



# ETHICAL USE OF ARTIFICIAL INTELLIGENCE IN RESEARCH

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NIOH – Biennial Research Day

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AI PROGRESS



# TWO AI LEADERS AWARDED NOBEL PRIZES IN 2024

GEOFFREY HINTON - PHYSICS

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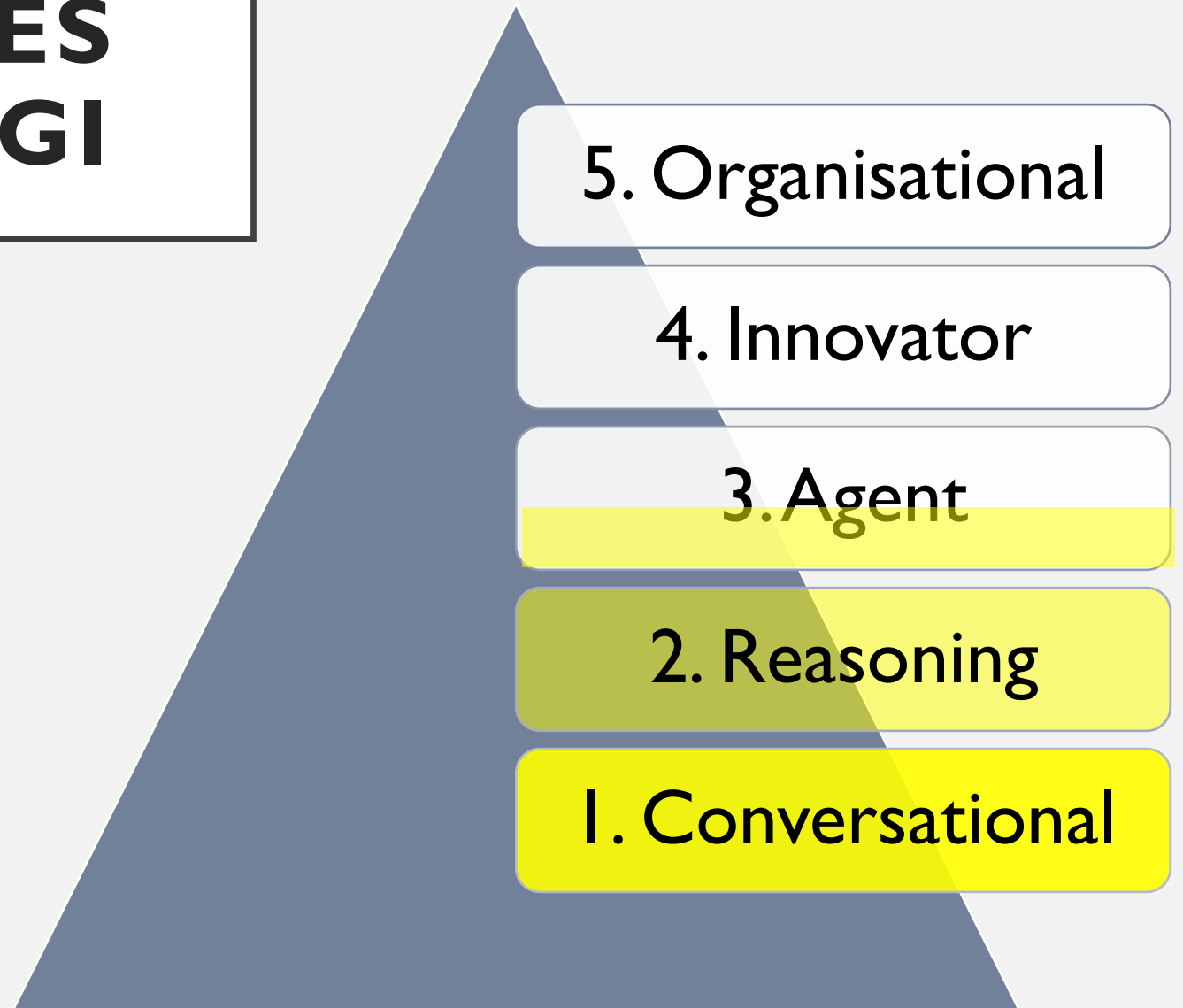
DEMIS HASSABIS - CHEMISTRY

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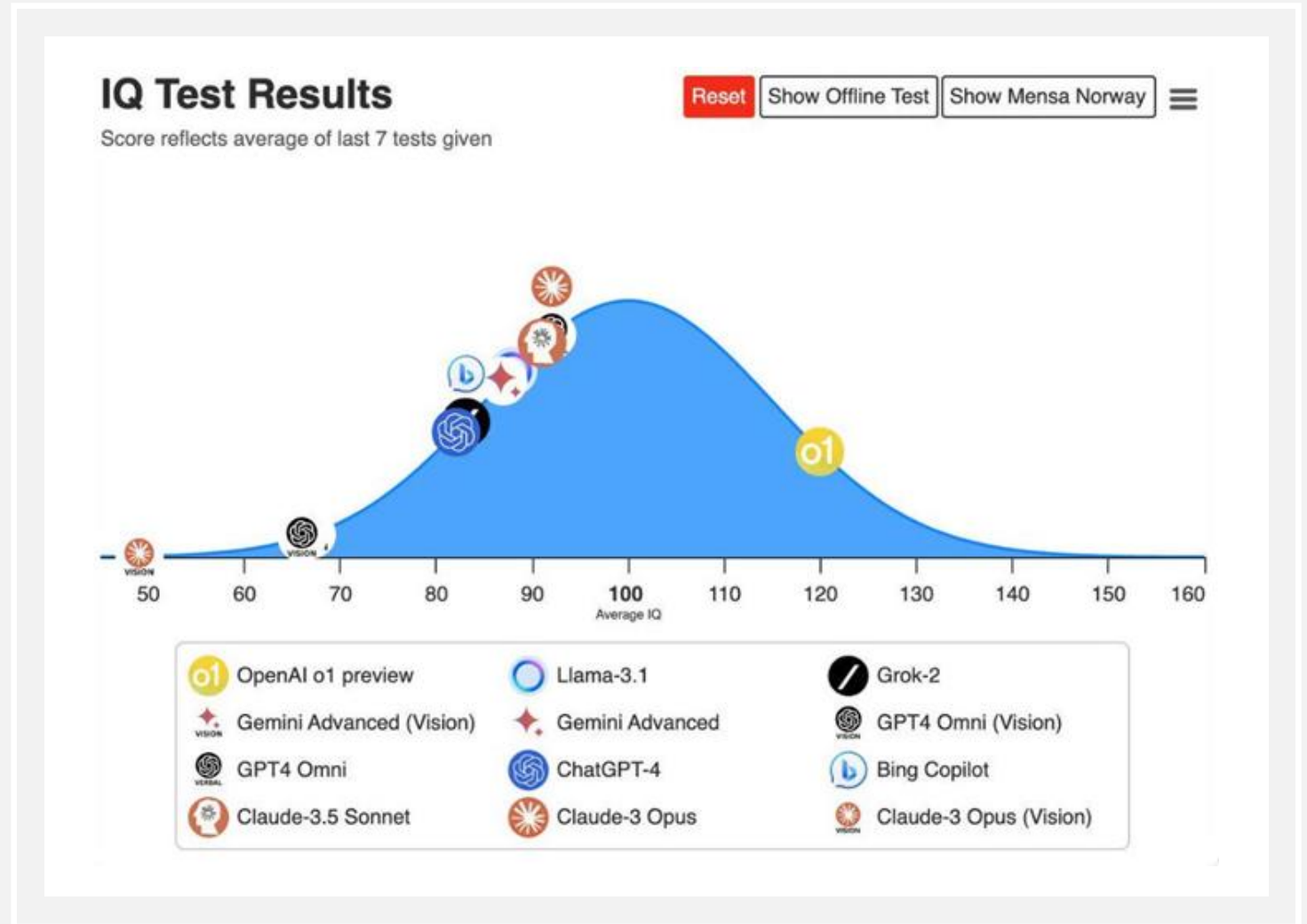
# OPEN AI DEFINES THE PATH TO AGI

1. Open AI Released the OI Preview Reasoning Model in September 2024
2. AGI = “highly autonomous systems that outperform humans at most economically valuable work”



# O1 ACHIEVES IQ OF 120

- Using the Norway Mensa IQ Test
- Median Human Score of 100





**deepseek**

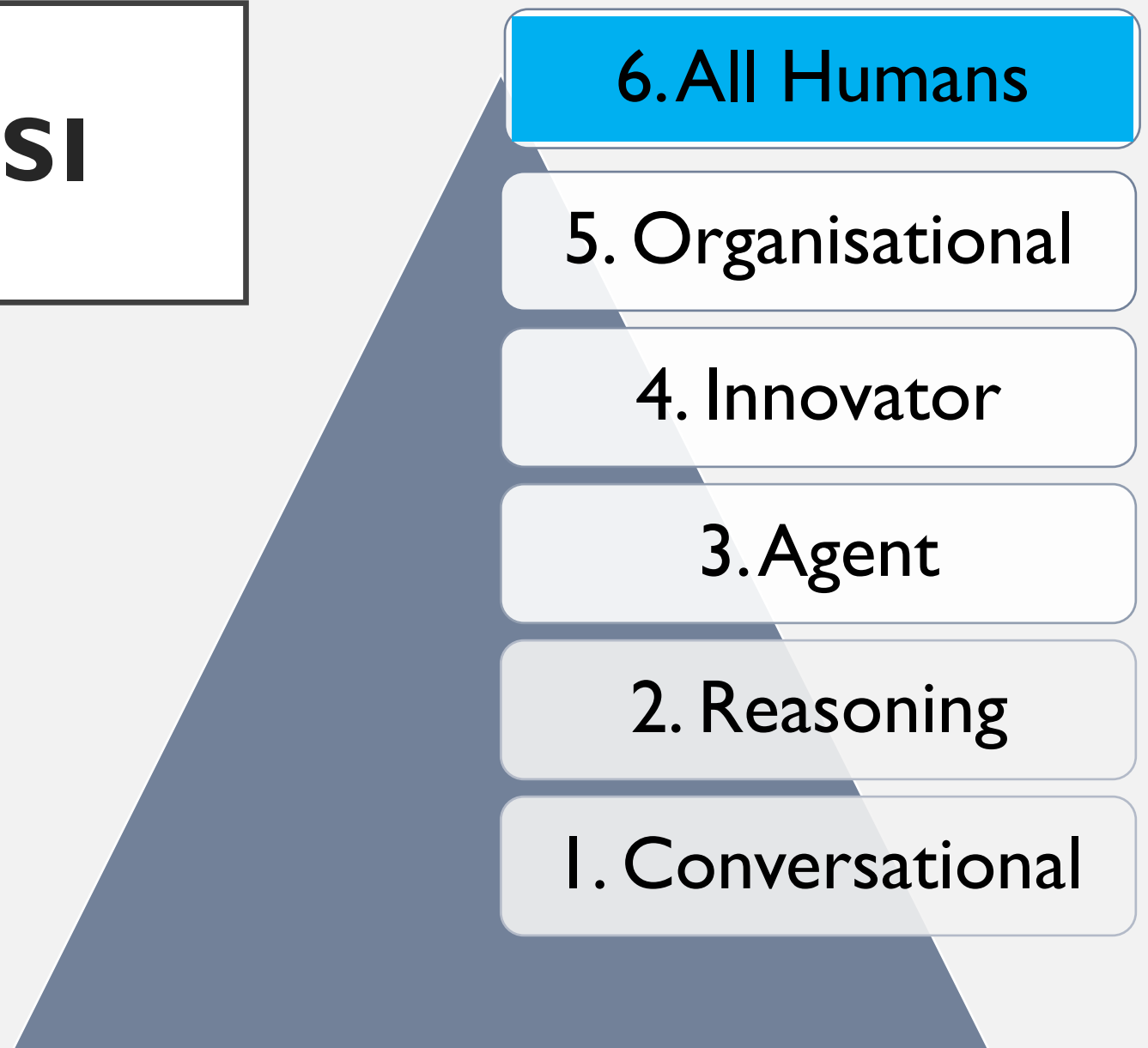
**Chat with DeepSeek AI**

## **CHINA RELEASES R1**

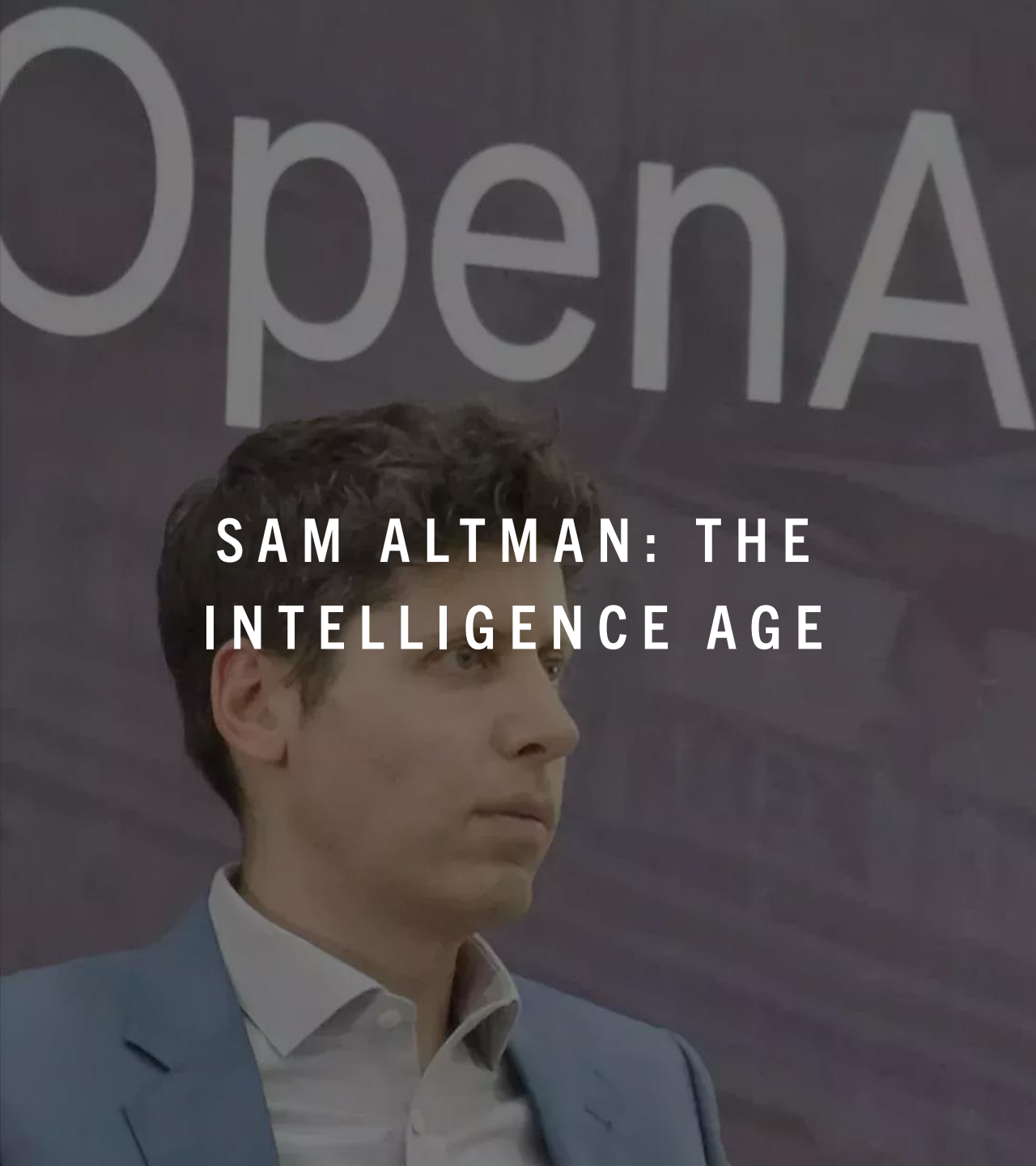
- Chinese Lab Deepseek releases Deepseek-R1 Reasoning Model last week
- R1 Surpasses O1 on many benchmarks
- Model released in Open Source Format
- Deepseek Registered on 17 July 2023
- <https://www.deepseek.com/>

# FROM AGI TO ASI

1. Level above AGI is Artificial Superintelligence (ASI)
2. When AI Capabilities exceed the combined abilities of all Humans on the planet







## SAM ALTMAN: THE INTELLIGENCE AGE

- Super Intelligence will arrive in “*a few thousand days*”
- Drastic Advances in Healthcare, Education, Climate Change and Innovation
- Open AI has unlocked reasoning — leading to advances in Physics and Maths
- Depends on Computation Power and Energy

A portrait of Dario Amodei, a man with curly dark hair and glasses, wearing a dark blue t-shirt. The background is a solid light blue color. The text is overlaid on the top left of the image.

# DARIO AMODEI: MACHINES OF LOVING GRACE

- Super Intelligence is Approaching
- *“Marginal Returns to Intelligence”*  
We need to consider limiting factors such as infrastructure, data costs, social barriers.
- Expands benefits in Health, Economic Development, Governance
- Incremental but rapid changes to work. E.g. No more call centres in 2025

A portrait of Emad Mostaque, a man with dark curly hair and glasses, wearing a dark long-sleeved shirt, standing with his arms crossed against a dark, textured background.

**EMAD MOSTAQUE:  
HOW TO THINK  
ABOUT AI**

- AI to fundamentally reshape society
- AI reduces the cost of intelligence
- AI control is monopolized
- Democratising AI is critical
- Open and Collaborative AI Development is needed
- Need to rethink our Economic Model
- Need AI Awareness

# ADVANCED USES OF AI

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# CERN'S LARGE HADRON COLLIDER

- Use AI Algorithms to examine Petabytes of data
- Each particle collision generates 1 MB of data
- The model generates 40 million collisions a second



# LADDERBOT – AI INTERVIEW AGENT

- Developed in the Karlsruhe Institute of Technology (KIT) in Germany
- AI Agent that is taught to ask relevant probing questions, mimic expert human interviewers
- Reach a larger audience
- Found to increase individual survey responses by 30%
- More intuitive and deeper insights
- Interviews are more reproducible



International Journal of Human-Computer Studies

Go to International Journal of Human-Computer Studies on ScienceDirect

ELSEVIER

Volume 171, March 2023, 102969

## Ladderbot—A conversational agent for human-like online laddering interviews

Tim Rietz <sup>a</sup>  , Alexander Maedche <sup>b</sup>

Show more 

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<https://doi.org/10.1016/j.ijhcs.2022.102969>  [Get rights and content](#) 

### Highlights

- Chatbots may extend the laddering technique by providing an alternative to surveys.
- Ladderbot encourages participants to provide twice as many and significantly longer answers.
- Interacting with Ladderbot provides participants with higher learnability.
- Survey-based laddering may produce more structured results than chatbots.

# GENERATIVE AGENT SIMULATIONS OF 1000 PEOPLE

- AI Based Interview tool collects data from 1000 people using the laddering technique through a single 2 hour interview
- Applies deep introspection and follow up questions
- Found simulated answer of AI model is similar to the human answer (85% Accuracy)
- Can now model human behaviour
- Allows mass testing

## Generative Agent Simulations of 1,000 People

**Authors:** Joon Sung Park<sup>1\*</sup>, Carolyn Q. Zou<sup>1,2</sup>, Aaron Shaw<sup>2</sup>, Benjamin Mako Hill<sup>3</sup>, Carrie Cai<sup>4</sup>, Meredith Ringel Morris<sup>5</sup>, Robb Willer<sup>6</sup>, Percy Liang<sup>1</sup>, Michael S. Bernstein<sup>1</sup>

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### Abstract:

The promise of human behavioral simulation—general-purpose computational agents that replicate human behavior across domains—could enable broad applications in policymaking and social science. We present a novel agent architecture that simulates the attitudes and behaviors of 1,052 real individuals—applying large language models to qualitative interviews about their lives, then measuring how well these agents replicate the attitudes and behaviors of the individuals that they represent. The generative agents replicate participants' responses on the General Social Survey 85% as accurately as participants replicate their own answers two weeks later, and perform comparably in predicting personality traits and outcomes in experimental replications. Our architecture reduces accuracy biases across racial and ideological groups compared to agents given demographic descriptions. This work provides a foundation for new tools that can help investigate individual and collective behavior.

# CHATGPT OUTPERFORMS DOCTORS IN DIAGNOSIS

- Study in JAMA Network
- Sample of 50 Doctors
- AI Outperformed Doctors in Diagnosing Diseases and Medical Conditions

## Results

- Doctors without AI – 74% Accuracy
- Doctors with AI – 76% Accuracy
- ChatGPT Alone – 90% Accuracy
- Human Bias?

## Large Language Model Influence on Diagnostic Reasoning A Randomized Clinical Trial

Ethan Goh, MBBS, MS; Robert Gallo, MD; Jason Hom, MD; Eric Strong, MD; Yingjie Weng, MHS; Hannah Kerman, MD; Joséphine A. Cool, MD; Zahir Kanjee, MD, MPH; Andrew S. Parsons, MD, MPH; Neera Ahuja, MD; Eric Horvitz, MD, PhD; Daniel Yang, MD; Arnold Milstein, MD; Andrew P. J. Olson, MD; Adam Rodman, MD, MPH; Jonathan H. Chen, MD, PhD

### Abstract

**IMPORTANCE** Large language models (LLMs) have shown promise in their performance on both multiple-choice and open-ended medical reasoning examinations, but it remains unknown whether the use of such tools improves physician diagnostic reasoning.

**OBJECTIVE** To assess the effect of an LLM on physicians' diagnostic reasoning compared with conventional resources.

**DESIGN, SETTING, AND PARTICIPANTS** A single-blind randomized clinical trial was conducted from November 29 to December 29, 2023. Using remote video conferencing and in-person participation across multiple academic medical institutions, physicians with training in family medicine, internal medicine, or emergency medicine were recruited.

**INTERVENTION** Participants were randomized to either access the LLM in addition to conventional diagnostic resources or conventional resources only, stratified by career stage. Participants were allocated 60 minutes to review up to 6 clinical vignettes.

**MAIN OUTCOMES AND MEASURES** The primary outcome was performance on a standardized rubric of diagnostic performance based on differential diagnosis accuracy, appropriateness of supporting and opposing factors, and next diagnostic evaluation steps, validated and graded via blinded expert consensus. Secondary outcomes included time spent per case (in seconds) and final diagnosis accuracy. All analyses followed the intention-to-treat principle. A secondary exploratory analysis evaluated the standalone performance of the LLM by comparing the primary outcomes between the LLM alone group and the conventional resource group.

**RESULTS** Fifty physicians (26 attendings, 24 residents; median years in practice, 3 [IQR, 2-8]) participated virtually as well as at 1 in-person site. The median diagnostic reasoning score per case was 76% (IQR, 66%-87%) for the LLM group and 74% (IQR, 63%-84%) for the conventional resources-only group, with an adjusted difference of 2 percentage points (95% CI, -4 to 8 percentage points;  $P = .60$ ). The median time spent per case for the LLM group was 519 (IQR, 371-668) seconds, compared with 565 (IQR, 456-788) seconds for the conventional resources group, with a time difference of -82 (95% CI, -195 to 31;  $P = .20$ ) seconds. The LLM alone scored 16 percentage points (95% CI, 2-30 percentage points;  $P = .03$ ) higher than the conventional

### Key Points

**Question** Does the use of a large language model (LLM) improve diagnostic reasoning performance among physicians in family medicine, internal medicine, or emergency medicine compared with conventional resources?

**Findings** In a randomized clinical trial including 50 physicians, the use of an LLM did not significantly enhance diagnostic reasoning performance compared with the availability of only conventional resources.

**Meaning** In this study, the use of an LLM did not necessarily enhance diagnostic reasoning of physicians beyond conventional resources; further development is needed to effectively integrate LLMs into clinical practice.

+ Visual Abstract

+ Invited Commentary

+ Supplemental content

Author affiliations and article information are listed at the end of this article.



# IMPLICATIONS FOR AI IN RESEARCH

- MUST BUILD AWARENESS AMONG STAFF AND PUBLIC!

- Use AI for Public Engagement

- Data collection is critical

  - Expand our data collection processes

  - Larger Samples

  - More Frequent Data Collection

  - Iterations

- AI can be used to accelerate data analysis

  - Use AI to analyse data

- Natural Language Processing to automate the analysis of Qualitative data

  - Allows Qualitative data to be paired with Quantitative data

- Dynamic AI – Enhanced Public Surveys

  - Automatically analyse data giving respondents immediate feedback.

UNDERSTANDING  
YOUR AI  
OPTIONS?

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# AVAILABLE CHATBOTS

	<b>ChatGPT 4o</b>	<b>Anthropic Claude</b>	<b>Google Gemini</b>	<b>Google's Notebook LM</b>	<b>Meta.AI</b>	<b>Poe.com</b>	<b>Le Chat from Mistral</b>	<b>Deepseek</b>
<b>Cost</b>	Free: Limited Plus: \$20	Free – limited  Pro = \$20	Free  Pro = \$20	Free	Free	Based on Points System	Free (Open Source)	Free
<b>Features</b>	Document Analysis + GPTs + Advanced Data Analytics + OI Preview + Canvas + Search + Advanced Voice	Document analysis + Quantitative Analysis + Artefacts	Linked to the Internet + Doc Analysis	<i>Audio Transcription</i> + <i>Podcasting</i> + <i>Deep analysis of 50 Sources</i>	Immediate image creation	Links to different models  Create Custom Bots like GPT	Image Generation + Search + Canvas	Free Reasoning model – 50 Questions a day
<b>Languages</b>	85	10	265	265	8	Depends	13	30+
<b>Token Window</b>	128k	Free = 100k Paid = 200k	Free = 32k Paid = 2m	25 million	128k	Depends	32k	128k

ETHICAL AI USAGE

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# Living guidelines on the RESPONSIBLE USE OF GENERATIVE AI IN RESEARCH

ERA Forum Stakeholders' document



European Commission

## UCT Senate Ethics in Research Committee

### Senate Ethics in Research Committee (EIRC) Guidelines and recommendations for the use of generative artificial intelligence (AI) tools in research

Title	Guidelines and recommendations for the use of generative artificial intelligence (AI) tools in research
Approval date	31 October 2023 (via EIRC Chair's Circular)
Person(s) responsible for drafting, review and revision	Research Integrity Manager Research Integrity Director
Next review date	October 2024
Status	Guideline
Approval route	Office of Research Integrity (ORI) > Senate Ethics in Research Committee (EIRC)
Approving body	EIRC
Relevant related policies, procedures and guidelines	<ul style="list-style-type: none"> <li>UCT Policy for Responsible Conduct of Research</li> <li>UCT Research Ethics Code for Research Involving Human Participants</li> <li>UCT Research Ethics Code for Use of Animals in Research and Teaching</li> <li>Authorship Practices Policy</li> <li>Conflict of Interest Policy</li> <li>UCT Policy and Procedures for Breach of Research Ethics Codes and Allegations of Misconduct in Research (colloquially known as the 'Research Misconduct' policy)</li> </ul>

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#### NWU Guidelines on the Responsible and Ethical Use of Artificial Intelligence

The following information will appear as a declaration when assignments/tests are to be submitted to eFundi:

Honour Pledge: I declare that this assignment/work was done according to the NWU Guidelines on Responsible and ethical use of Artificial Intelligence ([NWU Current Students](#))

AI, as Large Language Models (LLMs) or Generative AI, is primarily defined as "a type of artificial intelligence that can learn from and mimic large amounts of data to create content such as text, images, music, videos, code and more, based on inputs and prompts" (<https://huit.harvard.edu/ai#block-boxes-1687273052>). AI may also include other AI tools such as research summarising tools, automatic data analysis tools, and creation of synthetic data tools (<https://sajs.co.za/article/view/17147>). AI is not restricted to this definition and with new AI tools constantly being developed, the use of other or new forms of AI should not be excluded from this definition and it remains the responsibility of the student to get permission for the use of it from the relevant lecturer or supervisor.

#### Ethical use of AI

The NWU is committed to the ethical use of AI technologies and applies the following basic principles to which you as a student should adhere:

- 1. Transparency.** You should keep a record and be open and clear about when and how you use AI. Declare your use of AI and keep track of your use of it.
- 2. Honesty.** You should be honest about the use of AI in all your academic work. You need to follow the rules and guidelines given by the lecturer/supervisor for the use of AI, otherwise you are academically dishonest. Any work submitted by you that is not your own, and not clearly declared as such, might lead to a report on [AIITSA](#) (Academic Integrity Information Technology System Application).
- 3. Integrity.** Do not lose your trustworthiness through the dishonest use of AI. Integrity means wholeness or the consistent and coherent ability to live as an honest person. Honest and transparent use of AI is needed to keep your academic work's integrity intact.
- 4. Accountability and Ownership.** With the submission of an assignment, you as a student are seen as the owner of the work. You should therefore take ownership of what is written since you are accountable for it. You cannot blame AI if something false, biased, or inappropriate is stated in the work you present as your own. The

North West University

# KEY ETHICS PRINCIPLES

1. **Reliability:** Ensuring the quality and integrity of research, including the verification and reproducibility of AI-generated information.
2. **Honesty:** Maintaining transparency in all aspects of the research process, including the disclosure of generative AI use.
3. **Respect:** Consider the impact of AI use on research participants, colleagues, society, and the environment.
4. **Accountability:** Taking responsibility for all aspects of the research process and its outcomes, including those involving generative AI.

# PRIVACY AND INTELLECTUAL CAPITAL

1. Everything uploaded into ChatGPT (free), ChatGPT+ is introduced into ChatGPT's training data
  - Potentially could be accessed by someone else with a specific prompt
2. ChatGPT Teams & Notebook LM –*Claimed* to protect your data – not introduced into Training Data
3. Open AI API – data not used in training since 1 Mar 2023
4. Similar Issues with Claude, Bing, Bard, Perplexity, etc

Do	Don't
<ul style="list-style-type: none"><li>• Safeguard personal and sensitive data,</li><li>• Be transparent on how you use AI</li><li>• Verify your outputs</li><li>• Respect the Intellectual Property of others</li><li>• Stay informed</li></ul>	<ul style="list-style-type: none"><li>• Don't overely on AI</li><li>• Don't share secrets.</li><li>• Do not attribute AI-generated content as your own</li><li>• Don't use brand names or trademarks.</li><li>• Do not share <b>valuable IP</b></li></ul>



# RESEARCH ETHICS QUIZ

1. <https://chatgpt.com/g/g-uDPGP8pgK-generative-ethics-quiz-bot>
2. Click link and Sign Into ChatGPT





CLICK  
“LETS  
BEGIN”

  Generative Ethics Quiz Bot ▾

Open sidebar



## Generative Ethics Quiz Bot

By Krish Chetty 

Multiple-choice quiz GPT for ethical use of generative models in social science research.

Lets begin

Message Generative Ethics Quiz Bot



# ANSWER THE QUIZ

  Generative Ethics Quiz Bot ▾

Lets begin



Great! Let's dive into this interactive learning session about the ethical use of generative AI in social science research. I'll start with a question, provide options, and then explain the correct answer after you respond.

---

**Question 1:** Which of the following best captures the principle of "Honesty" as outlined in the guidelines for ethical generative AI use in social science research?

- A) Ensuring all AI outputs are free from bias and inaccuracies.
- B) Disclosing the use of generative AI tools in the research process.
- C) Avoiding the use of generative AI tools in sensitive research activities.
- D) Holding researchers accountable for AI-generated outputs.

---

What do you think is the correct answer? 😊



PROMPTING



# WRITING A GOOD PROMPT

## Prompt Structure:

- Instruction
- Layout
- Useful information

1. Critically engage
2. Refine
3. Repeat

The more specific, the better the output

# DANIEL KAHNEMAN'S MACHINERY OF THOUGHT



## System 1 Thinking – Immediate

- Operates automatically and quickly,
- Little or no effort
- No sense of voluntary control.

## System 2 Thinking – Deliberate

- Effortful mental activities
- Demand complex computations.
- More Subjective
- Greater Agency, choice and concentration.

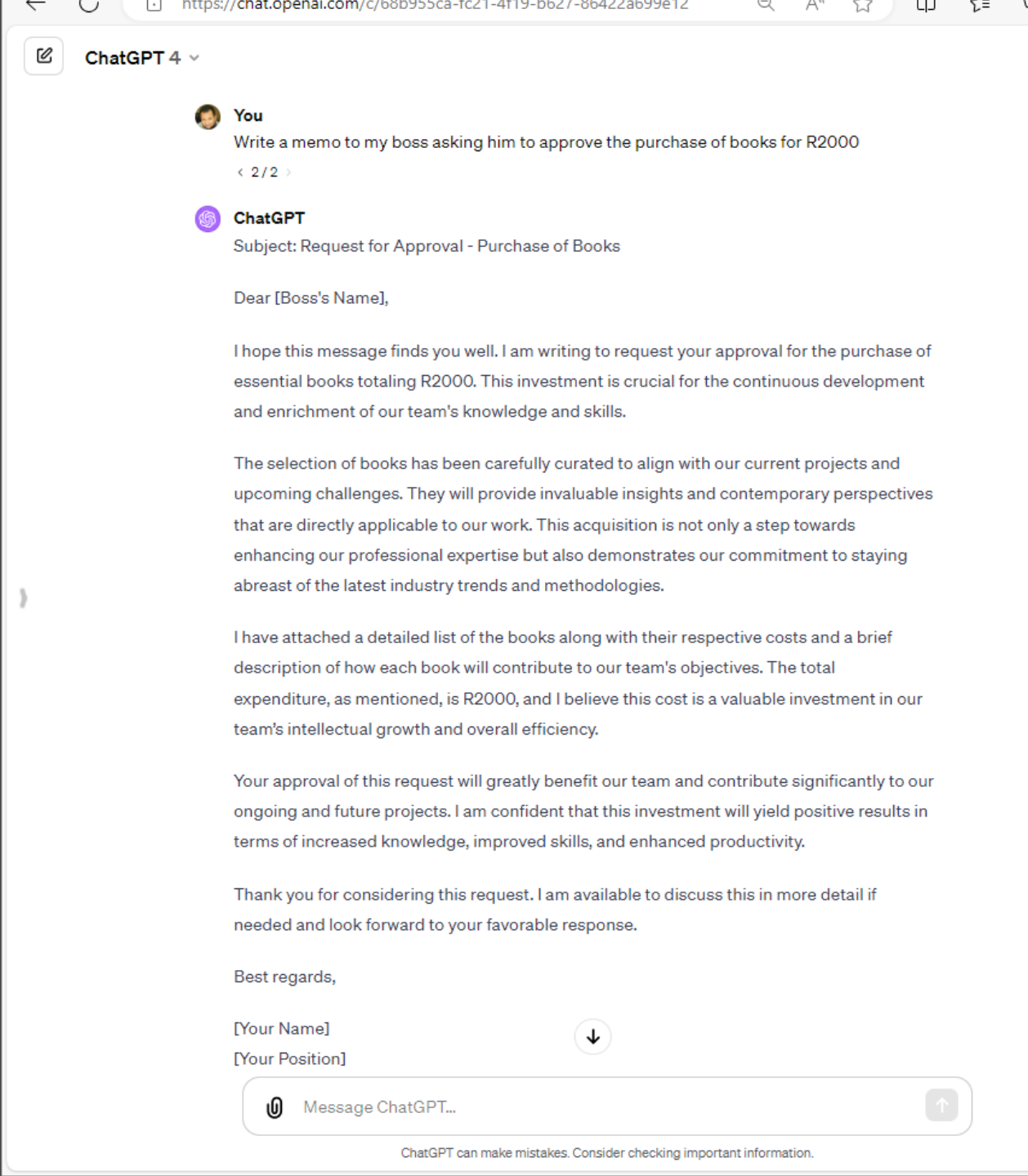
# SYSTEMS I: MEMO WRITING

## **Prompt:**

Write a memo to my boss asking him to approve the purchase of books for R2000



# LEVEL 1 COMPLEXITY MEMO WRITING



The screenshot shows a web browser window with a ChatGPT chat interface. The browser's address bar shows a URL from openai.com. The chat header indicates 'ChatGPT 4'. The user's prompt is: 'Write a memo to my boss asking him to approve the purchase of books for R2000'. The AI's response is a formal memo template with several paragraphs of placeholder text. At the bottom, there is a text input field with the placeholder 'Message ChatGPT...' and a send button. A disclaimer at the very bottom reads: 'ChatGPT can make mistakes. Consider checking important information.'

ChatGPT 4

**You**  
Write a memo to my boss asking him to approve the purchase of books for R2000  
< 2 / 2 >

**ChatGPT**  
Subject: Request for Approval - Purchase of Books

Dear [Boss's Name],

I hope this message finds you well. I am writing to request your approval for the purchase of essential books totaling R2000. This investment is crucial for the continuous development and enrichment of our team's knowledge and skills.

The selection of books has been carefully curated to align with our current projects and upcoming challenges. They will provide invaluable insights and contemporary perspectives that are directly applicable to our work. This acquisition is not only a step towards enhancing our professional expertise but also demonstrates our commitment to staying abreast of the latest industry trends and methodologies.

I have attached a detailed list of the books along with their respective costs and a brief description of how each book will contribute to our team's objectives. The total expenditure, as mentioned, is R2000, and I believe this cost is a valuable investment in our team's intellectual growth and overall efficiency.

Your approval of this request will greatly benefit our team and contribute significantly to our ongoing and future projects. I am confident that this investment will yield positive results in terms of increased knowledge, improved skills, and enhanced productivity.

Thank you for considering this request. I am available to discuss this in more detail if needed and look forward to your favorable response.

Best regards,

[Your Name]  
[Your Position]

Message ChatGPT...

ChatGPT can make mistakes. Consider checking important information.



## Prompt:

- No structure
- No context
- Not useful

# SYSTEMS 2

## MEMO WRITING

### Prompt:

#Role

Expert Memo Writer

#Mission

Craft a detailed memo for the CEO to approve the [your issue].

#Approach

Persuasively articulate the necessity and benefits of [your issue], ensuring alignment with organizational goals and compliance with legal and financial constraints.

#Structure

1. Purpose: Summarise the key arguments of the memo
2. Background and Motivation: [capture critical points related to your issue].
3. Financial Implications: The items cost [Rxxx]
4. Legal Implications: The issue requires special CEO consent, [expand with legal concerns]
5. Recommendation: Summarise the central recommendation of the Memo







# SYSTEMS 2

## MEMO WRITING

**Results:**

<https://chat.openai.com/share/ddd311a5-765a-46e9-9c8e-c0ca033dae5f>

Structured

Context driven

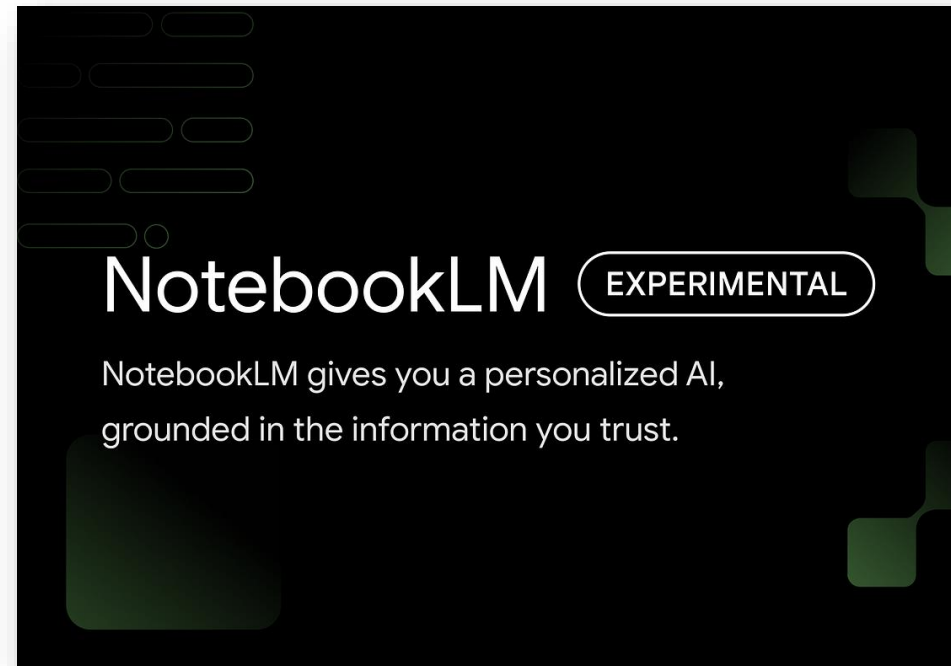
Opportunity to make edits

More thoughtful

**AVAILABLE AI TOOLS**

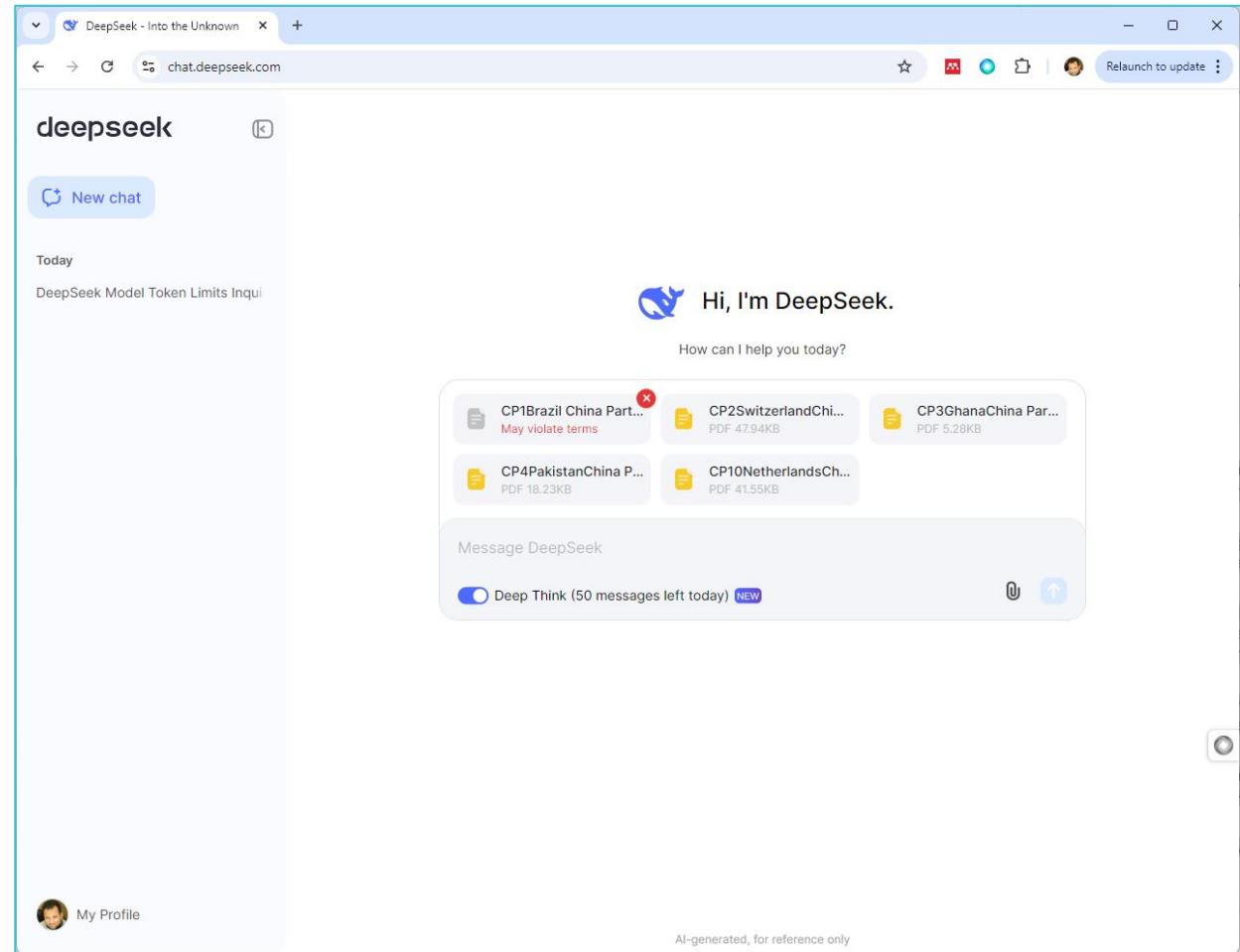
# NOTEBOOK LM FROM GOOGLE

- Access: <https://notebooklm.google.com/>
- Google has several “experiments” – <https://labs.google/>
- Built with Google’s Gemini 1.5 Model
- Free
- Claim not to use data for training
- Can input Documents, Audio Files, Web Links, YouTube Links (with a transcript)
- Can accept 50 Sources of Content
- Can process 25 million words
  - For comparison: ChatGPT+ processes 100 thousand words



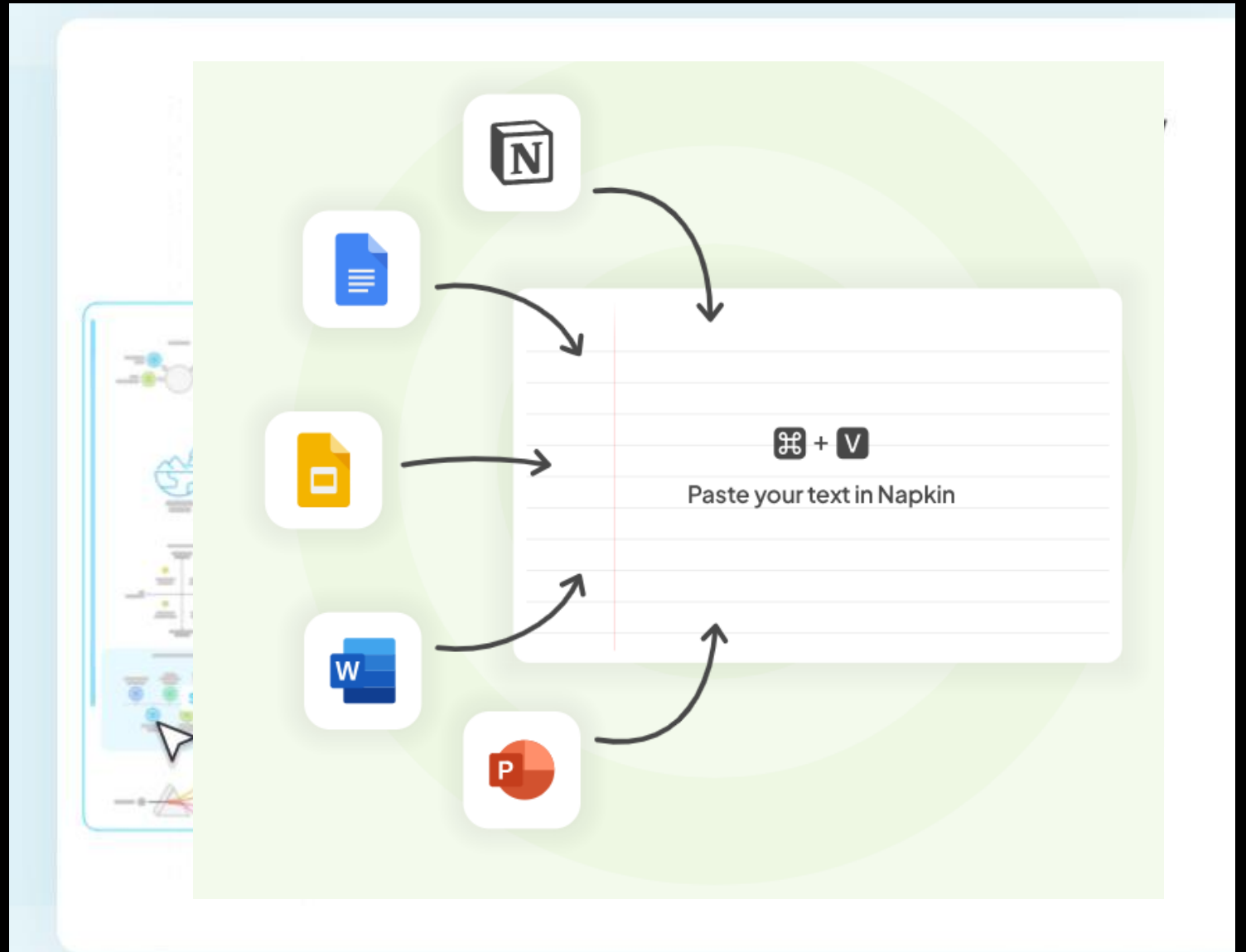
# CHAT.DEEPSEEK.COM

- Access: <https://chat.deepseek.com/>
- Accepts up to 50 Attachments
- Integrates Reasoning with Document Analysis
- Free
- Chinese rules of acceptable content



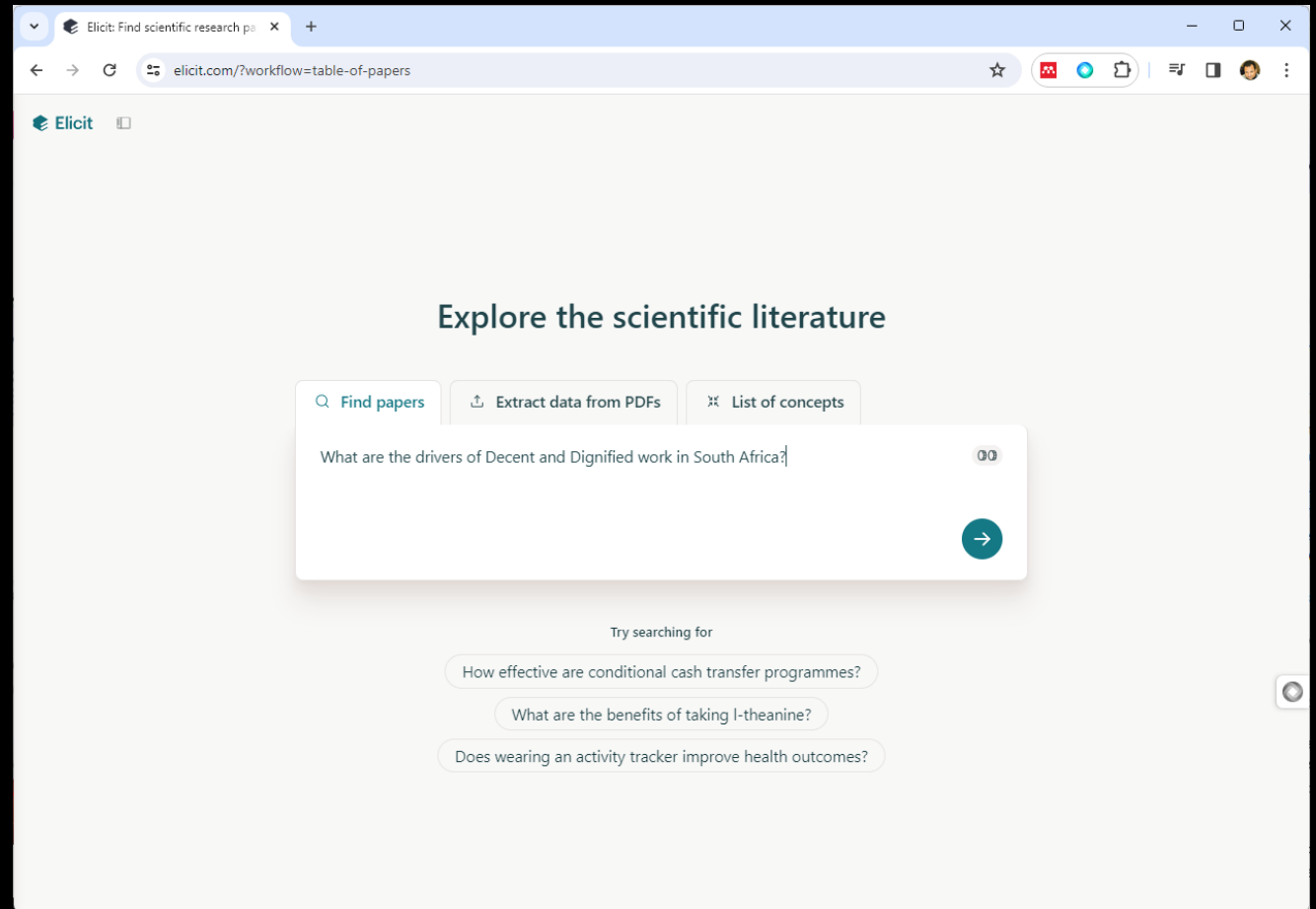
# NAPKIN.AI

- Access:  
<https://www.napkin.ai/>
- Free (for now)
- Analyses text
  - → Identifies Insights
  - → Creates Graphics



# ELICIT.COM

- <https://elicit.com>
- Semantic Search
- \$5 per month for the paid version
- Search for literature based on a research question, not keywords.



# CLAUDE – COMPUTER USE

- <https://docs.anthropic.com/en/docs/build-with-claude/computer-use>
- Claude is used to manage a virtual computer as your worker/assistant
- Test Version
- Costs you per token and time of task
- Uses a lot of system resources
- WATCH:  
<https://www.youtube.com/watch?v=ODaHJzOyVCQ>



# QUALITATIVE ANALYSIS

Exercise





## **PRECIS WRITING**

- Use Chatbot of Choice (requires doc upload)
- Upload your paper
- Craft a Prompt to produce a Precis Summary

# AI PRECIS WRITING

## **#Role**

Expert Precis Writer and Academic Summarizer

## **#Mission**

Create a concise and comprehensive summary of the uploaded academic paper, capturing its essence in a clear and accessible format.

## **#Approach**

Carefully analyze the paper's structure, arguments, and key findings. Distill the main ideas and supporting evidence into a coherent summary that maintains the original's intent and significance.

## **#Structure**

**Title and Author(s):** Provide the paper's title and author(s) name(s).

**Research Objective:** Clearly state the main purpose or research question of the paper.

**Methodology:** Briefly describe the research methods or approach used in the study.

**Key Findings:** Summarize the most important results or discoveries presented in the paper.

**Main Arguments:** Outline the central arguments or theoretical contributions of the paper.

**Significance:** Explain the importance of this research within its field or broader context.

**Limitations:** Mention any significant limitations or areas for future research noted in the paper.

**Conclusion:** Summarize the paper's overall conclusion and its implications.

## **#Guidelines**

Aim for a summary length of approximately 10-15% of the original paper.

Use clear, concise language while maintaining academic integrity.

Avoid personal opinions or critiques; focus on objectively presenting the paper's content.

OUTPUT

The screenshot displays the NotebookLM web application interface. The browser address bar shows the URL: notebooklm.google.com/notebook/ff388035-8eb5-4ee6-8dac-3b577b158d5a. The page title is "Climate Change and Occupational Health in South Africa".

**NotebookLM**

Sources

Select all sources

Climate Change and ...

### Climate Change and Occupational Health in South Africa

Settings Share

#### Summary of "Climate Change and Occupational Health: A South African Perspective"

**Title and Author(s):** "Climate Change and Occupational Health: A South African Perspective" by T Kjellstrom, B Lemke, O Hyatt, and M Otto. <sup>1</sup>

**Research Objective:** To analyze the impact of climate change, specifically rising temperatures, on occupational health in South Africa and highlight the urgent need for preventative measures. <sup>1</sup> <sup>2</sup> The article emphasizes that while South Africa is experiencing significant economic development as part of the BRICS nations, this progress might be hampered by the effects of a hotter climate. <sup>2</sup>

**Methodology:** The paper uses a combination of approaches, including:

- **Review of existing literature and research data:** The authors draw on historical studies conducted in South Africa, particularly research by Wyndham on heat stress in gold mines. <sup>3</sup> <sup>4</sup> They also reference global reports like the Intergovernmental Panel on Climate Change (IPCC) assessment reports and the Climate Vulnerability Monitor 2012. <sup>5</sup> <sup>6</sup> <sup>7</sup>
- **Analysis of climate data:** The study utilizes weather station data (from NOAA's GSOD) and climate model projections (from the Climate Research Unit, CRU) to analyze historical temperature trends and future projections in South Africa. <sup>8</sup> <sup>9</sup> <sup>10</sup> This data is further processed using specialized software, "Hothaps-Soft," to calculate heat stress indices like Wet Bulb Globe Temperature (WBGT). <sup>8</sup> <sup>11</sup> <sup>12</sup>
- **Examination of occupational health risks:** The paper identifies specific occupational health hazards linked to climate change, focusing primarily on heat stress. <sup>5</sup> <sup>13</sup> It draws on anecdotal evidence, like media reports on construction worker mortality in Qatar, to illustrate the severity of these risks. <sup>8</sup> <sup>14</sup>

**Key Findings:**

- Climate change is leading to a measurable increase in temperatures in South Africa, as evidenced by the rising WBGT levels observed in locations like Cape Town and East London. <sup>8</sup> <sup>15</sup>
- This rise in temperature poses a significant threat to occupational health, primarily due to heat stress, impacting work capacity, productivity, and increasing the risk of heat-related illnesses and mortality. <sup>3</sup> <sup>5</sup> <sup>14</sup>
- The authors highlight the vulnerability of various occupational groups, including miners, agricultural workers, construction workers, and those in factories and workshops without adequate cooling systems. <sup>3</sup> <sup>13</sup> <sup>16</sup> <sup>17</sup>
- The study estimates significant economic costs associated with reduced labor productivity due to heat stress, projecting a substantial increase in these costs in the coming decades. <sup>18</sup>

**Main Arguments:**

What specific occupational groups face heightened heat-related risks? How does climate change affect productivity in hot work e

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**GOOD INFORMATION**

The screenshot shows a LinkedIn profile for Mushtaq Bilal, PhD. The browser address bar displays 'linkedin.com/in/mushtaqbilalphd/'. The profile header includes a blue banner with the text 'Supercharge Your Academic Writing with AI' and a quote from Nature: 'Best known for his online tutorials, Mushtaq Bilal serves as an informal ambassador between academics and...search tools that make use of artificial intelligence (AI)'. Below the banner is a circular profile picture of a man with a beard and glasses. The profile name is 'Mushtaq Bilal, PhD' with a speaker icon and '3rd' next to it. The bio states: 'I simplify the process of academic writing | Helped 4,500+ become efficient academic writers with AI'. There are two university logos: 'Syddansk Universitet - University of Southern Denmark' and 'Binghamton University'. A link 'Click here to get my tutorial' is present. The profile has 63,790 followers and 75 connections. A 'Message' button is visible. The 'Featured' section shows a post with a blue background and text: 'Worth Every Cent - Anant Paul', '4,500+ academics including those at Harvard, Stanford, and Yale are using it.', and 'Become an Efficient Academic Writer with AI Apps'. The right sidebar contains an advertisement for 'Krish, need to hire for specialized roles?' with a 'Get started' button, and a 'People also viewed' section listing three other profiles: Andy Churchill, PhD; Razia Aliani; and Victoria (Tory) Wobber, PhD.

# MUSHTAQ BILAL ON LINKEDIN

<https://www.linkedin.com/in/mushtaqbilalphd/>

The image shows a screenshot of a web browser displaying the YouTube channel page for Dr. Andrew Stapleton. The browser's address bar shows the URL [youtube.com/@DrAndyStapleton](https://www.youtube.com/@DrAndyStapleton). The YouTube interface includes a search bar, navigation icons for Home, Shorts, Subscriptions, and You, and a channel banner for Dr. Andrew Stapleton. The banner features a profile picture of Dr. Stapleton, his name, the text "Academic AI tools | PhD Advice | Productivity", and "NEW VIDEOS EVERY WEEK". Below the banner is a profile section with a circular profile picture, the name "Andy Stapleton", the handle "@DrAndyStapleton", and statistics: "208K subscribers · 433 videos". A bio reads "Teaching you the insider secrets of academia to make it work for YOU." and includes a link to [academiainsider.com/product/ebook-bundle](https://academiainsider.com/product/ebook-bundle) and "3 more links". There are "Subscribe" and "Join" buttons. Below the profile section are navigation tabs for Home, Videos, Shorts, Live, Playlists, and Community. A video player is visible, showing a video titled "PhD Student Advice | 5 insider secrets no one tells you about ...". The video player shows a progress bar at 0:03 / 14:52 and the word "Introduction". To the right of the video player, the video title is repeated, followed by "375,054 views · 3 years ago". The description reads: "Ph.D. Student Advice is hard to come by as there is a load of great reasons for doing a Ph.D. Here are the five insider things that no-one told me about doing a Ph.D. and how you should approach choosing and doing a Ph.D." and a "READ MORE" link.

# ANDY STAPLETON ON YOUTUBE

<https://www.youtube.com/@DrAndyStapleton>



**THANK YOU**

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