

Intro to Generative AI

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Welcome!

Goals

- **Gain a working understanding of Generative AI**
- **How to think about Generative AI critically**
- **Understand the importance of use-case sharing**

I love questions – ask anytime

Agenda



How it works
I'm assuming nothing...



Use-cases
Let's play!



Challenges
The big ones...



HOW IT WORKS

What's under the hood?

What is AI?

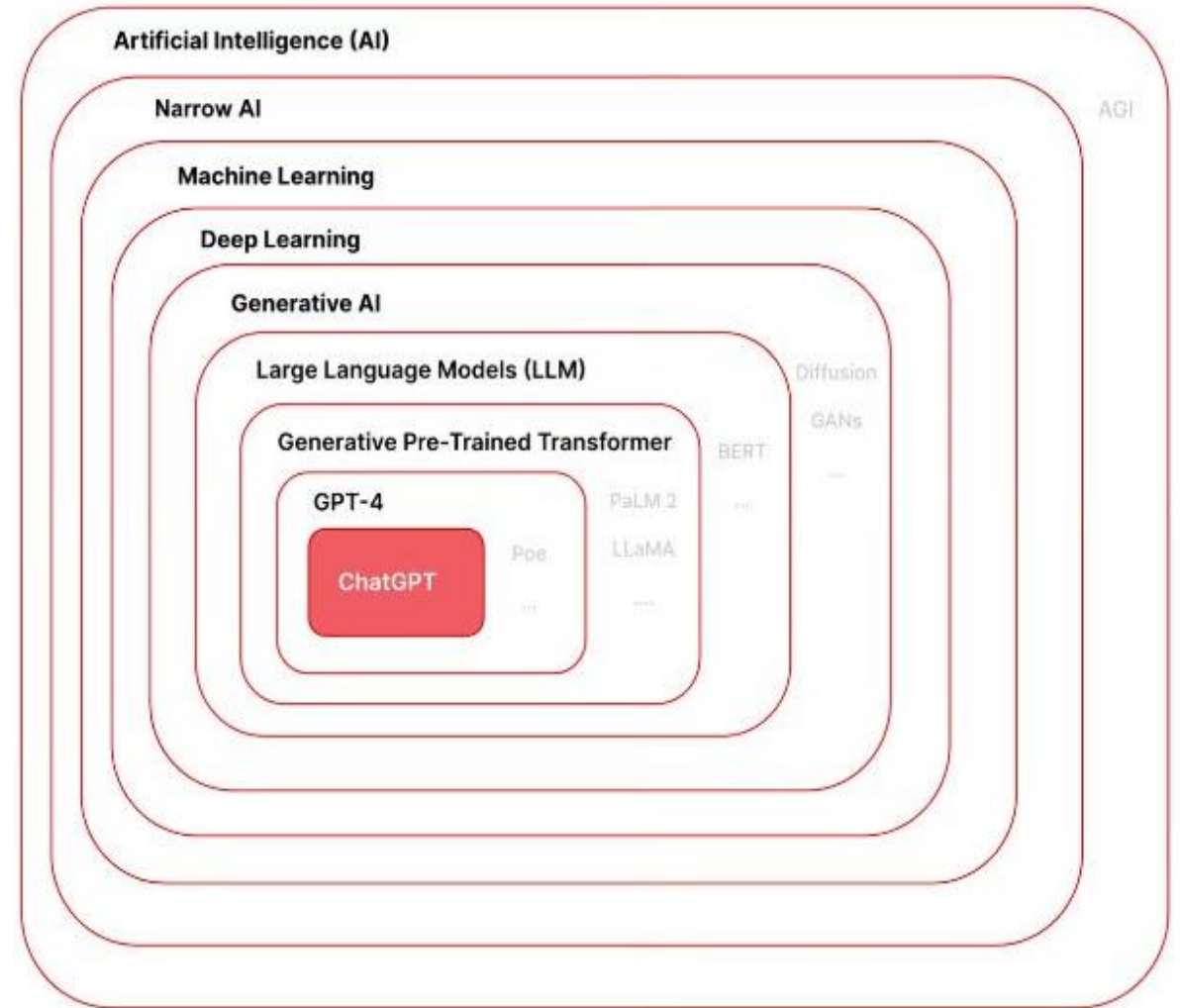
Artificial Intelligence

Technology used for learning, problem-solving, decision making, understanding language, etc.

Generative AI

A type of AI capable of generating original content

Also commonly known as: Gen AI, LLM, GPT, model



How does it work?

How does it generate original content?

1. **Training**

Use machine learning to identify the patterns in data (text, images, video, music).
The result is a *model*.

- “The cat sat on the ____” ... “mat”
- “The cat ____ on the mat” ... “sat”
- ... do this trillions of times ...

2. **Preference tuning**

Tweak the *model* so that it aligns with our preferences.

3. **Generation (inference)**

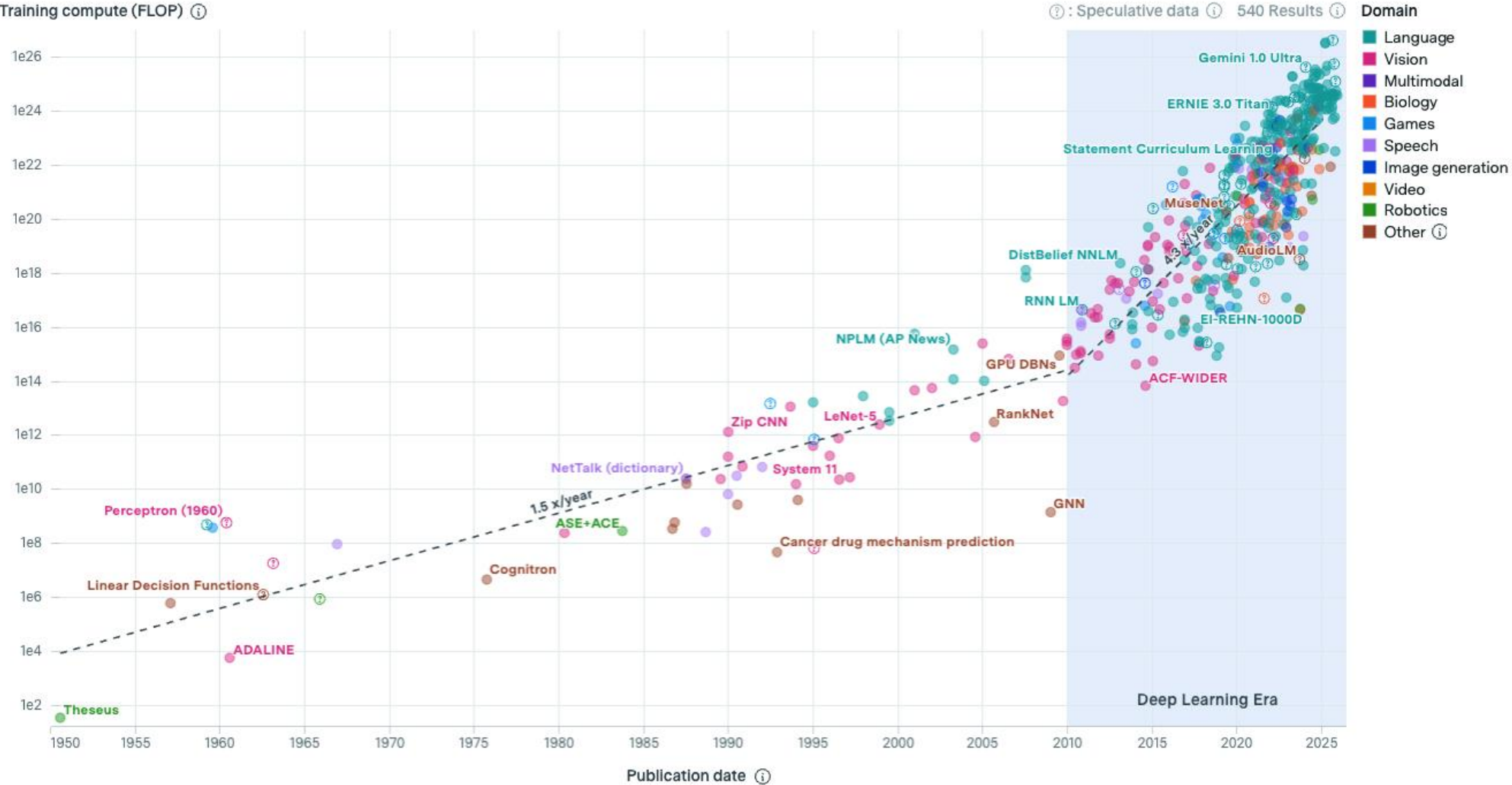
“Hey *model*, I have the following data, what comes next”?

Growth of AI models

Notable AI models ⓘ

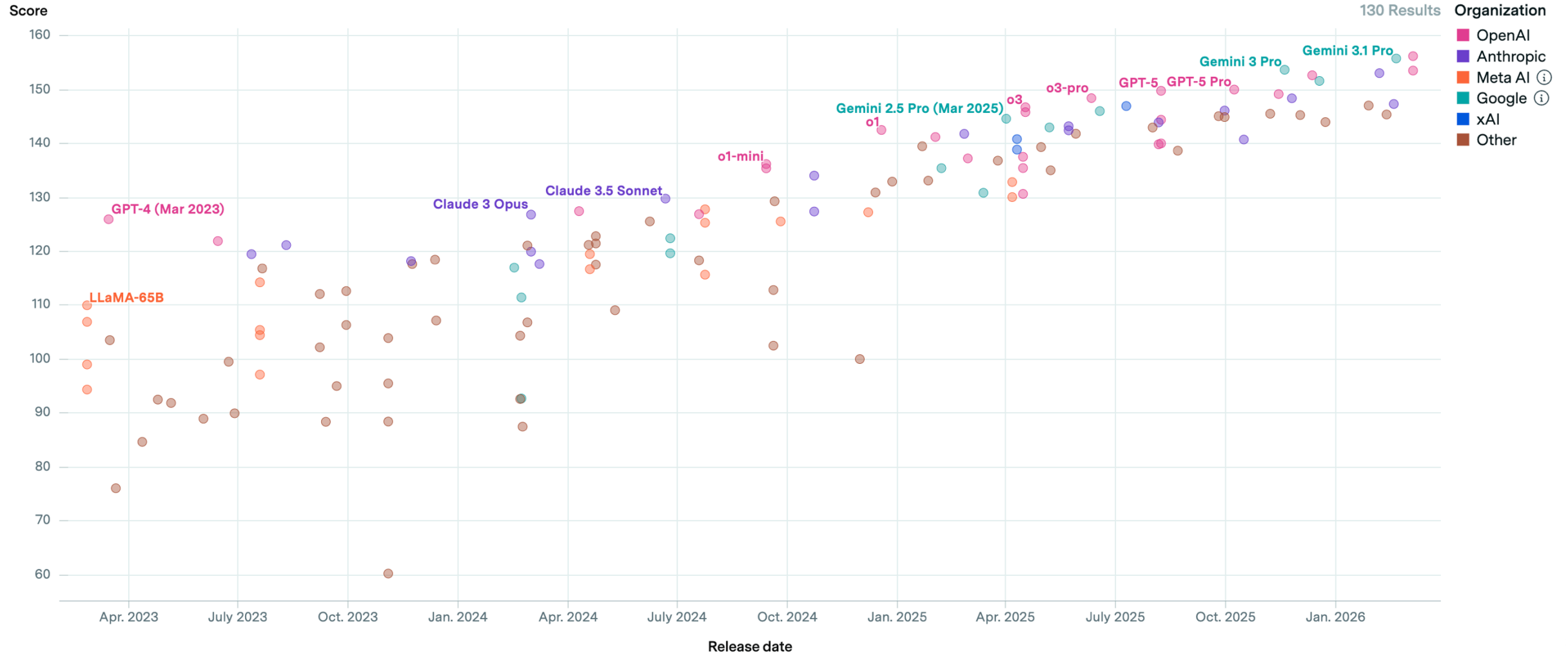
Training compute (FLOP) ⓘ

⚙️ Graph Settings



AI model capabilities

Epoch Capabilities Index (ECI)



130 Results

- Organization
- OpenAI
 - Anthropic
 - Meta AI ⓘ
 - Google ⓘ
 - xAI
 - Other



Cost of AI model use

LLM inference prices have fallen 9x to 900x/year, depending on the task 



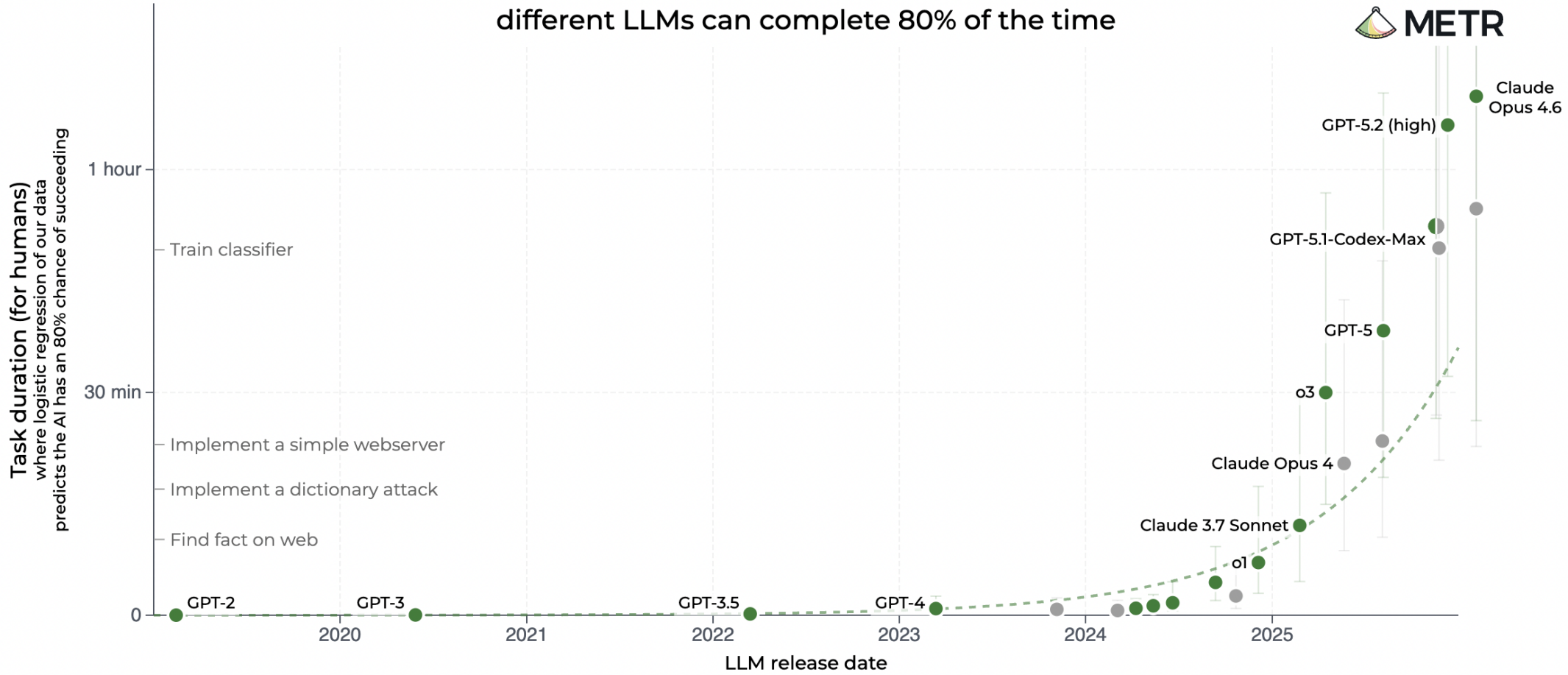
Data source: Epoch AI, Artificial Analysis
CC-BY

epoch.ai



Agentic capabilities (80% success)

Time horizon of software tasks
different LLMs can complete 80% of the time



Today
1 hr
10 min



Agentic capabilities (50% success)

Time horizon of software tasks
different LLMs can complete 50% of the time



4 - 7 month doubling

2026

~~- 2 hour tasks~~

2027

~~- 1 work day~~

2028

- 1 work week

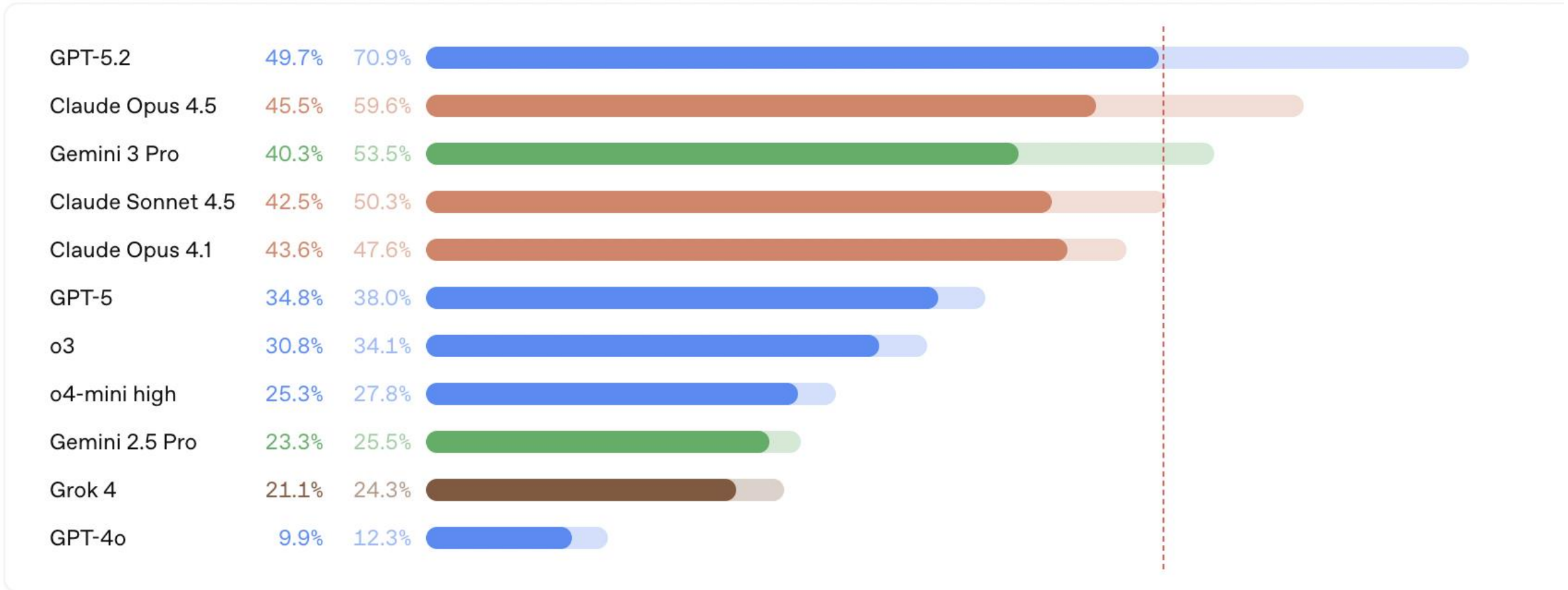
2029

- 1 work month

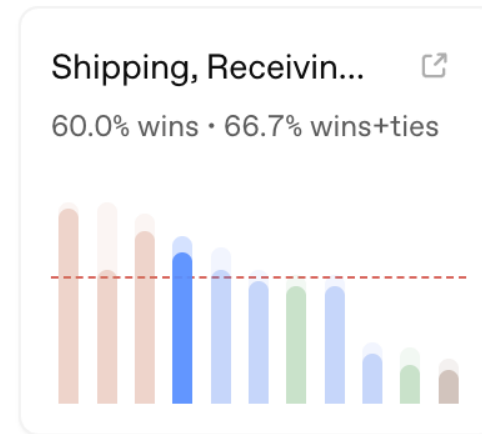
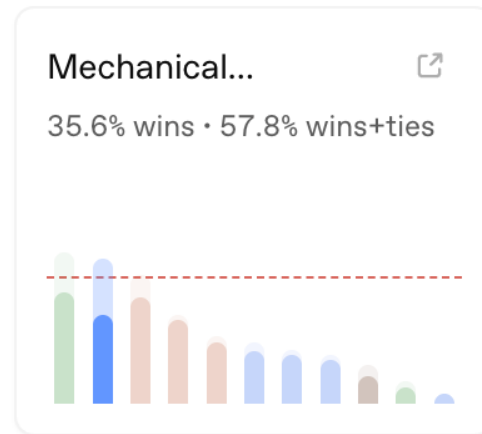
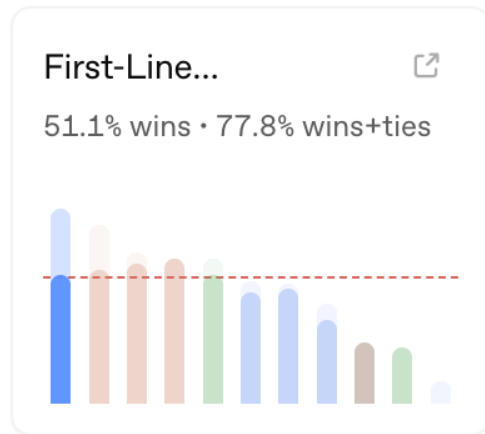
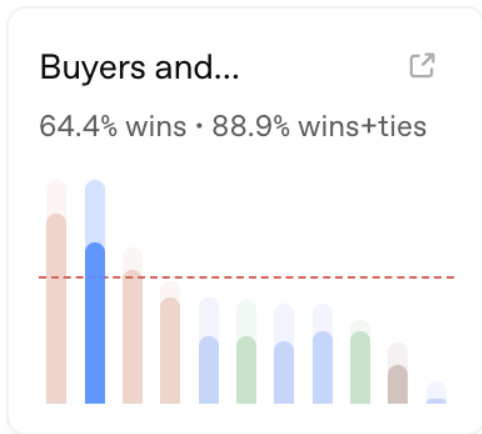
AI agent vs. industry professional

GPT-5.4 – 83%
Claude Opus 4.6 – 78%

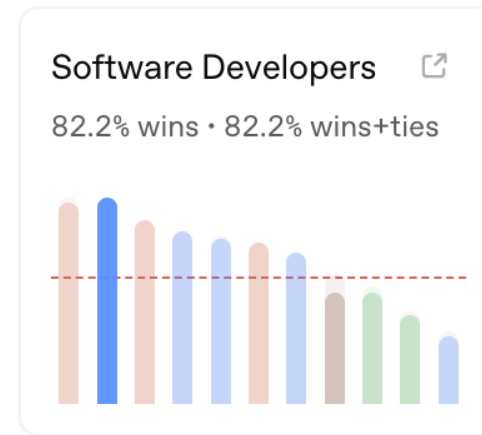
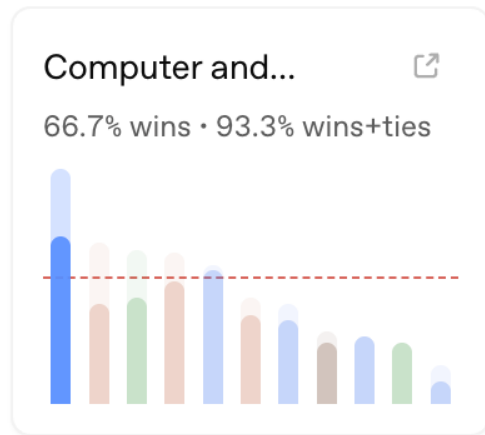
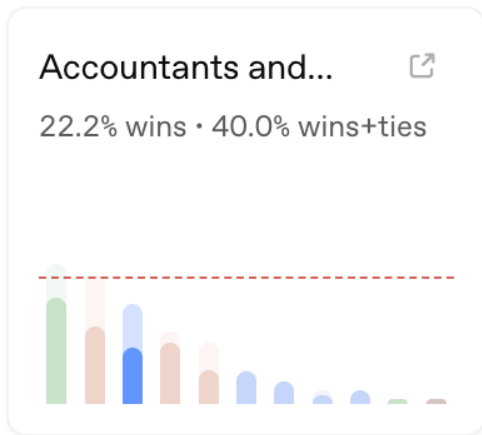
■ Wins Only ■ Wins + Ties ∴ Parity with Industry Expert (50%)



MANUFACTURING



PROFESSIONAL, SCIENTIFIC, AND TECHNICAL SERVICES



Application of AI

- Knowledgebase assistants/complex reasoners/deep research
- Agents (act on your behalf)
- Specialized AI systems
 - Medical imaging
 - Credit risk assessment
 - Legal research automation
 - Adaptive and personalized learning platforms
 - Student support agents
 - Personalized tutors
 - Course design assistants

Poll

- Have you ever used AI to improve a process or solve a problem at work?

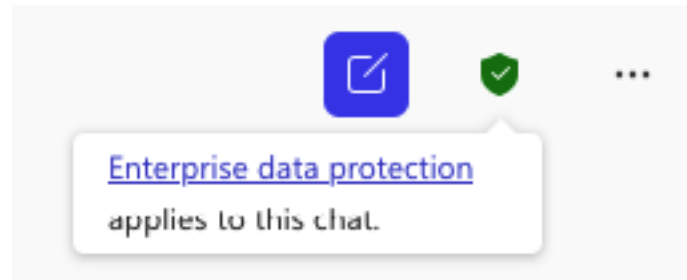


USE-CASES

This is the hardest part!

Microsoft Copilot

office.com/chat



Use-cases

- **Create** – compose net-new
- **Augment** – improve or ground
- **Collaborate** – co-think to decide

Prompts to try – create

Generate new content from scratch

- Tell me a joke; what is 350f in c?; how do you make apple pie?
- Draft a vacation request email to my boss
 - Can you make it more concise?
- Can you explain to me how Generative AI works in a couple sentences?
 - How would you explain that to a 5th grader?
- Draw me a picture of _____
 - Ask to alter the picture in some way
 - Write me a couple verse song about the pictures that were just created

Warning

Give me a succinct chronological bullet list of all influential gen ai tools from 2019-now with dates of when they were released

Here's a more complete chronological list of **major / influential** generative-AI model / tool releases from 2019 to 2025 (approximate dates):

- Feb 2019 – GPT-2 (initial announcement)
- Nov 2019 – GPT-2 full 1.5B release
- Nov 2019 – DialoGPT paper
- May 2020 – GPT-3 paper
- June 2020 – GPT-3 API (beta)
- Apr 2022 – DALL·E 2 announced
- July 12, 2022 – Midjourney open beta
- Aug 22, 2022 – Stable Diffusion public release
- Nov 2022 – ChatGPT (using GPT-3.5) released to public
- Mar 2023 – GPT-4 released
- Mar 2023 – Claude 1 (Anthropic) first release**
- Dec 6, 2023 – Google Gemini 1.0 (multimodal model) released**
- Jul 2023 – Claude 2 released**
- June 20, 2024 – Claude 3.5 Sonnet released**
- Mar 4, 2024 – Claude 3 released**
- May 22, 2025 – Claude 4 (Opus 4 & Sonnet 4) released
- Sep 29, 2025 – Claude Sonnet 4.5 released

Prompts to try – augment

Improve or ground existing content with your sources

- Here is a transcript from a meeting, please create a meeting summary with the following sections: attendees, summary of topics, and action items.

- I have an excel spreadsheet with columns: name, count, price and many rows. How do I highlight the rows where the price deviates from the average by more than 10%?

Prompts to try – augment

- Here are the contents of a {presentation I wrote on AI}. What am I missing?
- *Take a picture of a problem you are trying to solve. Ask AI to help...*
- I want to get AI to {review my email}. Help me write the prompt.

Prompts to try – collaborate

Co-think to brainstorm, compare options, and decide

- Draft an AI business case for an organization
 - ... format it like this one [attach document]
 - ... expand on point 3 including details about ...
 - ... make the last paragraph more succinct
- Analyze this sales data over the past five years and provide insights on seasonal trends and customer preferences {attach document}
 - ... if this year's numbers are the following, analyze our performance ...
 - ... write me a one-page executive summary of the findings

Prompting example - v1 😊

Write me an email welcoming a new hire

Prompting example - v1

Subject: Welcome to Our Team!

Dear [New Hire's Name],

I hope this email finds you well. On behalf of the entire team, I want to extend a warm welcome to you as our newest team member! We're thrilled to have you join us at [Company Name].

Introduction: Allow me to introduce myself. My name is [Your Name], and I work in the [Department/Team Name]. I've been with the company for [X] years and have had the pleasure of working with some amazing colleagues. I'm confident that you'll find our team to be supportive, collaborative, and full of talented individuals.

Your Role: As [New Hire's Position], you'll be responsible for [briefly describe their main responsibilities]. We believe your skills and expertise will be a valuable addition to our team, and we're excited to see the impact you'll make.

Getting Started: To help you settle in smoothly, here are a few things to keep in mind:

- **Orientation:** You'll receive an email with details about your orientation schedule. This will cover company policies, tools, and resources available to you.
- **Team Introduction:** We'll organize a virtual team meeting where you can meet your colleagues, learn about ongoing projects, and get acquainted with our team culture.
- **Buddy System:** You'll be assigned a buddy—a friendly colleague who will be your go-to person for any questions or assistance during your initial weeks.

Company Culture: At [Company Name], we value collaboration, innovation, and continuous learning. Our open-door policy encourages communication across all levels, and we believe in celebrating both individual achievements and team successes.

Next Steps: Please reply to this email with your preferred contact information (phone number and Slack handle) so we can add you to our communication channels. Additionally, let us know if you have any dietary preferences for team lunches or if you need any accommodations.

Once again, welcome aboard! We're excited to embark on this journey together and look forward to achieving great things as a team.

Best regards,



Prompting example - v2 🤖

I'm the hiring manager for a software developer position and I've selected a candidate whom I've already interviewed. Please write me a concise welcome email for Cathy, this new hire. The start date is June 1st and she will be working in EC2.

Prompting example - v2

Subject: Welcome to Our Team, Cathy!

Dear Cathy,

I am thrilled to welcome you to our team as a software developer! We are excited to have you join us at [Your Company Name]. Your start date is June 1st, and you'll be working with our EC2 team.

A Little About Us: [Your Company Name] is a dynamic and innovative company that thrives on collaboration, creativity, and cutting-edge technology. Our team is passionate about solving complex problems and delivering exceptional solutions to our clients.

Your Role: As a software developer, you'll play a crucial role in designing, developing, and maintaining software applications. Your expertise will contribute to our success, and we can't wait to see the impact you'll make.

First Steps: Before your start date, please review the following resources:

- **Employee Handbook:** Familiarize yourself with our company policies and guidelines.
- **EC2 Team Overview:** Reach out to your team lead, [Team Lead's Name], to learn more about your specific projects and responsibilities.
- **Onboarding Schedule:** You'll receive a detailed schedule for your first week, including introductions to team members and training sessions.

Our Team: We have an incredible group of talented individuals who are always willing to lend a helping hand. Don't hesitate to ask questions or seek guidance—everyone is here to support you.

Next Steps: On your first day, please arrive at [Location] by [Time]. We'll have a warm welcome waiting for you, along with your new equipment and workspace.

Once again, welcome to [Your Company Name], Cathy! We look forward to working together and achieving great things.

Best regards,



Prompting example - v3 🙄

Hi Cathy,

Welcome to the team! We are very excited to have you. As we discussed in the interview, the start date is June 1st and the team works out of EC2. Work hours are 8:30am – 4:30pm. We will do a full onboarding and orientation on your first day so you don't need to worry about preparing anything ahead of time.

Thank you and looking forward to seeing you on June 1st!

Here is a welcome email for a new hire. Can you please check it for grammar and tone?

Prompting example - v3 🤩

Hi Cathy,

Welcome aboard! We're thrilled to have you join our team. As we discussed during the interview process, your start date is June 1st, and our team operates out of EC2. Your work hours will be from 8:30 am to 4:30 pm. On your first day, we'll provide a comprehensive onboarding and orientation, so there's no need to prepare anything in advance.

Feel free to reach out if you have any questions or need assistance before your start date. Looking forward to meeting you in person on June 1st!

Best regards,

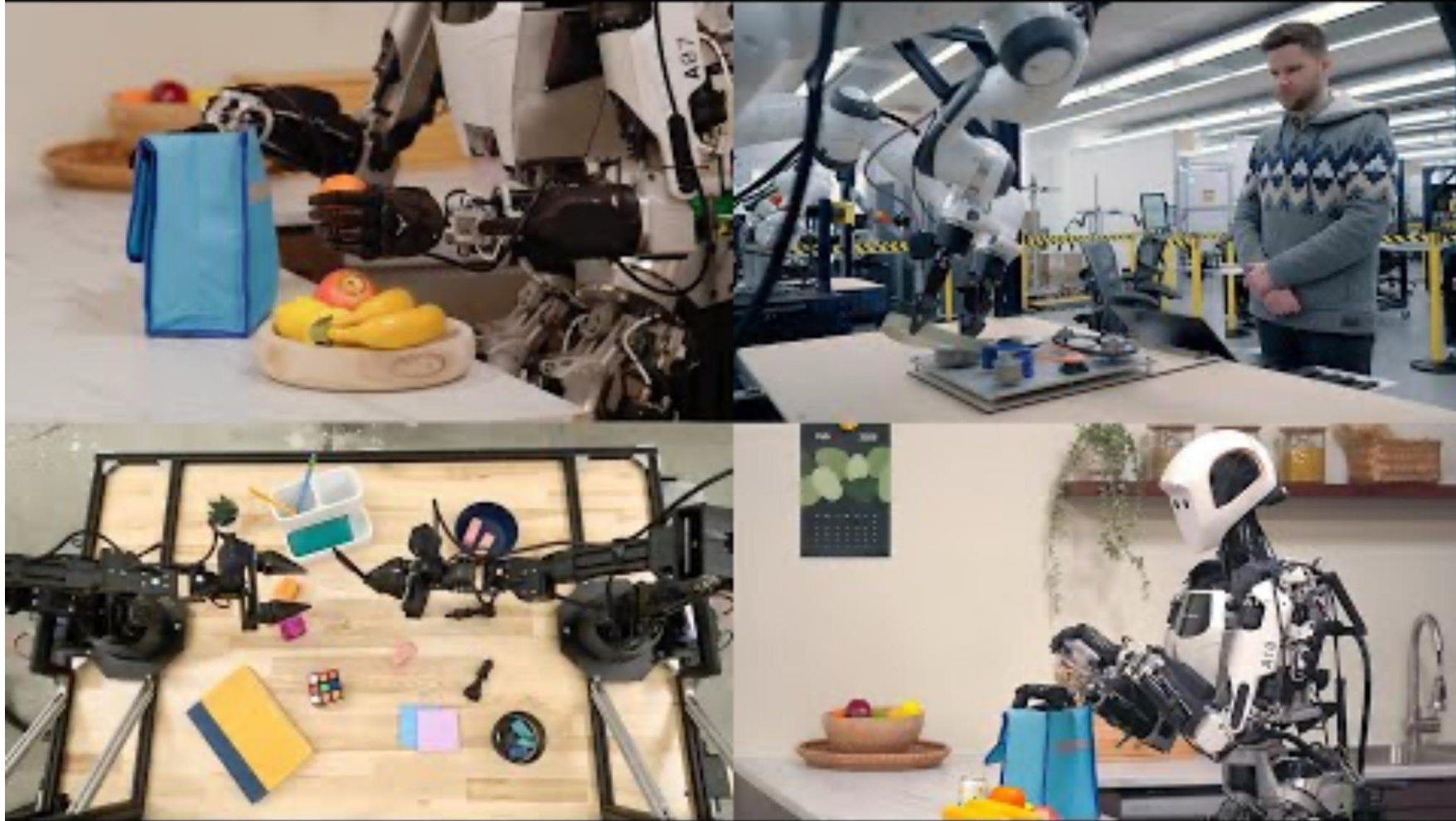
Prompting example – what have I learned?

In the future, I will draft my first version and then iterate with Copilot. I started with **Create** and ended with **Augment**.

- *Why did this work? - GenAI tools do well when provided with examples and boundaries (dos and don'ts)*

Sharing use-cases amongst colleagues is the fastest way to gain efficiencies using GenAI tools.

What else can it do?



March 2025 – Google Gemini Robotics



What else can it do?



May 2025 - Google veo 3 - <https://deepmind.google/models/veo/>

What else can it do?



Wouldn't it be great if AI could...

...



CHALLENGES

Data awareness

- The world is filled with exciting, cutting-edge tools to use today.
 - Remember, an AI enabled tool is just another information system owned by a vendor.
- Information Classification under Policy 46
 - **Public information** can be freely used in any AI system (Copilot, ChatGPT, Gemini, Claude, etc)
 - **Confidential/Restricted** information can only be entered into University-approved AI systems (Copilot)
 - **Highly-Restricted** information cannot be entered into any AI systems
 - SIN, PHI, credit card, etc...
- AI specific guidance

Data awareness

Public (examples)

- University publications
- Websites that do not require authentication
- Social media channels
- University Calendar
- Published Request for Proposals (RFPs)
- Salaries subject to disclosure by the Ontario Public Sector Salary Disclosure Act

Restricted (examples)

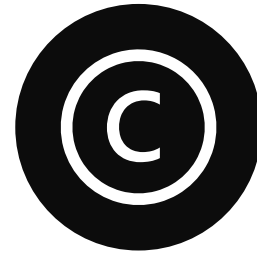
- Personal information (protected under Freedom of Information and Protection of Privacy Act (FIPPA) or Personal Information Protection and Electronic Documents Act (PIPEDA)). Examples include (non-exhaustive): Data that can directly identify a person
 - WatIam username
 - Student/Employee Number
 - WatCard number
 - IP Address
- Data that when combined can identify a person

Challenges



Data and accuracy

Bias
Hallucinations



Explainability and copyright

Accountability
Value alignment



Resources and sustainability

Cost
Energy

Poll

- What concerns (if any) do you have using AI at work?

FINAL THOUGHTS

Phases of AI use

1. **Learn:** foundational AI training + use-case identification
2. **Try:** habit forming and use-case scaling
3. **Standardize:** team transformation with confident AI use – The AI Enabled Team

Final thoughts

For work, please use Microsoft Copilot

Try – <https://aitools.uwaterloo.ca>

ITPD – Intro to AI & Advanced AI for Everyone
<https://uwaterloo.atlassian.net/wiki/x/nQCl6wk>

<https://uwaterloo.ca/genai/>

Additional reading

- <https://hai.stanford.edu/ai-index/2025-ai-index-report>
- <https://epoch.ai/>
- <https://www.kaggle.com/whitepaper-prompt-engineering>

Any questions?

Anyone in 2035 should be able to marshal the intellectual capacity equivalent to everyone in 2025; everyone should have access to unlimited genius to direct however they can imagine.

- Sam Altman (CEO OpenAI)



Thank you!

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