

A Student's Guide to Using AI Effectively

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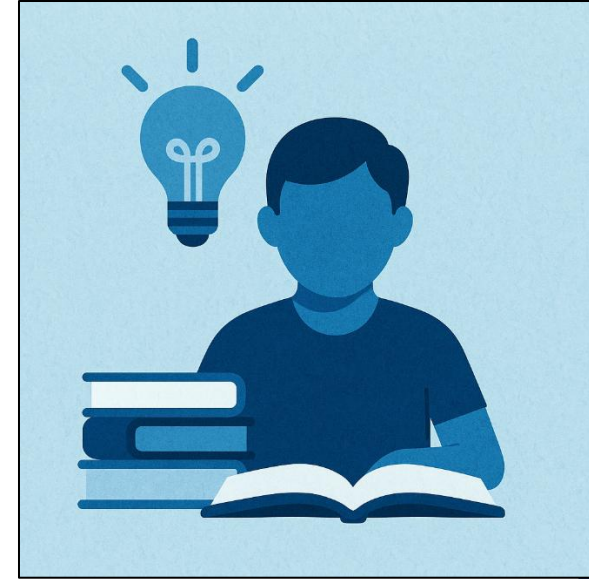
<https://bit.ly/3Kof8aa>



Starting assumption.

(What should people learn now?) ¹

- Purpose of a university is **learning**.
 - How to **think critically** about what you already know.
 - How to **learn new things** you don't know yet.
 - How to struggle and overcome difficulty.
- Grades, certificates, diplomas are *byproducts* of learning – not substitutes for it!
- Struggling, practicing, and working aren't detours – they *are* the learning process!



Goal: use AI to support this process!

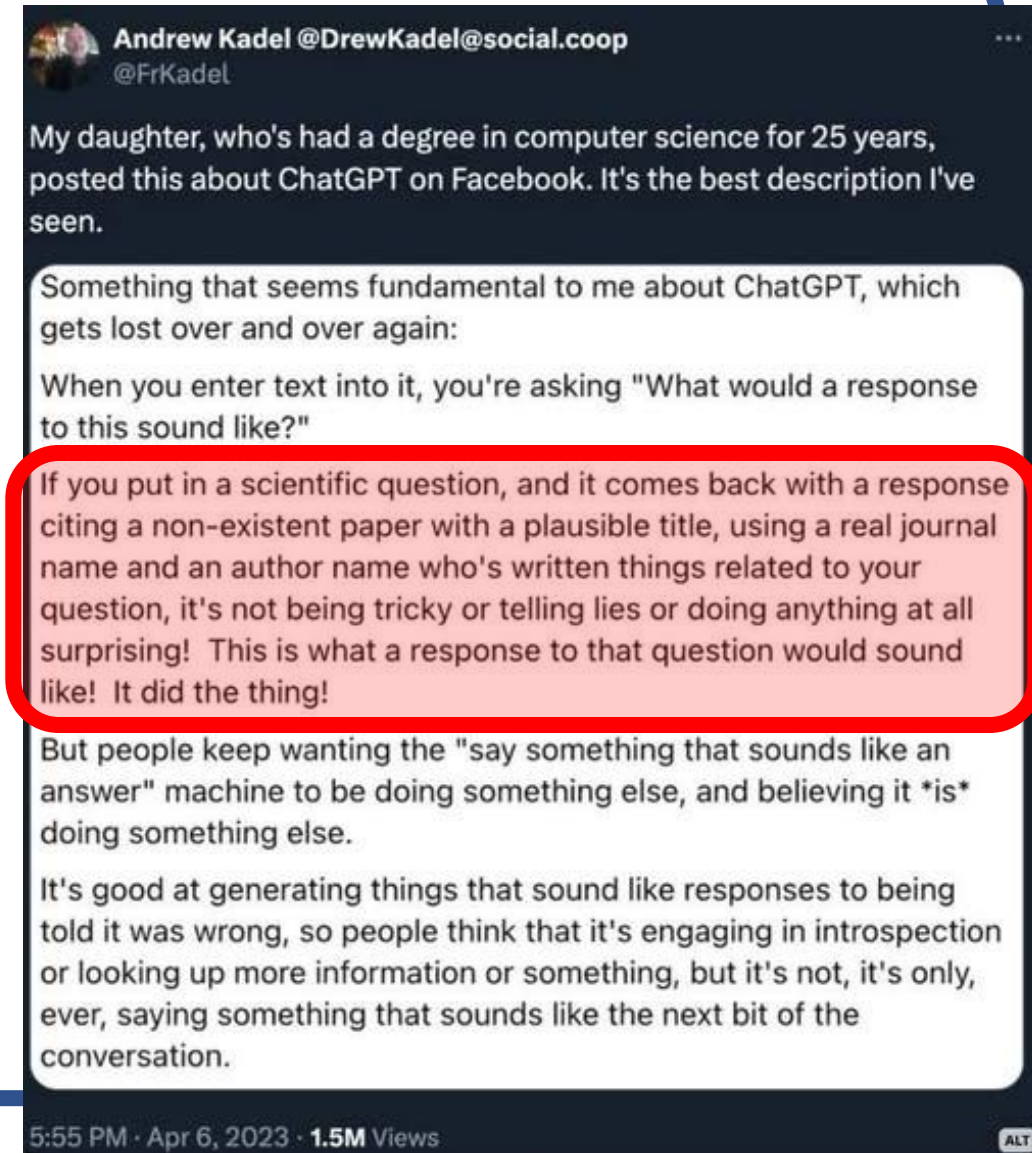
¹ OECD. *What should teachers teach and students learn in a future of powerful AI?* OECD Education Spotlights, No. 20, OECD Publishing, <https://doi.org/10.1787/ca56c7d6-en>.

What is Generative Artificial Intelligence (Gen AI)?

- Generative AI is a **statistical model** which predicts a **plausible** response to a query.
- Generative AI generates a response that **looks like** an answer.

*“What would a response to this sound like?”
– Andrew Kadel*

- Frequently *“looks like an answer”* means *“is an answer”*.
(especially if question was part of training)



“Everything that an AI generates is a hallucination”

AI is not a library

AI doesn't “know facts” but instead extrapolates patterns

* **RAG AI** can refer to documents for information

* **Agentic AI** can research via internet or other tools *

AI is not a brain

AI doesn't “think” or “reason”

* Modern *reasoning AI* can **simulate thinking** patterns

AI is not an authority

AI responses are plausible, but not guaranteed truth

Frequently will make mistakes

AI is not fair/objective

AI mirrors bias patterns from its training data (internet)

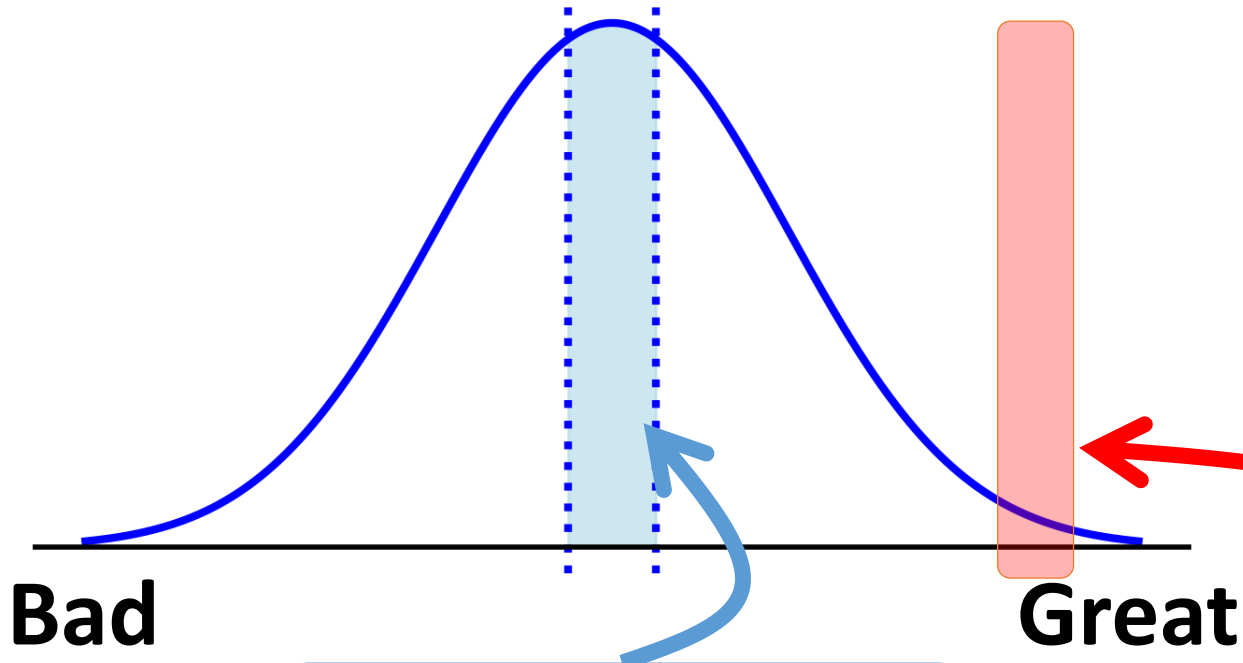
AI is not original

AI can echo and remix patterns into new *combinations*
– but not completely new *concepts*

* **Note to professors.** Look at the “deep research” mode in ChatGPT, Gemini, Claude (paid)

AI is Not a Substitute for Creativity

AI is probabilistic



Default AI output is here:

- Bland
- Homogeneous
- Character-less

AI is a tool, not a substitute.

It can help shape and realize **your** ideas, but it can't invent depth you don't provide.

Human input, guidance, and critical verification is needed to get here.

Key Foundation Models

AI rankings from
<https://lmarena.ai/>



Gemini

(Google)

honest



Claude

(Anthropic)

harmless



ChatGPT

(OpenAI)

helpful

Usually ranked top for

- Text & Image generation
- Vision
- Web development
- Coding

First to develop new ideas / features
Power many 3rd party apps

New release or
feature every
3-4 months!

Major Open Weight Models



Qwen

(Alibaba)



**LE CHAT
MISTRAL**

(Mistral AI)



deepseek

(DeepSeek)



LLaMA

(Meta)



Z.ai GLM

(Zhipu-AI)

Fine-tune to add extra knowledge
or modify behavior.

Other Noteworthy



KIMI

(Moonshot AI)



Grok

(xAI)

Third party / Other AI apps

Many niche tools for specific apps (*summarization, note taking, tutoring*)

- Khanmigo
- QANDA
- LearningRO
- AutoTutor
- Perusall
- Quadratic
- Consensus
- Blacklink
- MindScratch
- MathGPT
- QuillBot
- **Perplexity***

Big models rapidly absorb (*and improve on*) these features

→ In this talk, I will focus on ChatGPT, Gemini, Claude

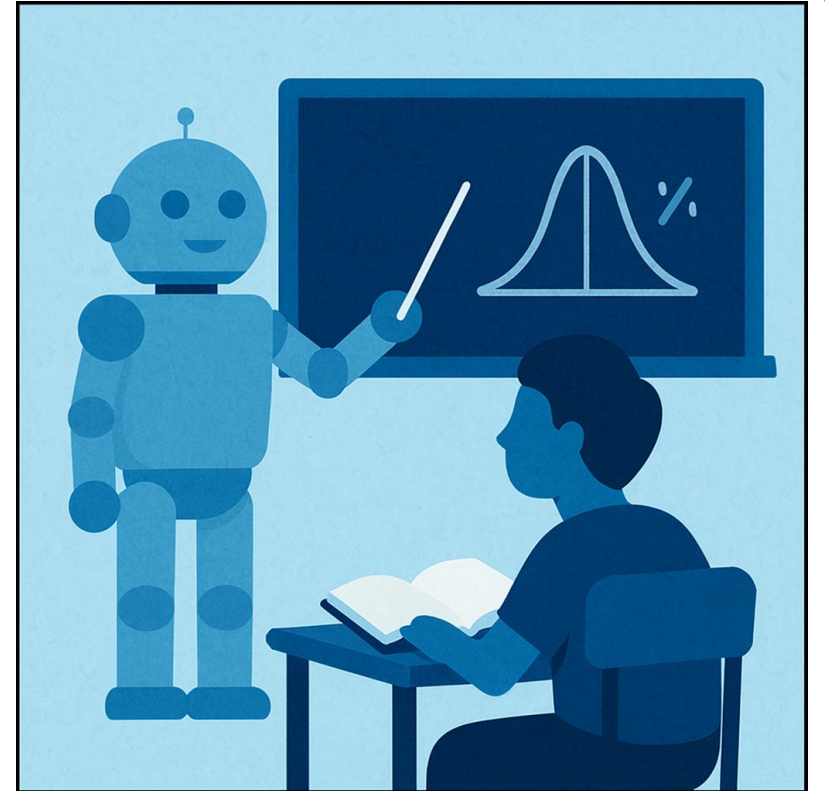
Business model for many AI startups are regularly subsumed

Notable mention:

Google NotebookLM – “intelligent notebook” (uses **Gemini**)
research / learning assistant
[\(feature description\)](#)

New Tools *(in ChatGPT, Gemini, Claude)*

- Study mode
- Canvas
- Branching conversations
- ~~Deep research~~

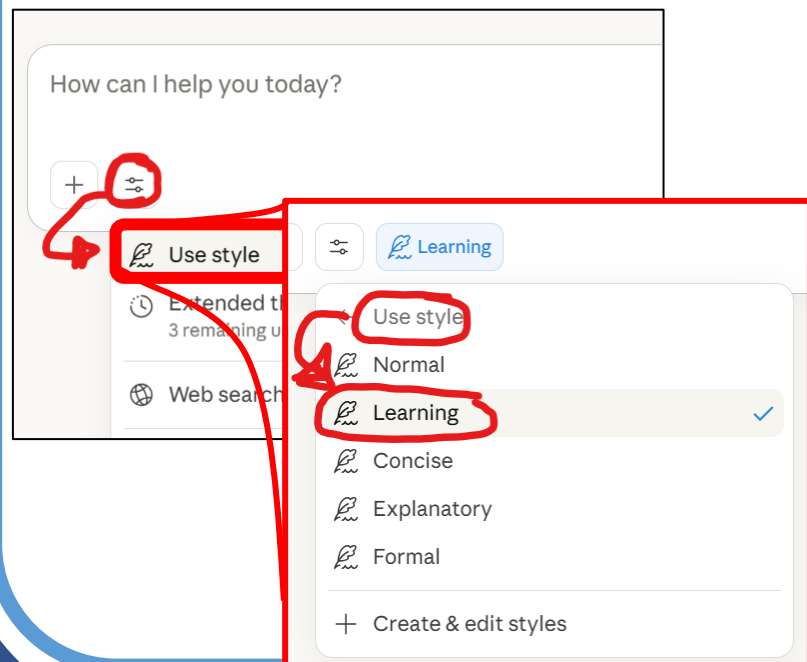


New Tools

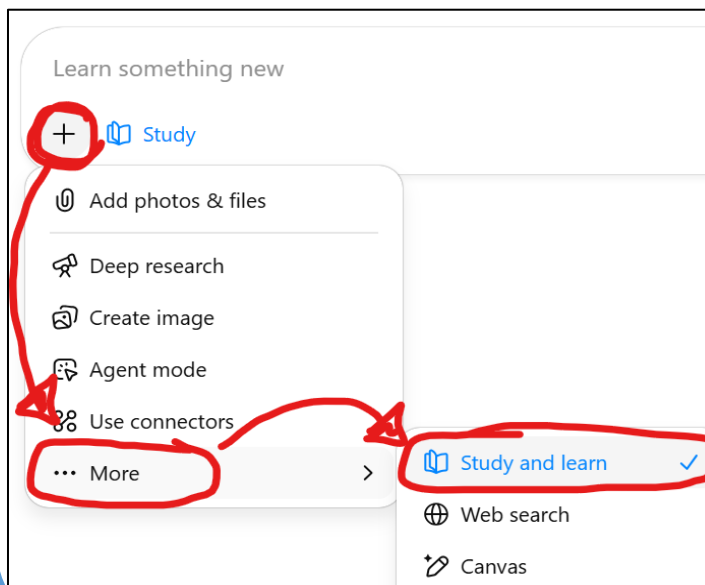
Study Mode!!!

Recently introduced in Claude, ChatGPT, Gemini.
Focus on *Socratic teaching* rather than *direct answers*.

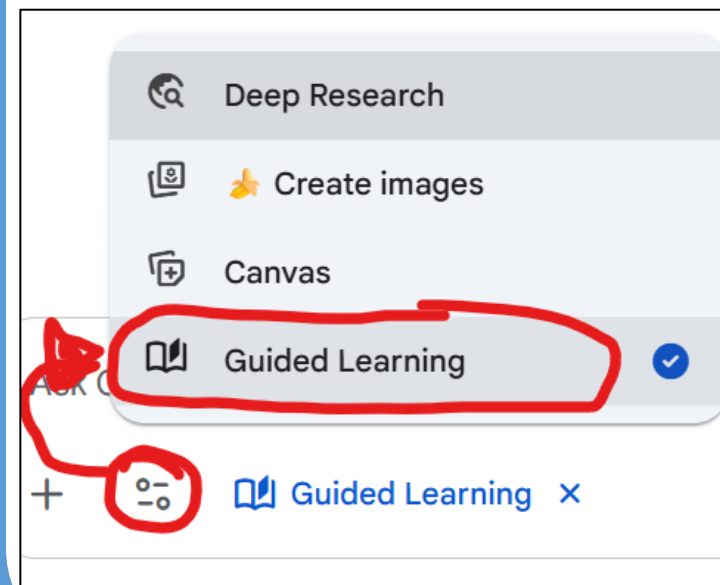
Claude



ChatGPT



Gemini



New Tools

Study Mode!!!

ChatGPT. No study mode.

$$\int \frac{3x-4}{(x-1)(x-2)^2} dx$$

I'm confused about this problem.

Thought for 40s

Great target for partial fractions. Because $(x-1)(x-2)^2$ has a repeated factor, write

$$\frac{3x-4}{(x-1)(x-2)^2} = \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{(x-2)^2}.$$

Multiply through by $(x-1)(x-2)^2$:

$$3x-4 = A(x-2)^2 + B(x-1)(x-2) + C(x-1).$$

Expand and match coefficients:

$$(x^2) : A + B = 0$$

$$(x) : -4A - 3B + C = 3 \implies A = -1, B = 1, C = 2.$$

$$(\text{const}) : 4A + 2B - C = -4$$

So

$$\frac{3x-4}{(x-1)(x-2)^2} = -\frac{1}{x-1} + \frac{1}{x-2} + \frac{2}{(x-2)^2}.$$

Integrate term-by-term:

$$\int \frac{3x-4}{(x-1)(x-2)^2} dx = -\ln|x-1| + \ln|x-2| - \frac{2}{x-2} + C = \ln\left|\frac{x-2}{x-1}\right| - \frac{2}{x-2} + C.$$

ChatGPT. Study mode.

$$\int \frac{3x-4}{(x-1)(x-2)^2} dx$$

I'm confused about this problem.

Thought for 7s

Got you. This one is a classic "partial fractions" integral.

Before we dive in: what level are you aiming for here—Calc II style partial fractions is okay?

If so, here's the plan (we'll go step by step): since the denominator is $(x-1)(x-2)^2$, the right decomposition is

$$\frac{3x-4}{(x-1)(x-2)^2} = \frac{A}{x-1} + \frac{B}{x-2} + \frac{C}{(x-2)^2}.$$

First micro-step: multiply both sides by $(x-1)(x-2)^2$ to clear denominators and get an identity in x .

That gives

$$3x-4 = A(x-2)^2 + B(x-1)(x-2) + C(x-1).$$

Your turn: do you want to solve for A, B, C by plugging convenient x -values (like $x = 1$ and $x = 2$) or by expanding and matching coefficients? Pick one method and find A, B, C . (Tell me your values and I'll check them, then we'll integrate each term.)

I got A=1, B=1, C=2

Thought for 27s

Nice work—two out of three are spot on.

Quick check at $x = 1$: $3(1) - 4 = -1$. RHS is $A(1-2)^2 = A$, so $A = -1$ (not +1). So the correct decomposition is

$$\frac{3x-4}{(x-1)(x-2)^2} = \frac{-1}{x-1} + \frac{1}{x-2} + \frac{2}{(x-2)^2}.$$

One step at a time: what is $\int \frac{-1}{x-1} dx$? (Then we'll do the other two.)

New Tools

Study Mode!!!

Gemini. Study mode.

Google has invested heavily in education...
Gemini is probably best for “study mode”.

$$\int \frac{3x - 4}{(x - 1)(x - 2)^2} dx$$

I'm confused about

Maybe it is $A/(x-1) + B/(x-2)^2$?

Show thinking ▼

Of course, let's break this problem down together. This integral uses a technique called **partial fraction decomposition**. It's a way to break a complex fraction as a sum of simpler ones that are easier to integrate.

The first step is always to look at the factors in the denominator: $(x - 1)$ and $(x - 2)^2$. The second factor is a repeated linear factor, which is a special case.

How do you think we should set up the decomposition for $\frac{3x - 4}{(x - 1)(x - 2)^2}$? We'll use simpler fractions with constants like A, B, and C in the numerators.

Show thinking ▼

You're very close! That's a common first guess. You've correctly handled the $(x - 1)$ factor and the highest power of the repeated factor, $(x - 2)^2$.

However, there's a special rule for repeated factors like $(x - 2)^2$: we need to include a separate fraction for **every power** of that factor, starting from the highest power.

So, the correct setup is:

$$\frac{3x - 4}{(x - 1)(x - 2)^2} = \frac{A}{x - 1} + \frac{B}{x - 2} + \frac{C}{(x - 2)^2}$$

See that extra $\frac{B}{x-2}$ term? That's the key for repeated factors.

Now that we have the right setup, the next step is to solve for the constants A, B, and C. What algebraic step could we take to clear all those denominators?



Should I multiply by something? Or should I be plugging something in for x?

Show thinking ▼

You've nailed the two main strategies! We do them in that order.

First, we multiply. Your intuition is spot on. To get rid of the fractions, we multiply both sides of the equation by the original denominator, $(x - 1)(x - 2)^2$.

When we do that, we get this much nicer equation:

$$3x - 4 = A(x - 2)^2 + B(x - 1)(x - 2) + C(x - 1)$$

Now, we plug in values for x. This is where your second idea comes into play. We can choose clever values for x that make some of the terms on the right side disappear, letting us solve for the constants one by one.

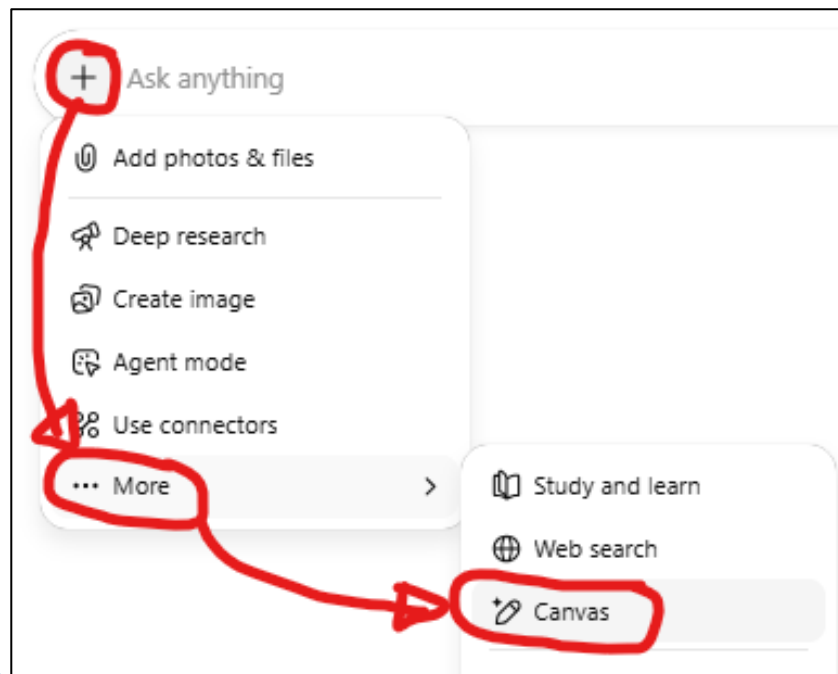
Looking at that equation, what value could we substitute for x that would make both the B and C terms vanish? 🤔

New Tools

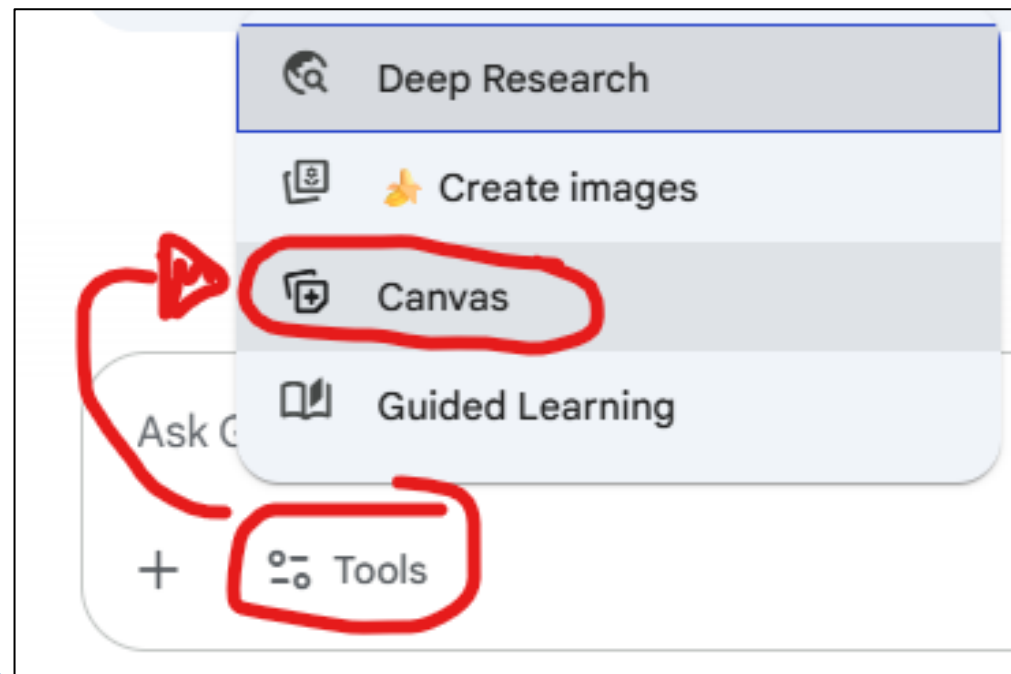
Canvas

Recently introduced in **Gemini** and **ChatGPT** (*experimental*).
Collaborative editing of documents (*word, excel, powerpoint, code*)

ChatGPT



Gemini



Gemini. Canvas Example (*word document*).

Gemini 2.5 Flash

Start Up Memo F2025
DOCX

please open this memo in canvas.

Analysis

I can definitely do that. Here is the memo you uploaded, now in Markdown format in the canvas.

CSM FALL 2025 Start-up Activities Memo
Sep 16, 4:29 PM

CSM FALL 2025 Start-up...

CSM FALL 2025 Start-up Activities

Important Dates to keep in mind:

- Aug. 18-22: Add-drop period
- Aug. 25: Start of Withdrawal
- Sept. 1: Labor Day Recess
- Sept. 2: Faculty report attending/non-attending student
- Sept. 8-12: Early Alerts
- Sept. 12: Census date
- Oct. 8: Midterm low-grade reports due
- Oct. 15: Last date to withdraw w/o Dean's permission
- Oct. 16: Start of withdraw w/ Dean's permission

Please open this memo in canvas.

Gemini 2.5 Flash

please modify the dates so that months are full spelled out!

I can do that for you. Here is the updated memo with the months spelled out in full.

I have updated the file to spell out all of the month names. Is there anything else you'd like to change or add to the document?

CSM FALL 2025 Start-up...

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Please modify the dates so that months are fully spelled out.

Gemini. Canvas Example (*continued*).

Gemini
2.5 Flash

please modify the dates so that months are full spelled out!

◆

I can do that for you. Here is the updated memo with the months spelled out in full.

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👍 🗨️ 🔗 ⋮

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Please modify the dates so that months are fully spelled out.

Gemini
2.5 Flash

Do you have any suggestions for making this memo more readable?

◆

Based on the current version of the memo, here are a few suggestions to make it even more readable:

- **Use a consistent format for the date lists.** The lists of "Important Dates" and "Holidays" are a bit different. We could make them look more uniform by aligning the dates and descriptions.
- **Break up longer paragraphs with subheadings.** For example, the "Syllabi & Attendance" section could be split into a **Syllabi** and an **Attendance** section to make the two topics distinct.
- **Add bolding to more key details.** While some dates are bold, we could also highlight important locations like **SharePoint** and **BucsConnect** or specific requirements like **seven office hours** to make them stand out.

CSM FALL 2025 Start-up Activities Memo

CSM FALL 2025 Start-up Activities

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- September 12: Census date
- October 8: Midterm low-grade reports due
- October 15: Last date to withdraw w/o Dean's permission
- October 16: Start of withdraw w/ Dean's permission
- October 23: Early registration for Spring 2026
- October 31: Liberty Day Recess

Do you have any suggestions for making this memo more readable?

New Tools

Canvas

ChatGPT. Canvas Example (*javascript code*).

The screenshot displays the ChatGPT Canvas interface. On the left, a code editor shows a JavaScript prototype for an algebra game. A red box highlights the 'Preview' button in the top right of the code editor. A red arrow points from this button to the preview window on the right. The preview window shows the rendered output of the code, which is a playable algebra game interface.

Code Editor Content:

```
1 import React, { useEffect, useMemo, useReducer } from 'react'
2
3 /**
4  * Single-file React prototype of a DragonBox-style algebra game (int
5  * - Engine is pure (inside this file)
6  * - 3 starter levels
7  * - Ops: +1, -1, x2, ÷2 (division allowed only if all coeffs divisib
8  * - Undo, Reset, Next, simple progress save in LocalStorage
9  * - Keyboard: 1=+1, 2=-1, 3=x2, 4=÷2, Z=Undo, R=Reset, N=Next
10 */
11
12 // =====
13 // Types / Data Model
14 // =====
15 export type Term = { kind: 'const' | 'var'; coeff: number } // e.g.,
16 export type Side = Term[]
17 export type Equation = { left: Side; right: Side }
18 export type OpType = 'add' | 'sub' | 'mul' | 'div'
19 export type Operation = { type: OpType; value: number }
20
21 export type Level = {
22   id: number
23   start: Equation
24   allowedOps: OpType[]
25   allowedValues?: number[]
26   title?: string
27   tip?: string
28 }
29
30 // =====
31 // Algebra Engine (pure)
```

Preview Window Content:

Algebra Playground (MVP)

Isolate **x** by doing the same operation to both sides. Integers only for this MVP.

DO TO BOTH SIDES:

x + 3 = 7

Tip: Try subtracting 3 from both sides.

+1 -1 x2 ÷2

Level 1: Warmup Attempts: 0

Undo Reset Next

Annotations:

- Can you put the code into canvas so that we can test it out?
- Thought for 23s
- Algebra Mvp (dragon Box-style) — Single-file React Prototype
- Done! I dropped a single-file React prototype into the canvas. It's playable right there (integers only, +1/-1/x2/÷2, undo/reset/next, 3 starter levels).
- If you want, I can now:

 - export this into a full Vite + TS + Tailwind repo structure, or
 - add negatives/fractions, hints, or a teacher sidebar with per-level stats.

Put the code into canvas so that we can try it out and edit!

Clicking "Preview" switches to the output of the code (playable javascript).

New Tools

Branching conversations

Recently introduced in **ChatGPT**.

Follow alternate threads from a single conversational point.

Explain the chain rule in calculus.

The **chain rule** is a fundamental tool in calculus used for differentiating **composite functions** — functions built by plugging one function inside another.

The Idea

If you have a function defined as

$$y = f(g(x)),$$

Similar to editing previous prompts, but it doesn't reset later chat history.

Would you like me to also show you a **graphical illustration** (with plots) to make the chain rule more visual, or keep it strictly symbolic?

📄 🍌 🗣️ ⬆️ ↺ ⋮

Give me a visual

Great idea — the **chain rule** really clicks when you see both a picture and a

🔧 Real-World Analogy

Imagine you're **driving a car** and want to know how quickly your **position** changes with respect to **time**.

- First, your **distance from home** depends on your **position** along the road.

$$d = f(p) \quad (\text{distance as a function of position})$$

- Second, your **position** depends on **time**:

effect.

Would you like me to also show you a **graphical illustration** (with plots) to make the chain rule more visual, or keep it strictly symbolic?

Give me a visual

Thought for 17s

Here's a clean **limit-based proof** of the chain rule.

Setup (hypotheses)

Let f be differentiable at a and g be differentiable at a .

Would you like me to also show you a **graphical illustration** (with plots) to make the chain rule more visual, or keep it strictly symbolic?

Give me a visual

Show me

Here's a challenging one that really makes you flex the chain rule:

Problem

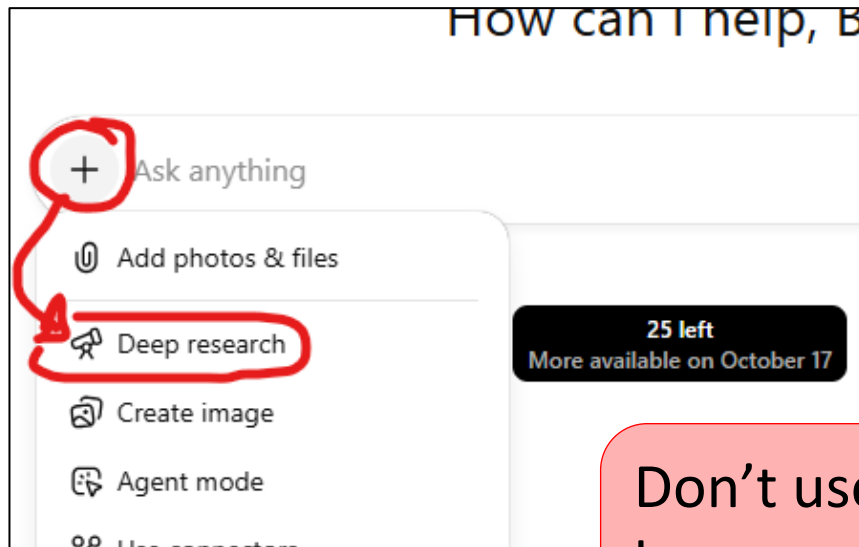
Find the derivative of

New Tools

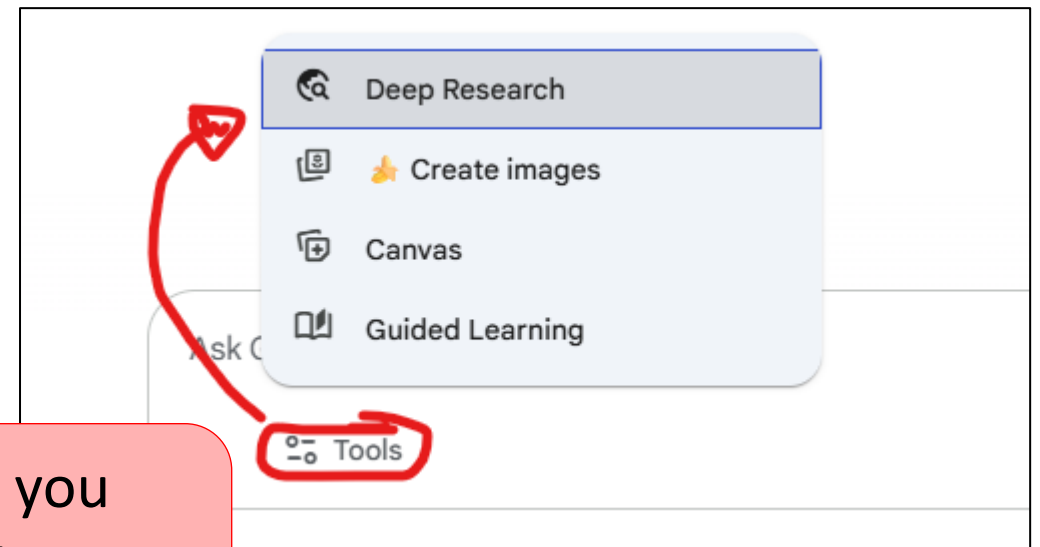
~~Deep Research ???~~

Introduced to ChatGPT and Gemini in Spring 2025; Claude in Summer 2025.

- *“Autonomous research agent.”*
- *5 - 45 minute search / compilation / refinement / synthesis*
- *Multi-page, detailed reports using “hundreds of sources” creating charts and visualizations (plots, graphs)*



ChatGPT

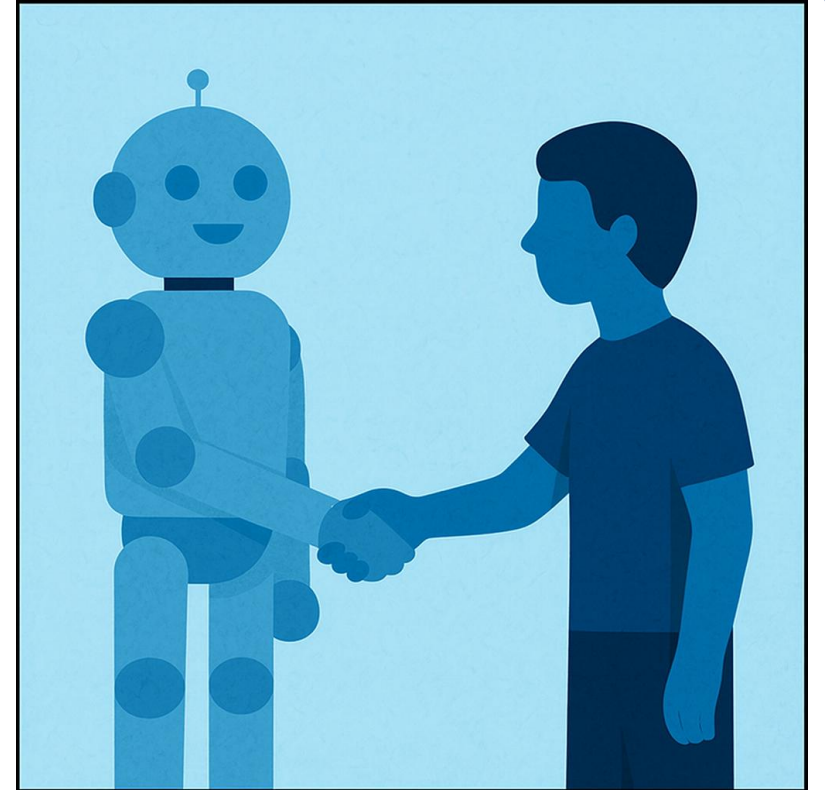


Gemini

Don't use this unless you
know enough to spot errors
(not a tool for students)

A Few More Notes

- Versioned Prompting
- Privacy and Data Controls
- AI, Cognitive Debt, and Learning
- Risk Management
- General Usage Examples



“Versioned” prompting *(all models)*

AI chat preserves conversational state, so you can “roll back time”

- Edit previous prompts to get better targeted or different responses
- Regenerate responses

Alice has two brothers and three sisters. How many sisters does her brother have?

Thought for 11s

4

Alice has 3 sisters (not counting herself). So there are 4 girls total: Alice + her 3 sisters. Any brother in that family has **4 sisters**.

📄 👍 🗨️ ↗️ ↺ ⋮



+ Oh! I meant to ask how many brothers her brother has!

- Wrong prompt.
- Want to include more detail.
- Want to change style of answer.

Edit prompt

Alice has two brothers and three sisters. How many sisters does her brother have?



Edit message

Alice has two brothers and three sisters. How many brothers does her brother have?

📄 ✎ < 2/2 >

Thought for 5s

1.

Alice has **two brothers total**. For any one of those brothers, the other one is his only brother (he doesn't count himself).

Regenerate response

Alice has **two brothers total**. For any one of those brothers, the other one is his only brother (he doesn't count himself).

📄 👍 🗨️ ↗️ ↺ ⋮

Try again...
Used GPT-3.5 Turbo

Ask to change response ↑

↺ Try again

⇅ Add details

⚡ More concise

🌐 Search the web

↔ Switch model >

Temporary Chat

ChatGPT 5 ▾

Turn off temporary chat

Temporary Chat

This chat won't appear in history, use or update ChatGPT's memory, or be used to train our models. For safety purposes, we may keep a copy of this chat for up to 30 days.

+ Ask anything

Note. Even temporary chats are stored on server for **30 days** and could surface in case of legal discovery process, etc.

Train on prompts?

DragonBox Algebra coding proj...

User AI Etiquette Importance

AI Character Traits Overview ✕

Jupyter OpenAI API Integrat

TensorFlow vs CNN

AI Productivity Seminar Out

benjamin.walter@uvi.e

Upgrade plan

Personalization

Settings

Help

Log out

Dr. Benjamin Walter
Plus

General

Notifications

Personalization

Connectors

Schedules

Data controls

Security

Account

Model improvement

Improve the model for everyone

Allow your content to be used to train our models, which makes ChatGPT better for you and everyone who uses it. We take steps to protect your privacy. [Learn more](#)

Voice mode

Include your audio recordings

Improve the model for everyone

Remote browser data

Shared links

Archived chats

Archive all chats

Privacy and Data Controls

Claude

Temporary Chat

The screenshot shows the 'Incognito chat' window. At the top, it says 'Use incognito ⌘+Ctrl+I' with a ghost icon. Below that is a 'Free plan · Upgrade' button. The main text says 'Good evening, Benjamin'. A search bar contains 'How can I help you today?'. Below the search bar is a dark header 'Incognito chat' with a close button. The main content area says 'You're incognito' with a 'Free plan · Upgrade' button. A search bar contains 'How can I help you today?'. Below the search bar are two icons (a plus sign and a speech bubble) and a dropdown menu showing 'Sonnet 4'. At the bottom, it says 'Incognito chats aren't saved to history or used to train models. [Learn more](#) about how your data is used.'

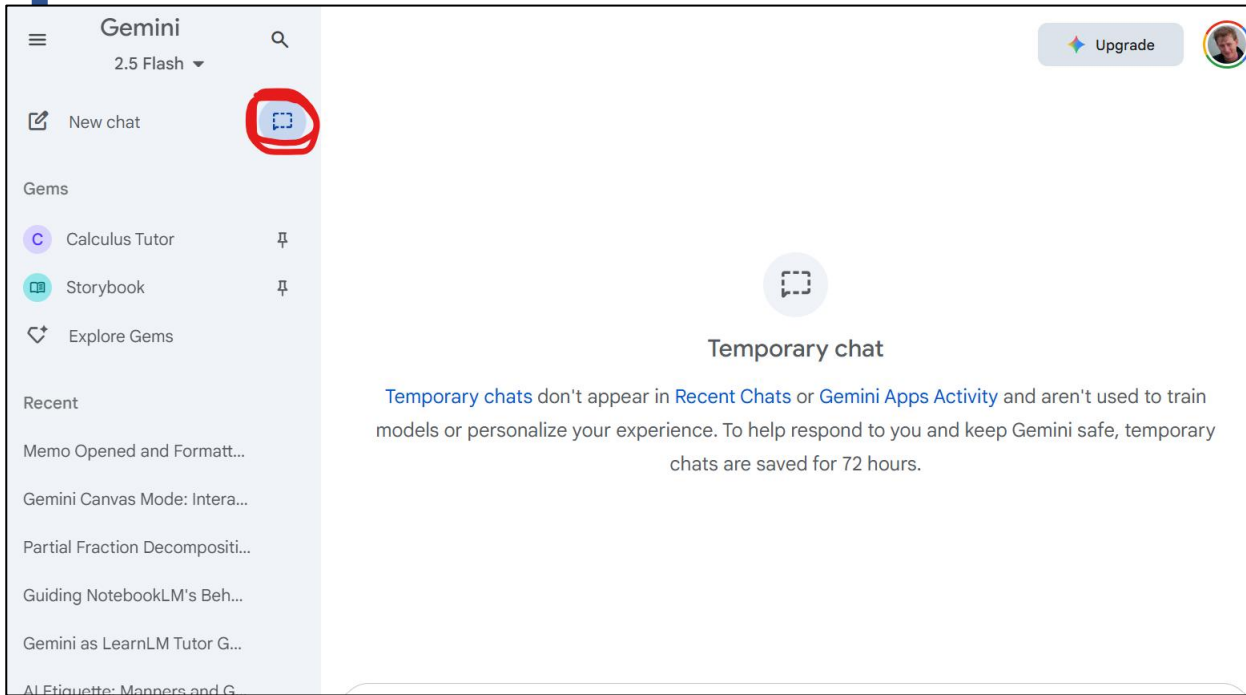
Train on prompts?

The screenshot shows the 'Settings' page in Claude. On the left is a sidebar with 'Claude' at the top, followed by 'New chat', 'Chats', 'Projects', 'Artifacts', 'Recents', and a list of recent prompts. At the bottom of the sidebar is a user profile 'BW Benjamin Walter Free plan'. The main area is titled 'Settings' and has a list of options: 'Profile', 'Account', 'Privacy' (circled in red), 'Billing', 'Features', 'Connectors', and 'Claude Code'. On the right is a 'Data privacy' section with a shield icon, stating 'Anthropic believes in transparent data practices' and providing links to 'Privacy Center' and 'Privacy Policy'. Below this are links for 'How we protect your data' and 'How we use your data'. Further down is a 'Privacy settings' section with 'Export data' (button), 'Shared chats' (button), 'Location metadata' (toggle switch), and 'Help improve Claude' (toggle switch, circled in red).

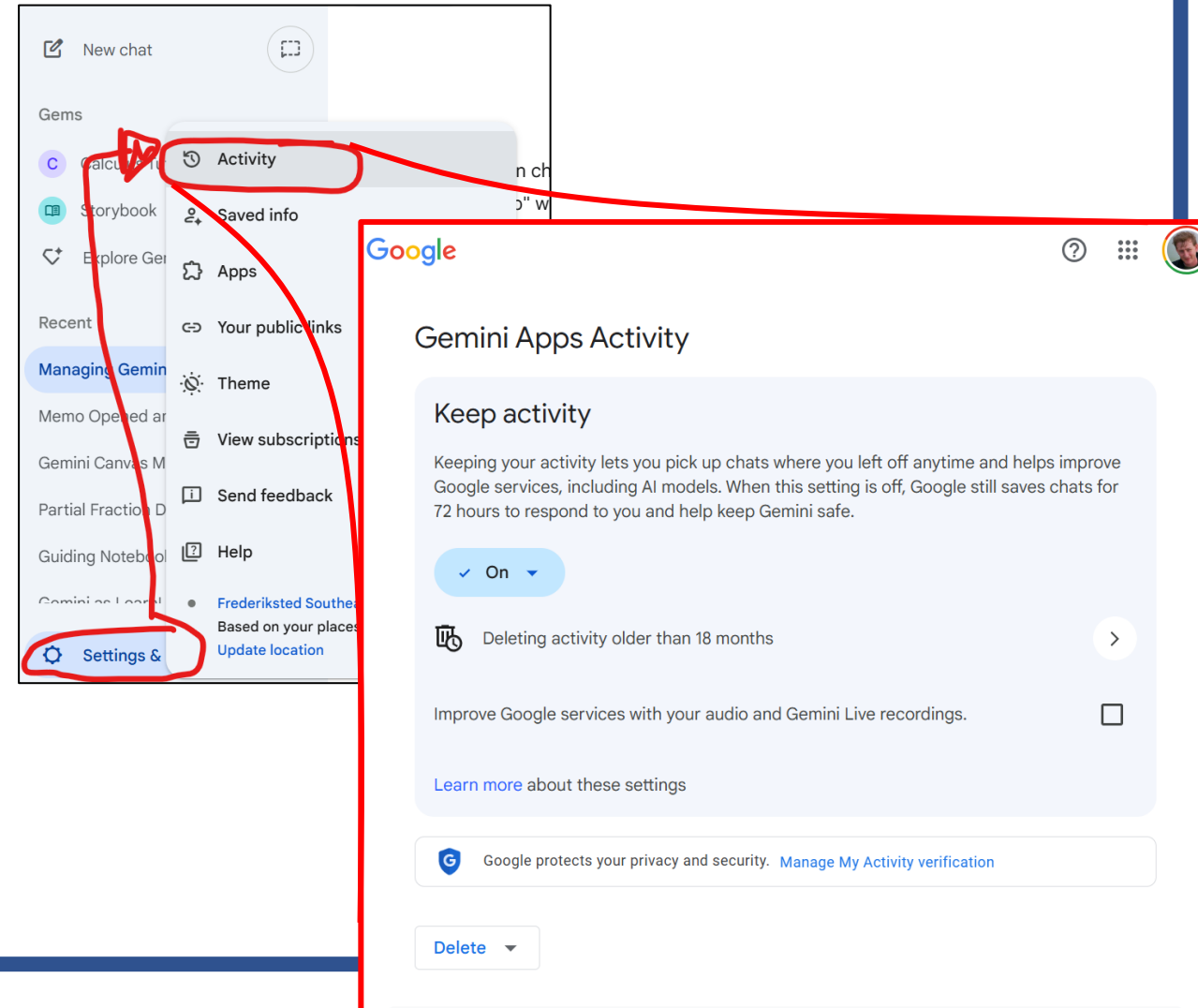
Privacy and Data Controls

Gemini

Temporary Chat



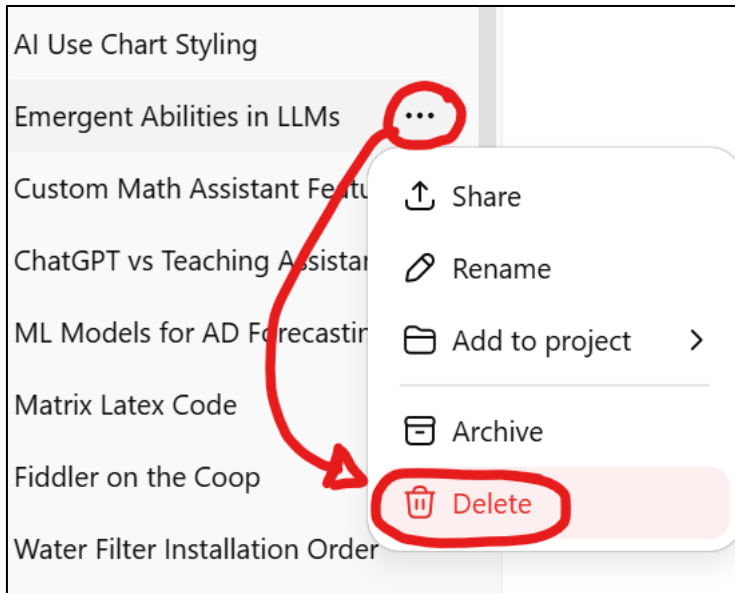
Auto-remove chats?



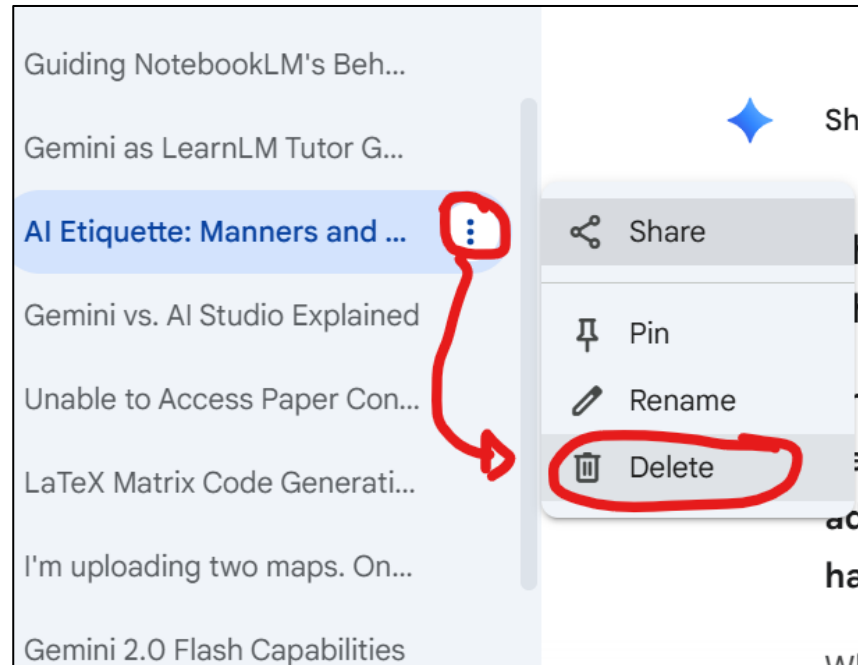
Privacy and Data Controls

Deleting Chats

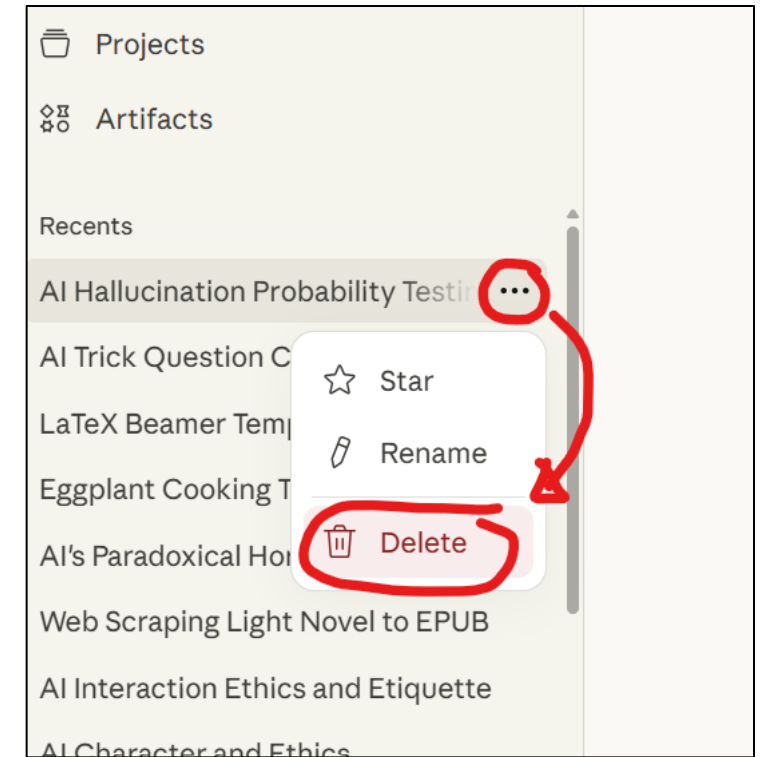
ChatGPT



Gemini



Claude



- Best method for privacy is to have an AI on **your own computer**

- Ollama
- LM Studio

Many available models:

GPT-oss, Gemma, DeepSeek 3.1, Qwen 2.5, Llama 3.2, DeepSeek R1, etc....

- Next best is to have an AI on a **university server**

- vLLM

Problem: It costs at least \$6,000 to put together a server which can run inference using a **top model** at **decent speeds**...

Though you can use a 4-bit *quantized* model for “edge devices”

AI, Cognitive Debt, and Learning *(oh my!)*

- **Cognitive offloading.** Frequent AI usage lowers critical thinking, creativity
(Gerlich. AI Tools in Society. 2025)
- **Cognitive debt.** Over-reliance on AI lowers brain engagement
“Debt” builds up, skills atrophy
(Kosmyna et al. Your Brain on ChatGPT. 2025)
- **Easy ≠ Better.** Full AI help while studying **reduces** test performance
(Wecks et al. Generative AI Usage and Exam Performance. 2024)
- **Some AI is fine.** Intermediate AI support **can increase** test scores
(Chen et al. Examining the AI Assistance Dilemma. 2025)

Include periods
of “AI free”
practice time.

Convenience vs. Engagement.

Reducing mental effort frequently pairs with lower engagement, memory formation, originality, critical thinking.

Risk Management

VIBE CODING IS NOT FOR PRODUCTION!!!!

Check sources.

Major AI now cite **web** sources by default (*toggle in Claude?*). Verify reliability, authoritativeness. E.g. [sun language theory](#)???

Be skeptical.

Responses that are too good often are too good (to be true)! Double-check for second sources (“triangulate”). THINK!

Citations.

AI are subtly **bad** at generating citations. Verify citations very carefully!

Summaries.

AI summaries often over-generalize, simplify, or exaggerate. Use them to **guide** reading; but not to **replace** it!

Medical advice.

Don't blindly take medical advice (or get therapy) from an AI! [\(Bromide poisoning is bad!\)](#)

AI Psychosis.

You did not *invent a new physics*. You did not *crack the matrix*. Do not talk solely to AI. *AIs convince people of **crazy** things...*

General Usage Examples

Prompt Engineering

Not as important as it used to be.
(Persona, Task, Context, Format, Examples)

Self Testing

“Generate 5 practice questions based on this worksheet. Check my answers after I solve.”

Flash Card Generation

“Make a series of flash-cards for the TEAS test.”
(good with canvas!)

Critical peer review

“Read my draft and act like a skeptical classmate or professor. What is weak or unconvincing here?”

Reverse outlining

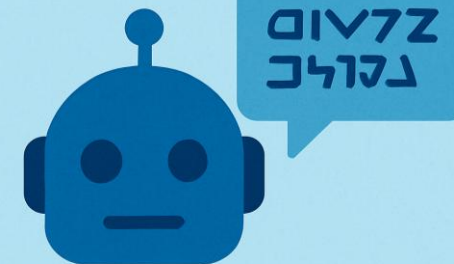
“Based on my paper, outline my argument as you understand it.”

Bug insertion

“Insert a bug into this program, so that I can practice debugging.”

Presentation practice

“Ask me 5 tough questions an audience might ask.”



Thanks for your attention!

Previous AI talks:

- Jan 2024. <https://bit.ly/4gpbnx8>
- Sept 2024. <https://bit.ly/4df8fAY>
- Dec 2024. <https://bit.ly/49NUMjD>
- June 2025. <https://bit.ly/4jxAWMs>

Primary sources and further reading:

OECD. *What should teachers teach and students learn in a future of powerful AI? OECD Education Spotlights*, No. 20, <https://doi.org/10.1787/ca56c7d6-en>

Gerlich M. AI Tools in Society: Impacts on Cognitive Offloading and the Future of Critical Thinking. *Societies*. 2025; 15(1):6. <https://doi.org/10.3390/soc15010006>

Kosmyna N. et al. Your brain on ChatGPT: Accumulation of cognitive debt when using an AI assistant for essay writing task. (2025). [arXiv preprint arXiv:2506.08872](https://arxiv.org/abs/2506.08872)

Wecks J. O. et al. Generative AI Usage and Exam Performance. (2024). [arXiv preprint arXiv:2404.19699](https://arxiv.org/abs/2404.19699)

Chen X. et al. More AI Assistance Reduces Cognitive Engagement: Examining the AI Assistance Dilemma in AI-Supported Note-Taking. (2025). [arXiv preprint arXiv:2509.03392](https://arxiv.org/abs/2509.03392)



<https://bit.ly/3Kof8aa>