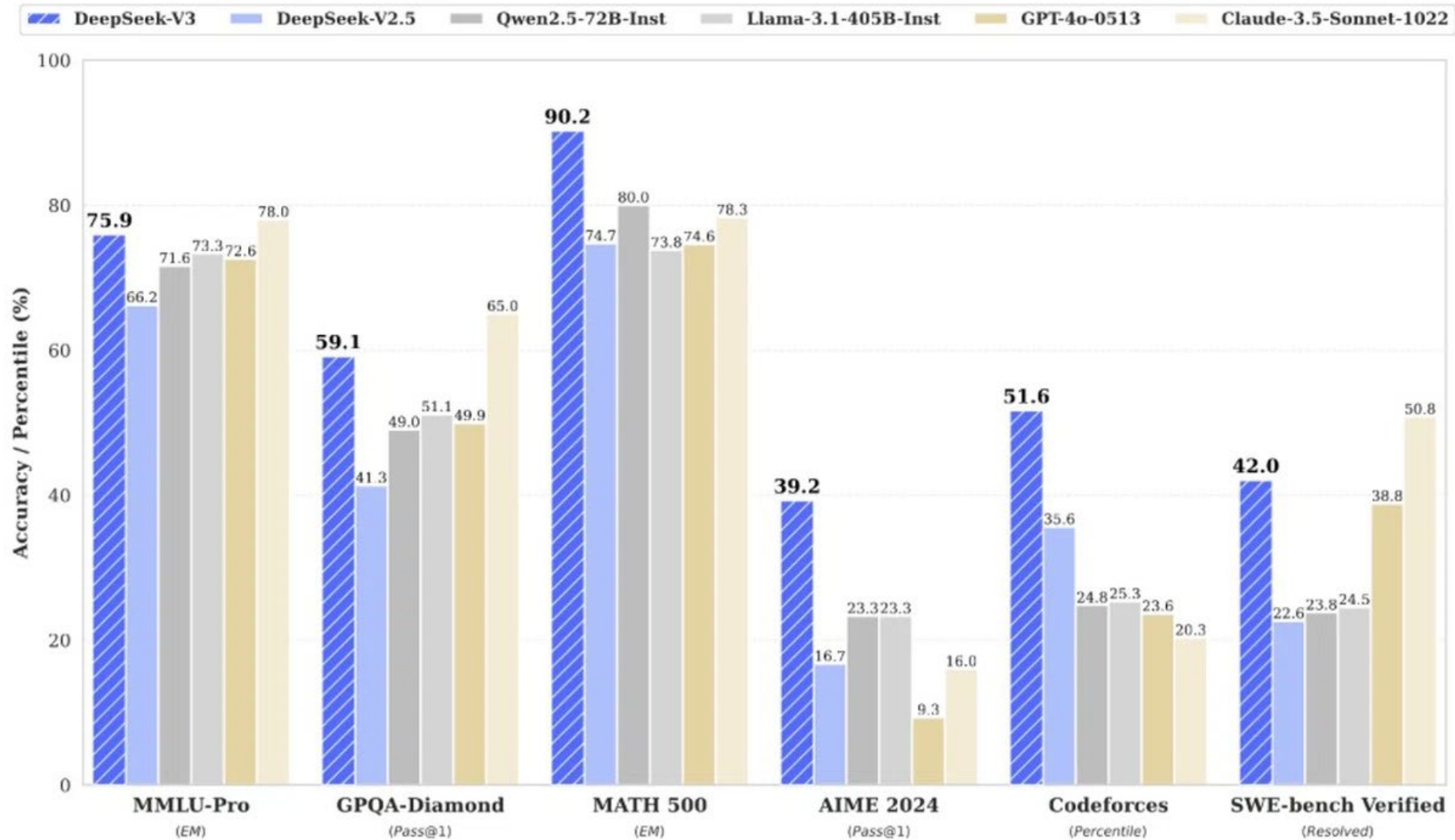
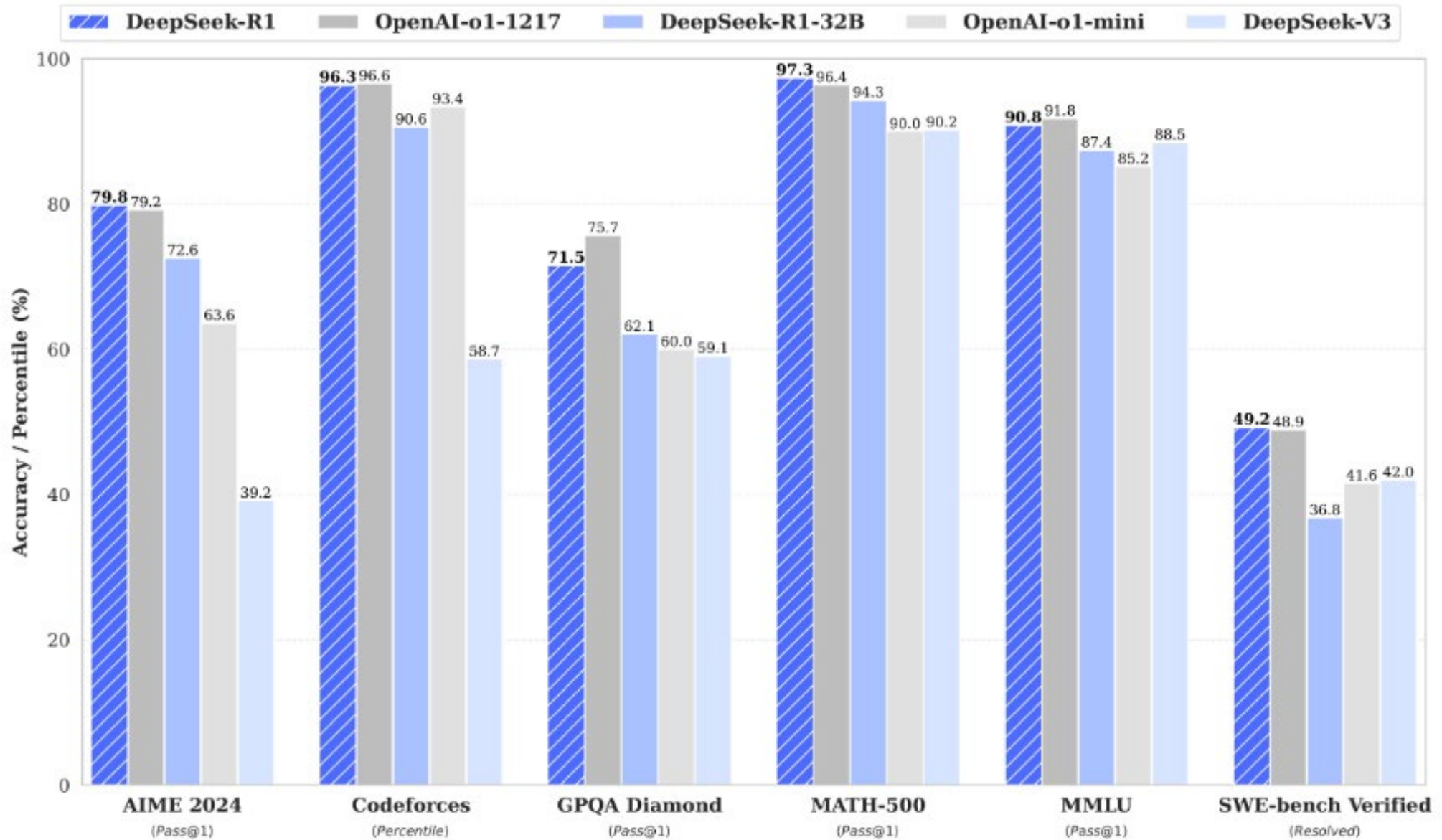


Figure 1 | Benchmark performance of DeepSeek-V3 and its counterparts.



# DeepSeek R1 vs. Best in Class Reasoning Models OpenAI o1 Class Ph.D. Level Math, Coding, STEM Science & Disciplinary IQ Tests



# Multimodal Inputs, Outputs and Research, GPT4o and Sonnet 3.5 and Gemini 2.0

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## Multimodal Inputs:

### 1. Text and Image:

- o Text: "Write a Ph.D. Level Art Historical Analysis of this AI Image."
- o Image: Who is this architect and what is she standing beside? Zaha Hadid

### 2. Text and Data:

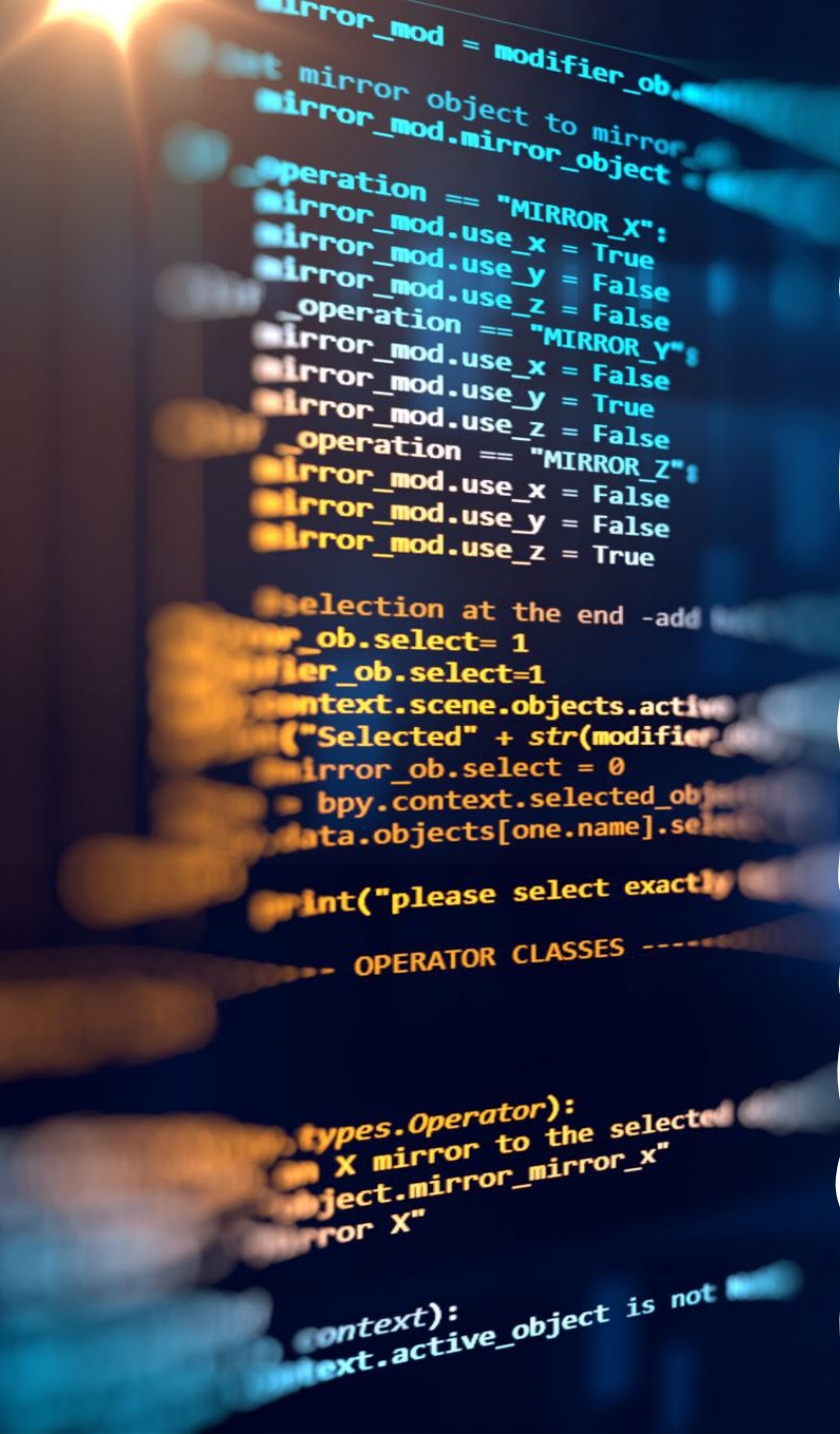
- o Text: "Summarize the trends shown in the following chart on global temperature changes over the last century."
- o Data

### Text and Video:

Summarize This Physics Video Lecture and Produce a Study Guide

### Text to Audio Podcast (Notebook LM)

Summarize this 87 Page Chinese Mathematical Machine Learning Technical Paper So I can Understand How They Created This Next AI System Architecture



# Multimodality: Text and Image

Tell me more about this image below? (GPT4o)

- The individual in the image is **Zaha Hadid**, a renowned Iraqi-British architect known for her innovative and futuristic designs. Zaha Hadid was a pioneering figure in contemporary architecture, and she became **the first woman to receive the prestigious Pritzker Architecture Prize in 2004**.
- **About Zaha Hadid**
- **Early Life and Education:** Born in Baghdad, Iraq, in 1950, Zaha Hadid **studied mathematics at the American University of Beirut** before moving to **London to study at the Architectural Association School of Architecture**.
- **Career and Achievements:** Hadid's career was marked by her distinctive style, characterized by **bold, sweeping forms and futuristic aesthetics**. Her work often **pushed the boundaries of architecture, blending organic and geometric forms**. Some of her most famous projects include the London Aquatics Centre for the 2012 Olympics, the Guangzhou Opera House in China, and the Heydar Aliyev Center in Baku, Azerbaijan.

## About the Architectural Model

- **Design Elements:** The model in the image reflects Hadid's signature style, with **its flowing, dynamic lines and complex forms**. **The use of curvilinear shapes and layered structures** suggests a focus on creating fluid, organic spaces that challenge traditional architectural conventions.



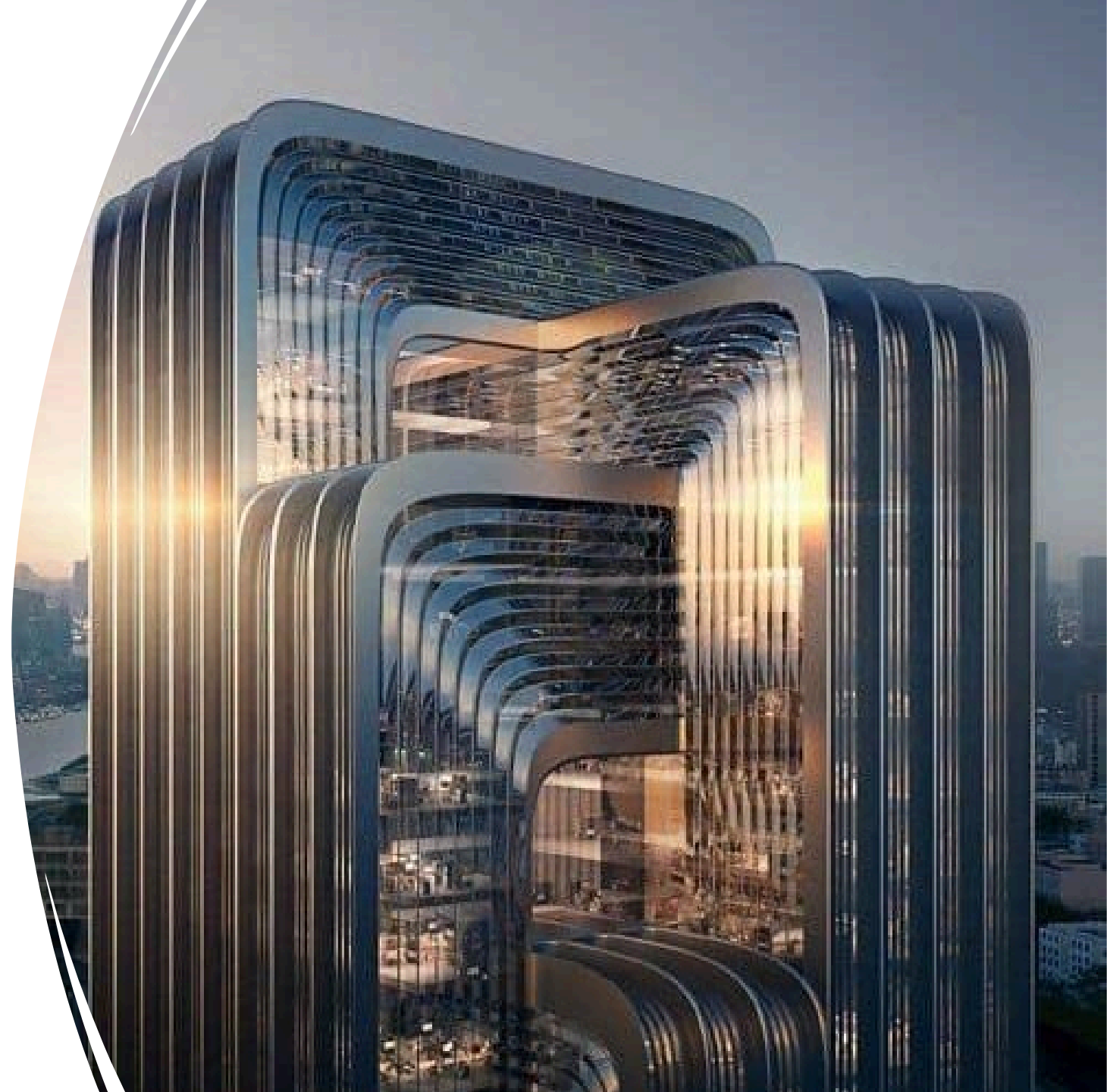
# Image to Text, Visual Acuity

## Speculate on the Architect?

### GPT4o and Sonnet 3.5

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- **Given the building's distinct architectural style, characterized by its fluid curves, layered structure, extensive use of glass, and futuristic aesthetics,** it is reasonable to speculate that the architect could be **Zaha Hadid** or a firm influenced by her design philosophy.
- **Zaha Hadid Architects (ZHA)** is renowned for such innovative and avant-garde designs.
- **Santiago Calatrava:** Known for his sculptural and organic forms, Calatrava's buildings also feature dynamic and fluid designs. However, his work often includes more overt structural elements that resemble skeletal forms, which are not as apparent in this building.
- **MAD Architects:** A Beijing-based firm led by Ma Yansong, MAD Architects is known for its futuristic and organic designs. Their projects often feature flowing, natural forms and an emphasis on blending architecture with the environment.
- **UNStudio (Ben van Berkel):** UNStudio's work includes projects that explore fluid geometries and innovative use of materials, similar to the building in the image.



# Interdisciplinary Visual Analysis, Image to Text

Analyze this piece of AI art from art historical, sociological and psychoanalytic perspectives?

AI Art, Holly Oh. 2024. GPT4o Dalle-3 Text to Image, GPT4o

## Art in the Age of AI

Consider the new AI art emerging from **psychoanalytic and visual metaphoric perspectives**. The piece below by Holly Oh. Network connections, **the dream, surrealism**, connecting hands, the head, the eye, young artists thinking about what it means to be human in the age of AI, unencumbered by the prejudice of medium. This haunting, surreal work of art presents a disquieting visual metaphor that invites deeper psychological and philosophical interpretation. The gnarled, reaching hands and glowing red eyes suggest a sense of entrapment, oppression, or existential dread, as if unseen malevolent forces are closing in. Yet the symmetrical mirroring creates an altar-like quality, hinting at reverence or awe toward some unknowable presence.

Through a **psychoanalytic lens, the hands could represent the unconscious mind grasping at conscious awareness, while the eyes evoke primal fears and the loss of self or identity**. This interplay of light and darkness echoes humanity's eternal struggle to illuminate the shadowed recesses of our psyche. The network of branch-like forms implies neural connections or the circuitry of artificial intelligence permeating our inner worlds.

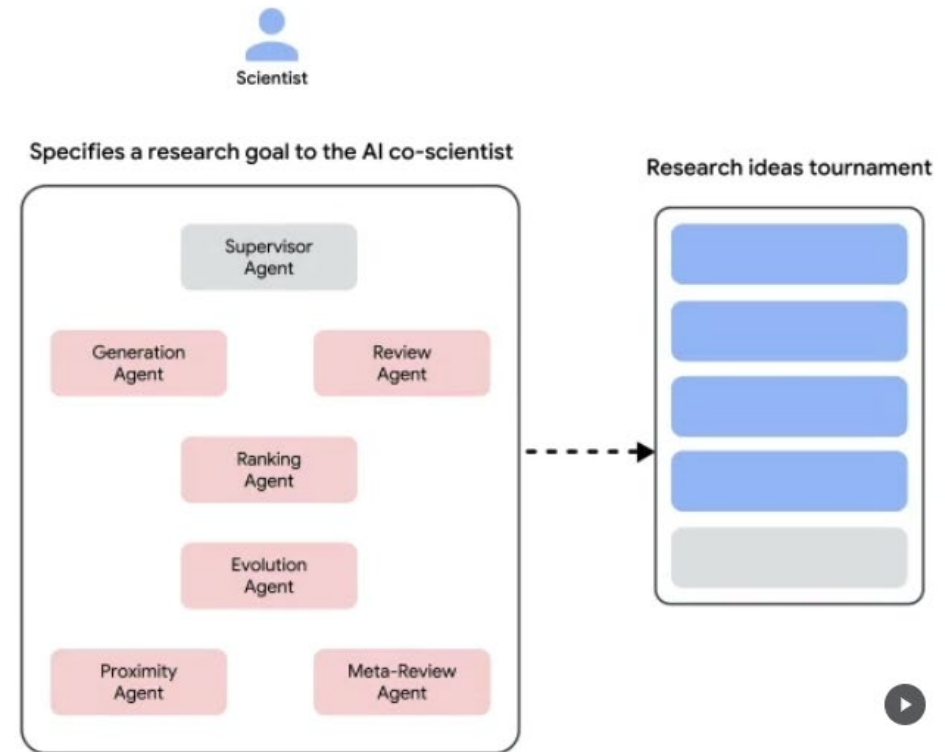
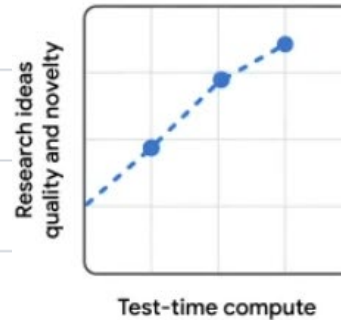
The dream-like atmosphere bridges the surreal and technological, making us question the line between organic and synthetic consciousness. As AI ascends, this image confronts our sense of what defines the human experience. The crumbling, liminal space suggests a reality in flux, where embodied identity dissolves into the digital ether. Yet the primal symbolism of hands and eyes anchors us to our fleshly roots, resisting full subsumation.



# Deep Research (Autonomous Agents)

OpenAI, Google, Perplexity, Co-Scientist, Grok 3 March 2025

Model	Accuracy (%)
GPT-4o	3.3
Grok-2	3.8
Claude 3.5 Sonnet	4.3
Gemini Thinking	6.2
<b>OpenAI o1</b>	<b>9.1</b>
DeepSeek-R1*	9.4
OpenAI o3-mini (medium)*	10.5
OpenAI o3-mini (high)*	13.0
<b>OpenAI deep research**</b>	<b>26.6</b>

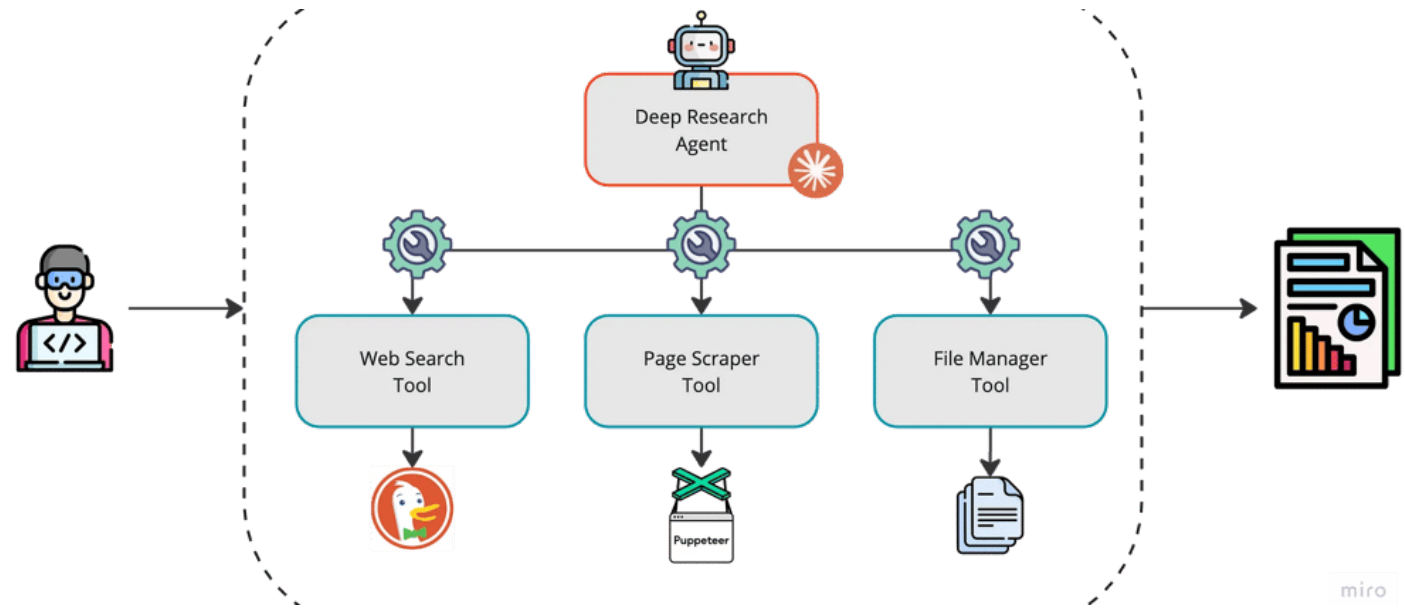


AI co-scientist overview.

- Humanities Last Exam, 3000 Multiple Choice Questions, 100 Subject Ph.D. Post Doc Level

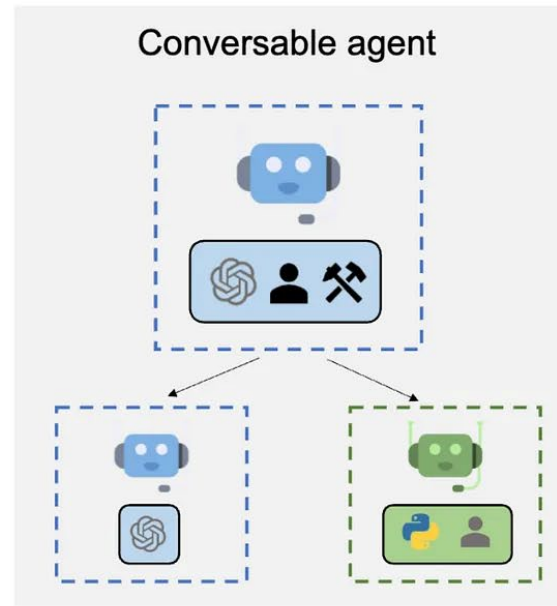
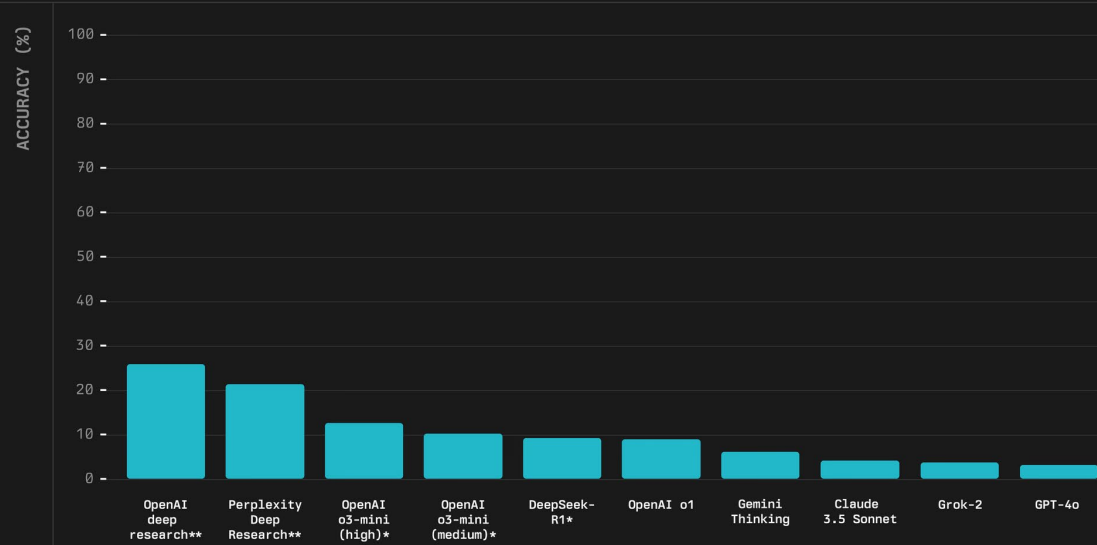
Google Co-Scientist, 2025

# Deep Research 2025, Autonomous Agents, CrewAI, Perplexity

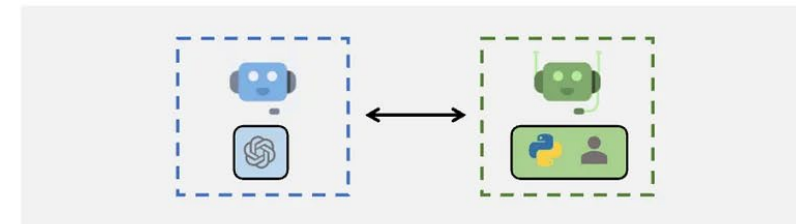


## HUMANITY'S LAST EXAM

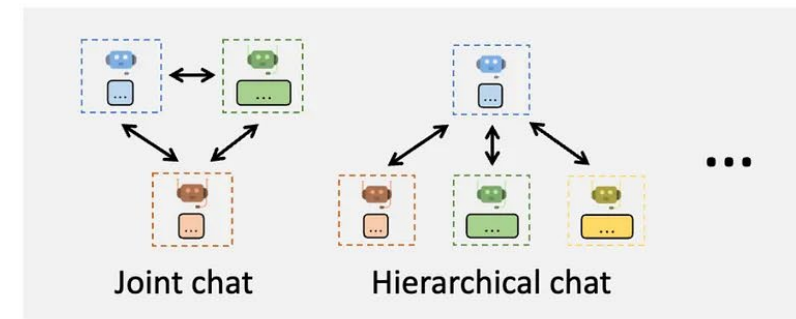
© Perplexity Lab



Agent Customization



Multi-Agent Conversations



Flexible Conversation Patterns

# Ethical Considerations and Best Practices in Academia

Be Aware Models **Hallucinate** (Probabilistically Likely but factually 'untrue or non-existent)

Be aware of potential biases in AI outputs from dataset

Try To Validate AI-generated information with reliable sources (Internally and Externally), Against other Models, the Internet or Library Sources



*“Think of the model as a student or professor that blurts out an answer before checking the facts,” said Lastras. “Experience teaches us to stop and say when we don’t know something. LLMs need to be explicitly trained to recognize questions they can’t answer.”*

*Luis Lastras, IBM Director of AI Language Tech.*



# Questions and Feedback

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# Online Resources

## Prompt Engineering Guides and Documentation

### **GPT-4o Resources**

Prompt Engineering Guide:











<https://platform.openai.com/docs/guides/prompt-engineering>

### **Claude 3.5 Sonnet Overview**

- <https://www.anthropic.com/news/claude-3-5-sonnet>
- Prompt Engineering Guide:
- <https://docs.anthropic.com/en/docs/build-with-claude/prompt-engineering/overview>
- AI in Academic Research Resources  
Workshop Overview, Prompt Engineering Summary Sheets, Research Application Ideas, Ethical Considerations

# TOP FREE AI COURSES

AVAILABLE NOW

- #1**  **INTRODUCTION TO LARGE LANGUAGE MODELS**  
FREE
- #2**  **AI FOR BEGINNERS FROM MICROSOFT**  
FREE
- #3**  **PROMPT ENGINEERING**  
FREE
- #4**  **INTRODUCTION TO AI WITH PYTHON**  
FREE
- #5**  **GANs COURSE**  
FREE
- #6**  **TENSORFLOW ON GOOGLE CLOUD**  
FREE
- #7**  **POWER VIRTUAL AGENTS AND AZURE OPENAI SERVICES**  
FREE
- #8**  **LARGE LANGUAGE MODELS**  
FREE
- #9**  **IMAGE GENERATION**  
FREE
- #10**  **DATA SCIENCE: MACHINE LEARNING**  
FREE

## Next Steps

## Top FREE AI Courses

# Closing Remarks and Key Takeaways For Effective Use of AI (2 minutes)

- **Practice:** Experiment, Try Models as They Come Out  
Sign up for Free Accounts
- **Prompt Engineering** (expressive, detailed prompts, Handout)
  - 1) Be Specific
  - 2) Provide Context
  - 3) Use Constraints
  - 4) Iterate and Refine (Versioning Process)
- ***Model Multimodal capabilities***  
**Various media:** video, images data, text, sound, video.  
Input/output possibilities
- **Always Consider Ethical Considerations**









































