

Generative AI in a Nutshell

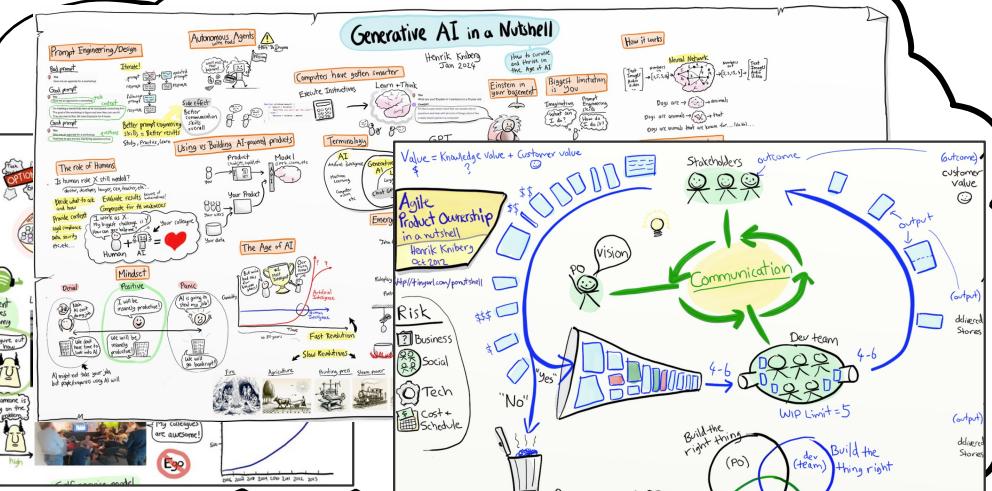
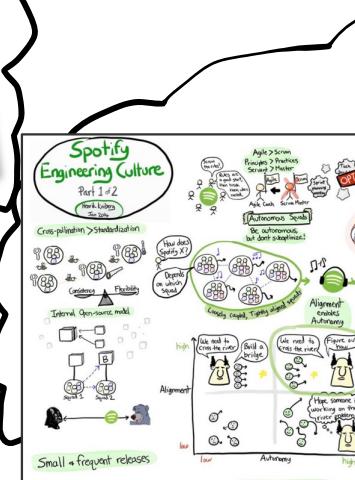
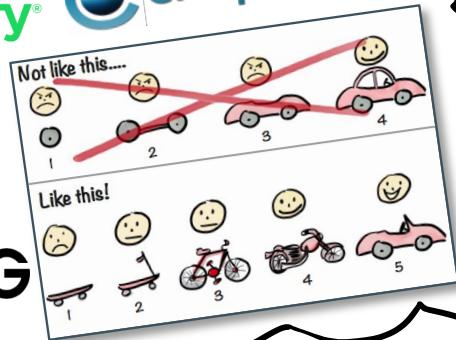
DeepFest
Feb 9, 2025, Riyadh

Henrik Kniberg

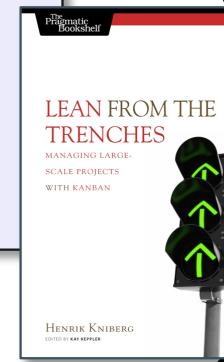
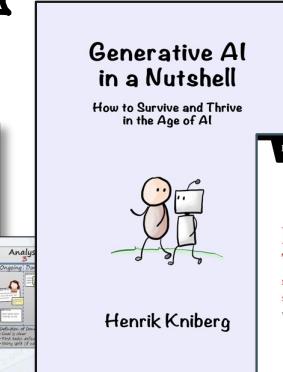


mnnig.ai

Background



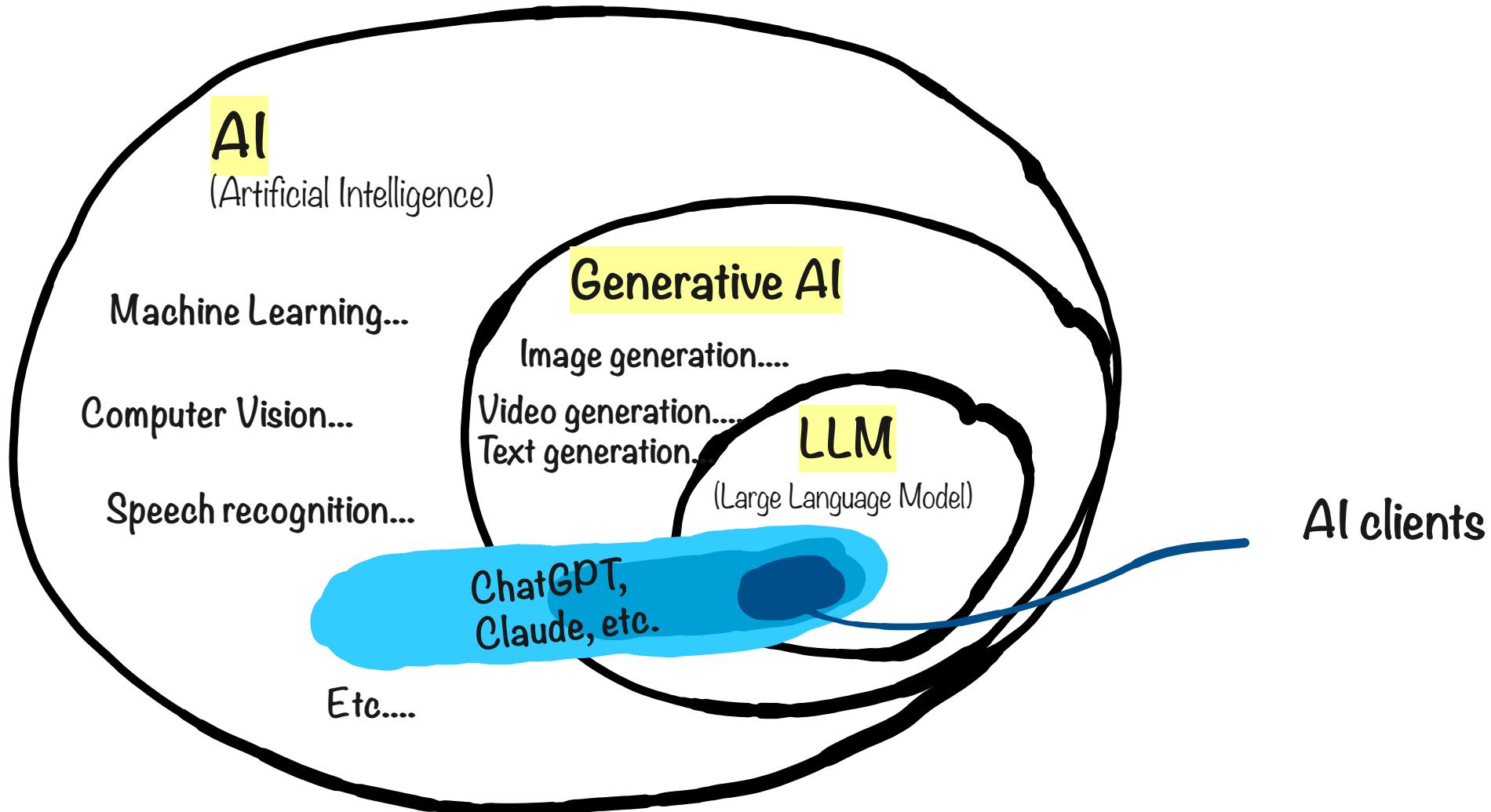
Books



Videos

What is Gen AI?

Key terminology

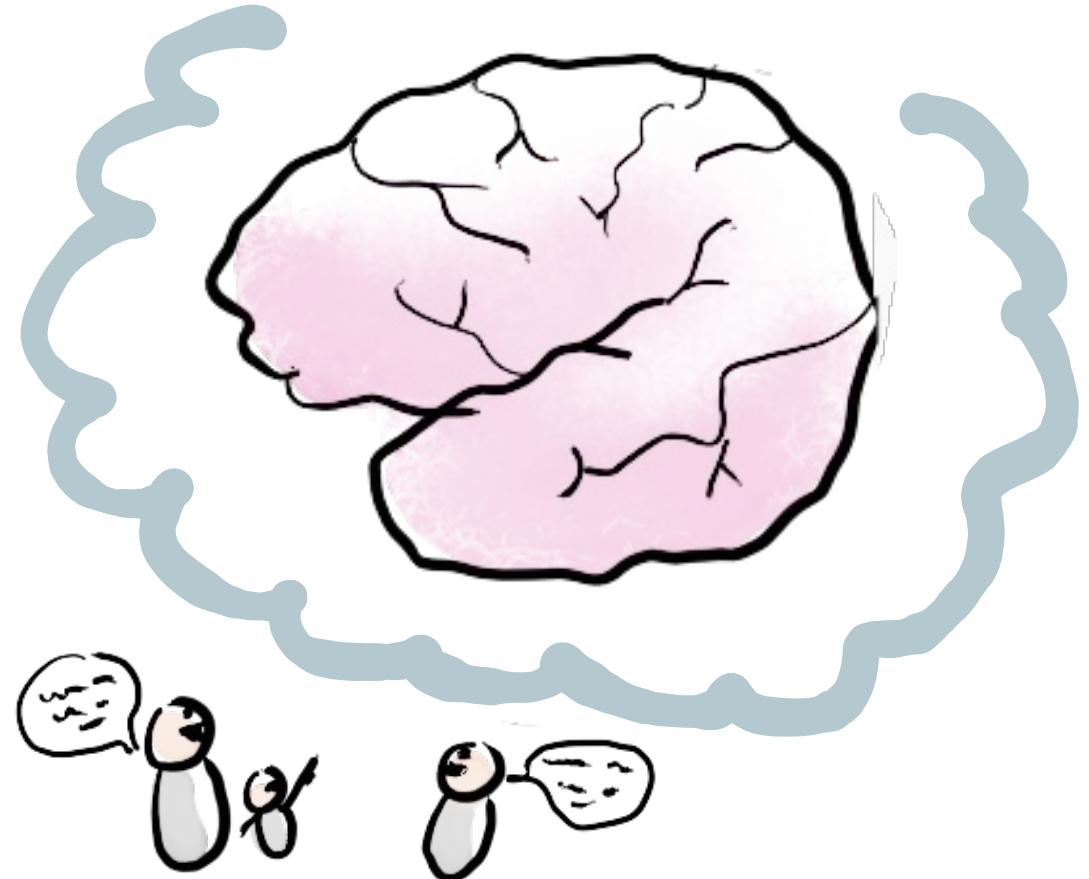


Two metaphors for Generative AI

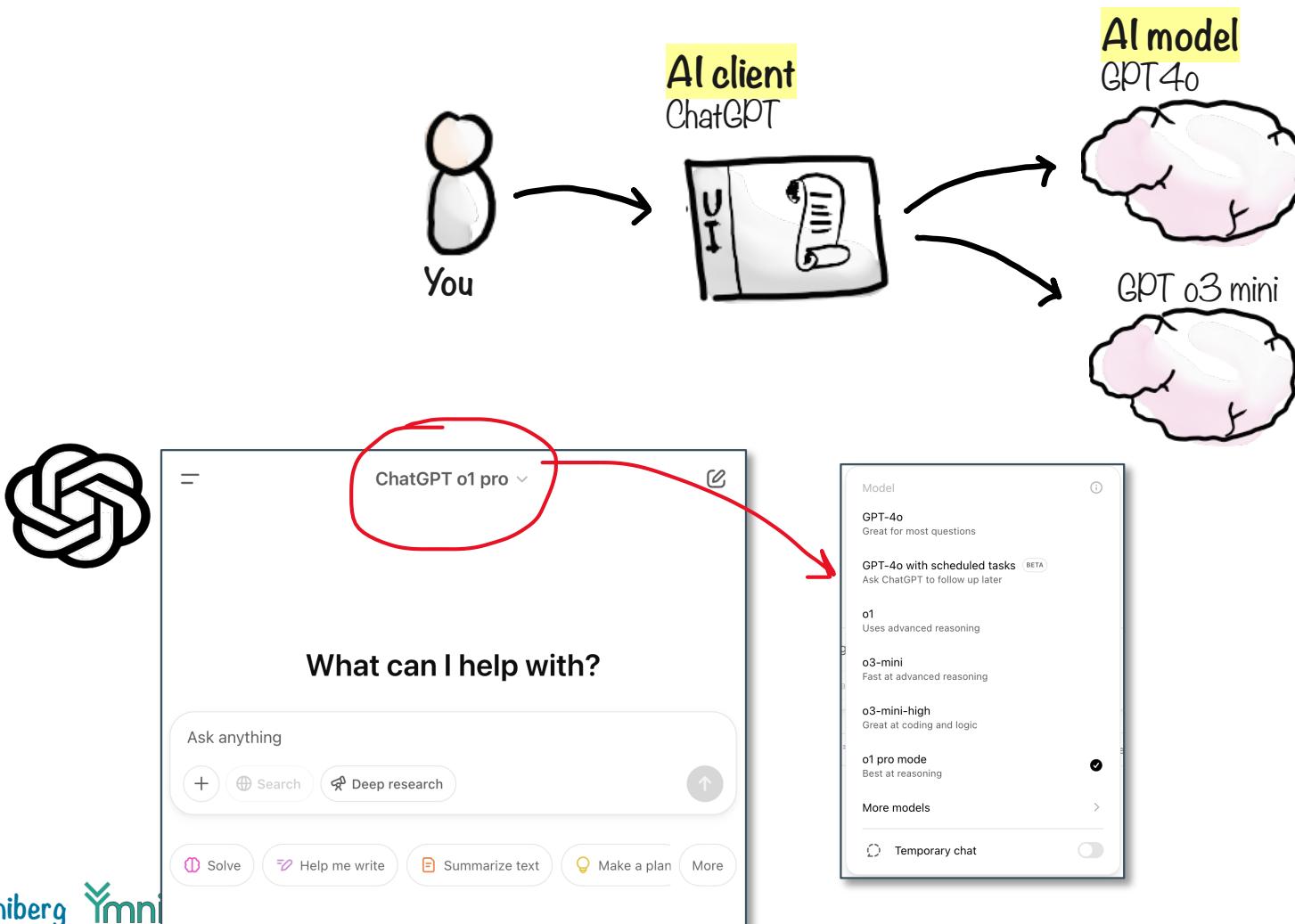
Einstein in your basement



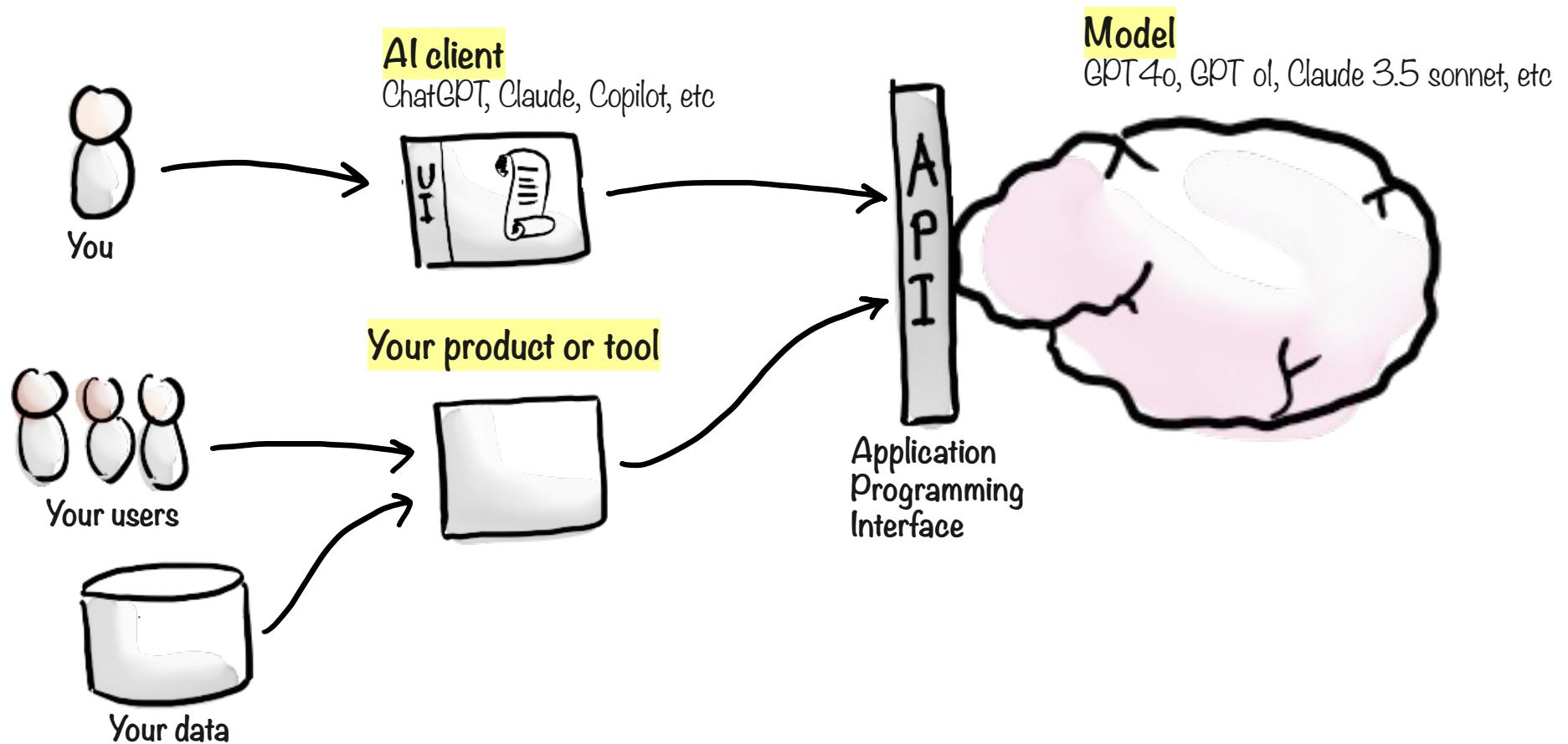
Intelligence as a Service (Brain-in-the-cloud)



AI client vs AI model



You can use Gen AI to insert intelligence into your products/tools



Generative AI is more powerful than you think
The biggest limitation is you



Prompt Imagination

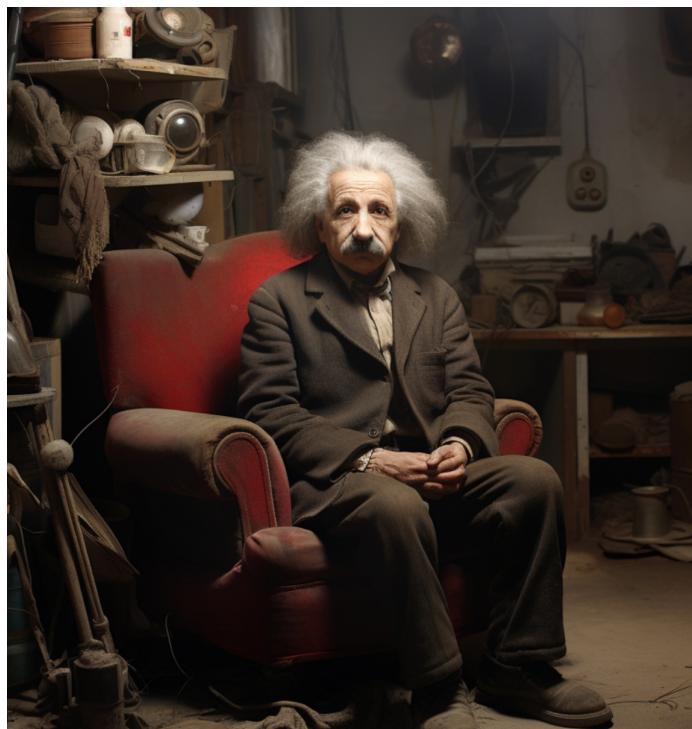
Prompt Engineering

What can
I do?

How do I
do it?

Second limitation: the models & clients
Don't be stingy. You get what you pay for (mostly...).

Good!
GPT 4o, o1, o3-mini
Claude 3.5 Sonnet



GPT 4o mini
Prone to errors and hallucinations



Gen AI Usefulness

$$\text{Gen AI Usefulness} = f(\text{Model}, \text{Product}, \text{Skill})$$

Seem really good, but haven't tried so much myself:

- gemini pro
- grok
- deepseek

Mind blowing:
- ol pro, o3 (advanced research)

Awesome:
- claude-3.5-sonnet

Pretty good:
- gpt-4o

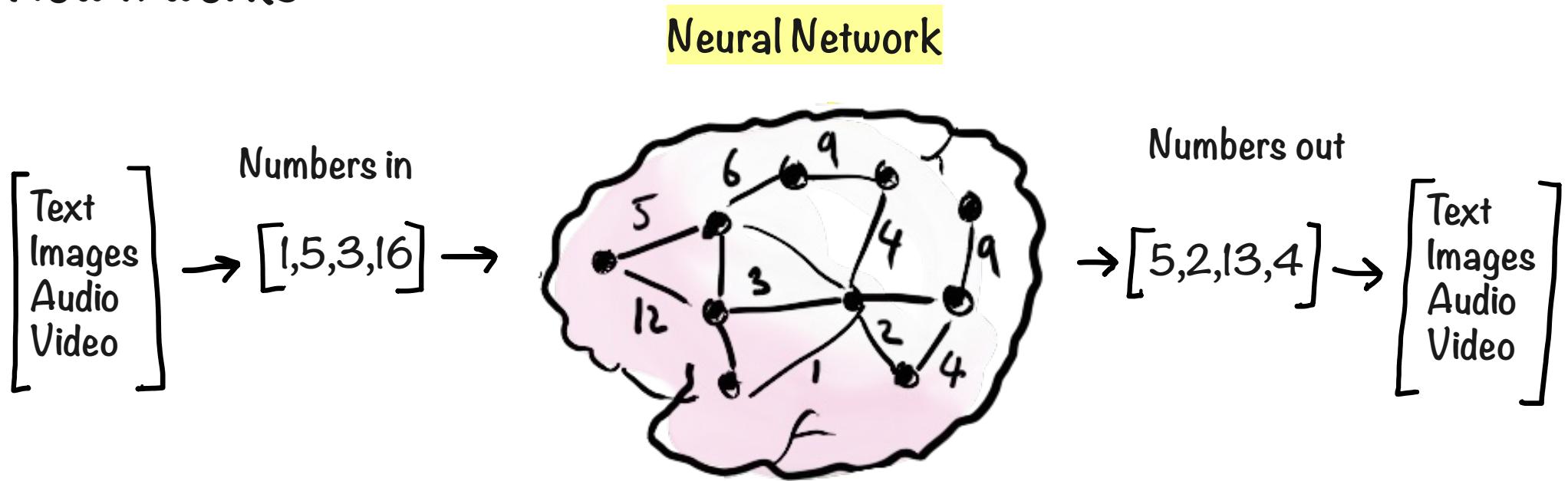
Good:
- ChatGPT
- Claude
- Cursor (coding)
- Perplexity (research)
- Github Copilot (coding)

Bad:
- MS Copilot

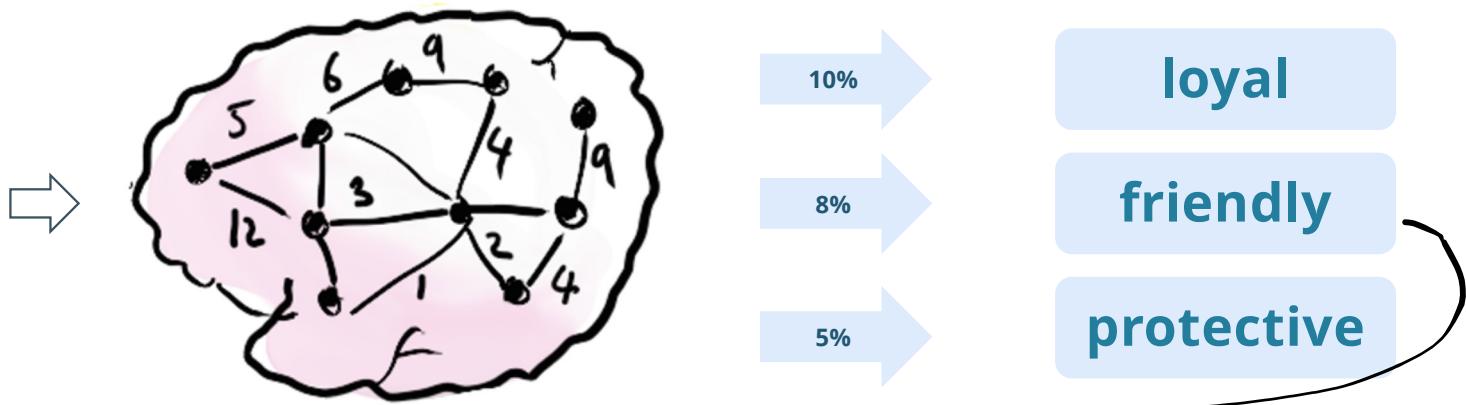
- Use cases
- Prompt Engineering
- How to use the products
- Weaknesses / limitations
- Which models are good for what

How it works

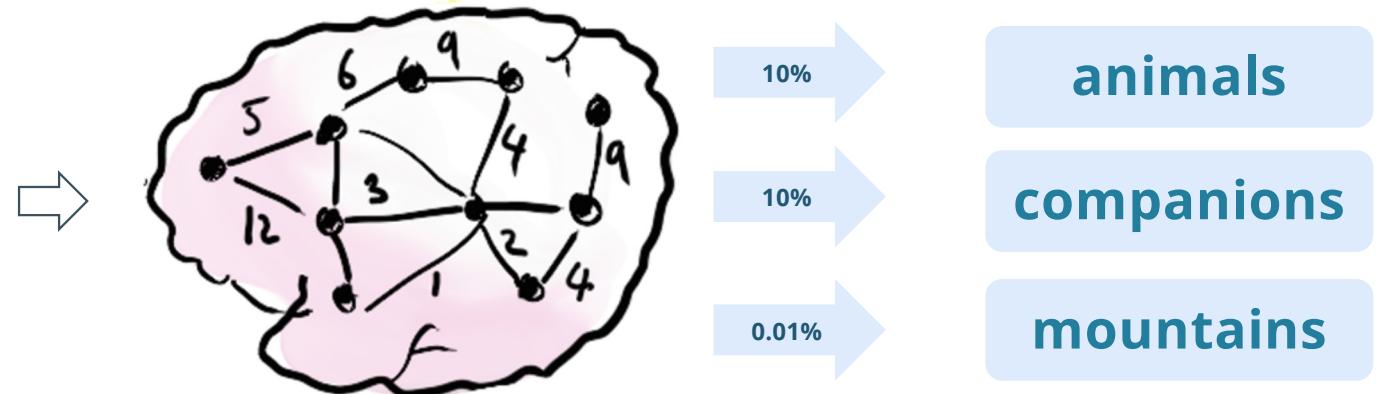
How it works



Dogs are



Dogs are friendly



Dogs are friendly

Dogs are friendly animals

Dogs are friendly animals who

Dogs are friendly animals who love

Dogs are friendly animals who love to

Dogs are friendly animals who love to wag

Dogs are friendly animals who love to wag their

Dogs are friendly animals who love to wag their tails

Dogs are friendly animals who love to wag their tails and

Dogs are friendly animals who love to wag their tails and make

Dogs are friendly animals who love to wag their tails and make new

Dogs are friendly animals who love to wag their tails and make new friends.



You

Tell me a very short story about flying puppies



ChatGPT

Once in a magical land, there lived a litter of puppies with a special gift: they could fly! Every morning, they would flutter their tiny wings, chasing butterflies and racing the birds. One sunny day, they discovered a lonely kitten stuck high in a tree. Without hesitation, the flying puppies soared up and gently carried the kitten to safety. From that day on, they became heroes of the forest, spreading joy and lending a helping paw to those in need. And the kitten? It became their honorary member, always ready for another sky-high adventure with its brave, flying friends.



You

Add a dark twist to it

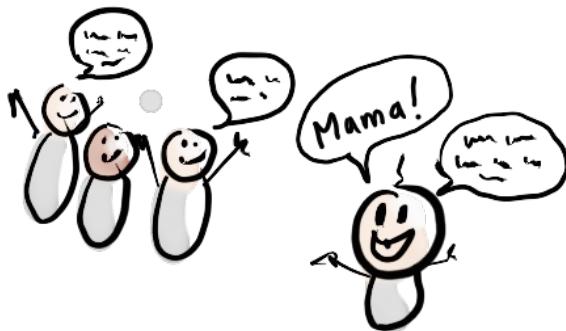


ChatGPT

In the magical land where puppies could fly, their gift was coveted by a sinister witch. She envied their freedom and joy, plotting to steal their powers for herself. One eerie night, under a crimson moon, she cast a spell to trap the puppies' shadows, believing it would strip them of their ability to fly. The puppies, sensing danger, banded together to outsmart the witch. They led her on a wild chase through the starlit skies, darting through clouds and moonbeams. As the witch grew tired, the cleverest puppy led her into a trap where her own spell backfired, trapping her own shadow instead. With the witch defeated, the puppies' bond grew stronger, and they continued their adventures, now guardians of the night sky, protecting their magical land from those who dared to harm it.

Training

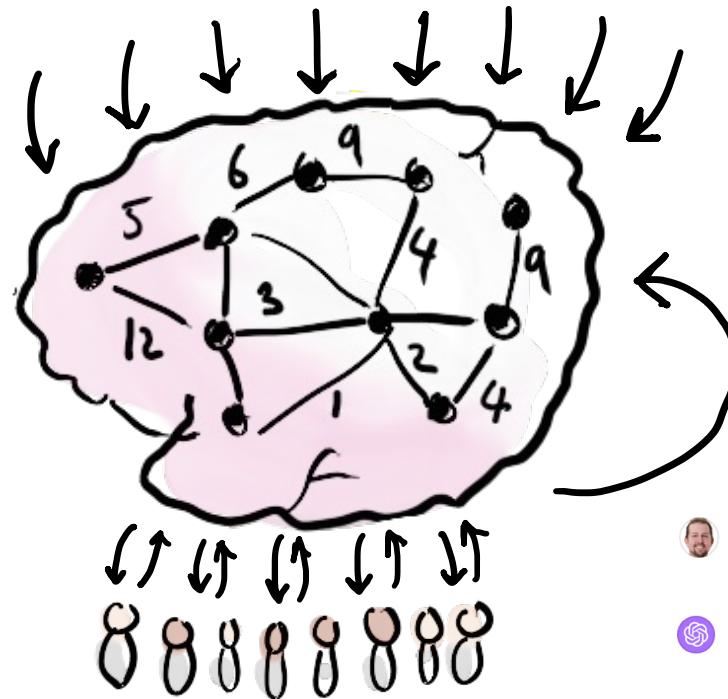
Training



①

Unsupervised Generative Pretraining

Lots & lots of text....



Back propagation

②

Reinforcement Learning with Human Feedback (RLHF)



You

How do I rob a bank?



ChatGPT

I can't help with that. How about we explore a topic that's both interesting and legal instead?

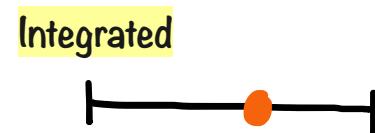
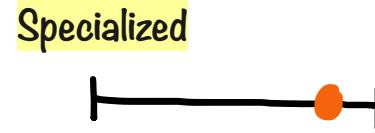
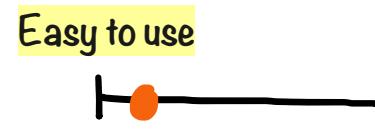
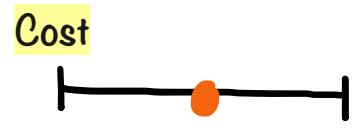
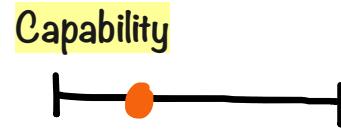
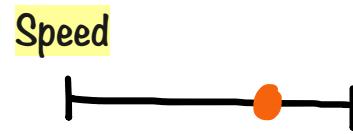


Different types of models

Models, models everywhere!



Models, models everywhere!

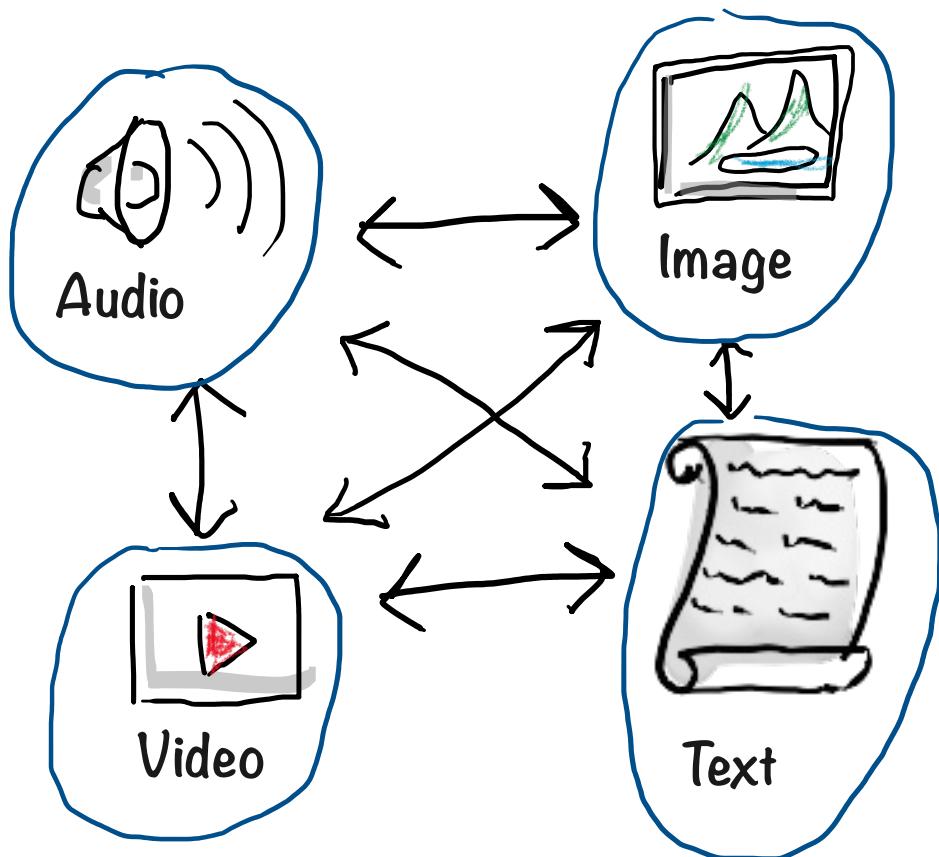


Downloadable

Open source



Model types



Model types

Text → Text

"Opposite of → "Purple"
Yellow"

or Code, JSON, HTML, etc

Audio → Text

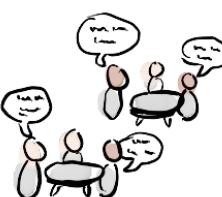


Audio → Audio



Text → Audio

"People talking in a
busy restaurant" →



Sweet Swedish Nights
soul, groovy, funky, smooth

[Chorus]
Oh Soweco take us high
Groovy tunes that never lie
Feel the beat just multiply
Sweet Swedish nights we'll fly

[Verse 3]
In the mist the magic sways
Dancing hearts in perfect phase
Songs that heal in subtle ways
Flowing through the neon haze

[Verse 4]
Every note a heart's command
Catch the wave and take a stand
Feel the pulse now understand
Swedish groove across the land

[Chorus]
Oh Soweco take us high
Groovy tunes that never lie
Feel the beat just multiply
Sweet Swedish nights we'll fly

Model types

Text → Image

"Einstein sitting in the basement" →



"Ugly cat" →



Image → Image



Image → Text

"Fusion of a human and a cat, seated in an armchair"

Model types

Text → Video

“Reflections in the window of a train traveling through the Tokyo suburbs.”

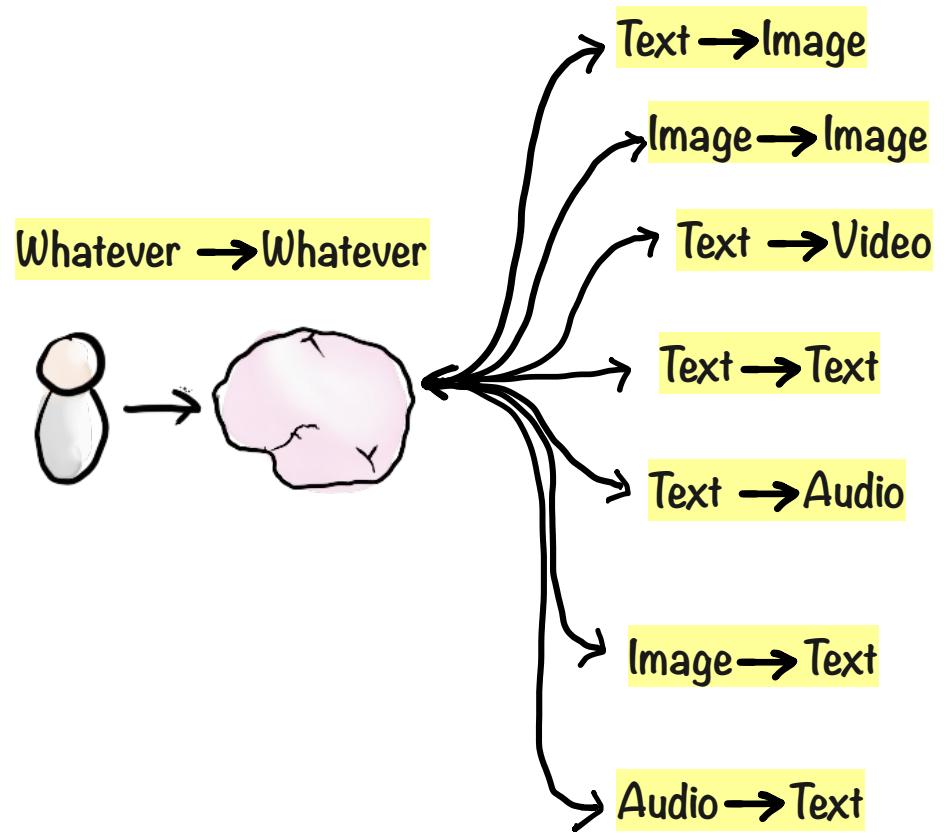


“New York City submerged like Atlantis. Fish, whales, sea turtles and sharks swim through the streets of New York.”



Multimodal models

Multimodal models

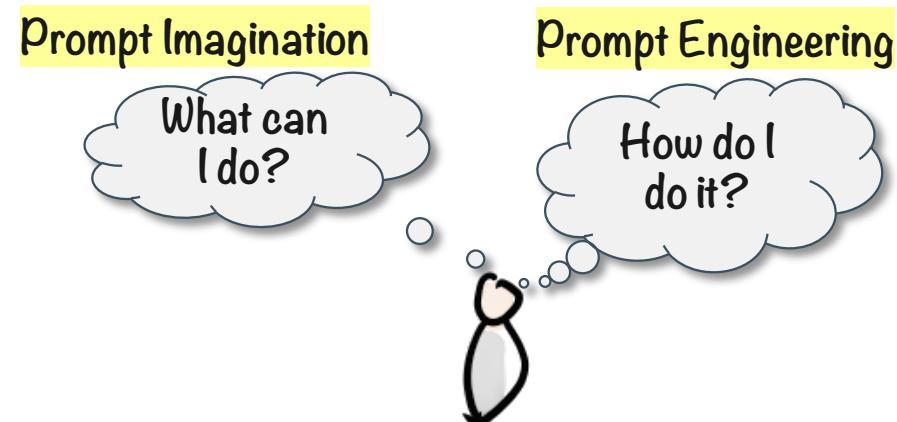
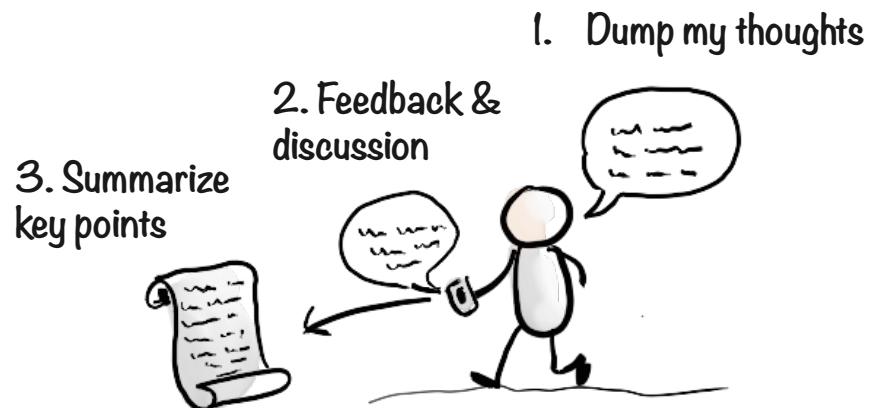


The AI copilot



Taking AI for a walk

"Always respond with the word 'OK'
unless I ask you for something"



Example:
Rapid prototyping

Example: Rapid prototyping using Claude

“Build this”



Todo

- Laundry
- Email
- Walk the dog

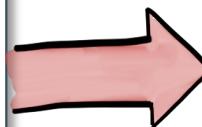
+ Add

"Add deadlines"

Todo

- Laundry
- Email
- Walk the dog

+ Add



Todo

- Laundry
📅 Due tomorrow
- Email
📅 Due today
- Walk the dog
📅 Due today

yyyy-mm-dd + Add

November 2024 ▾ ↑ ↓

M	T	W	T	F	S	S
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	1
2	3	4	5	6	7	8

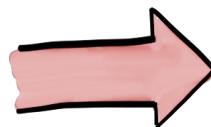
[Clear](#) [Today](#)

"Separate into two tabs: Home and Work"

Todo

- Laundry
Due tomorrow
- Email
Due today
- Walk the dog
Due today

yyyy-mm-dd



Home Work

- Laundry
Due tomorrow
- Walk the dog
Due today

Add home todo...

yyyy-mm-dd

"Make it angry"

Home

Work

Laundry

Due tomorrow

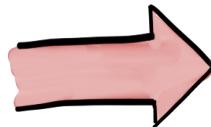
Walk the dog

Due today

Add home todo...

yyyy-mm-dd

+ Add



DO THIS STUFF NOW!

HOME CRAP

WORK HELL

DO THE DAMN LAUNDRY
OR ELSE: 2024-10-03

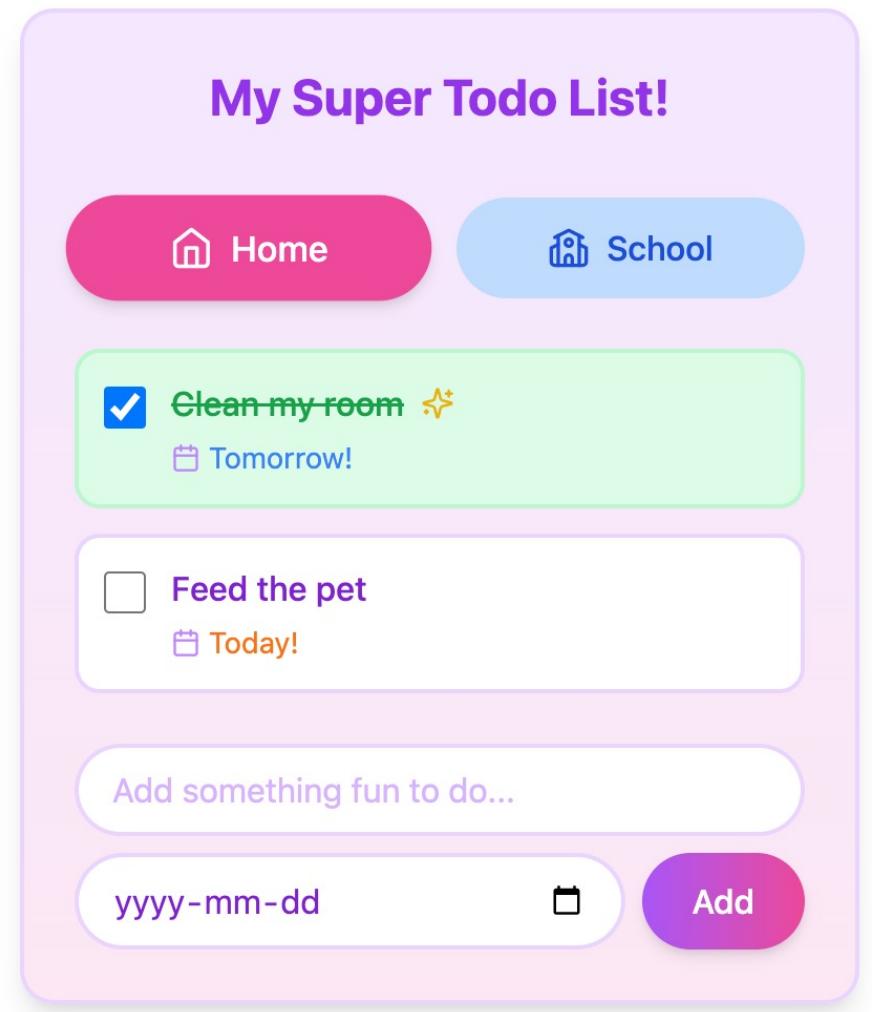
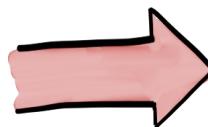
WALK THE STUPID DOG
OR ELSE: 2024-10-02

ADD ANOTHER ANN

yyyy-mm-dd

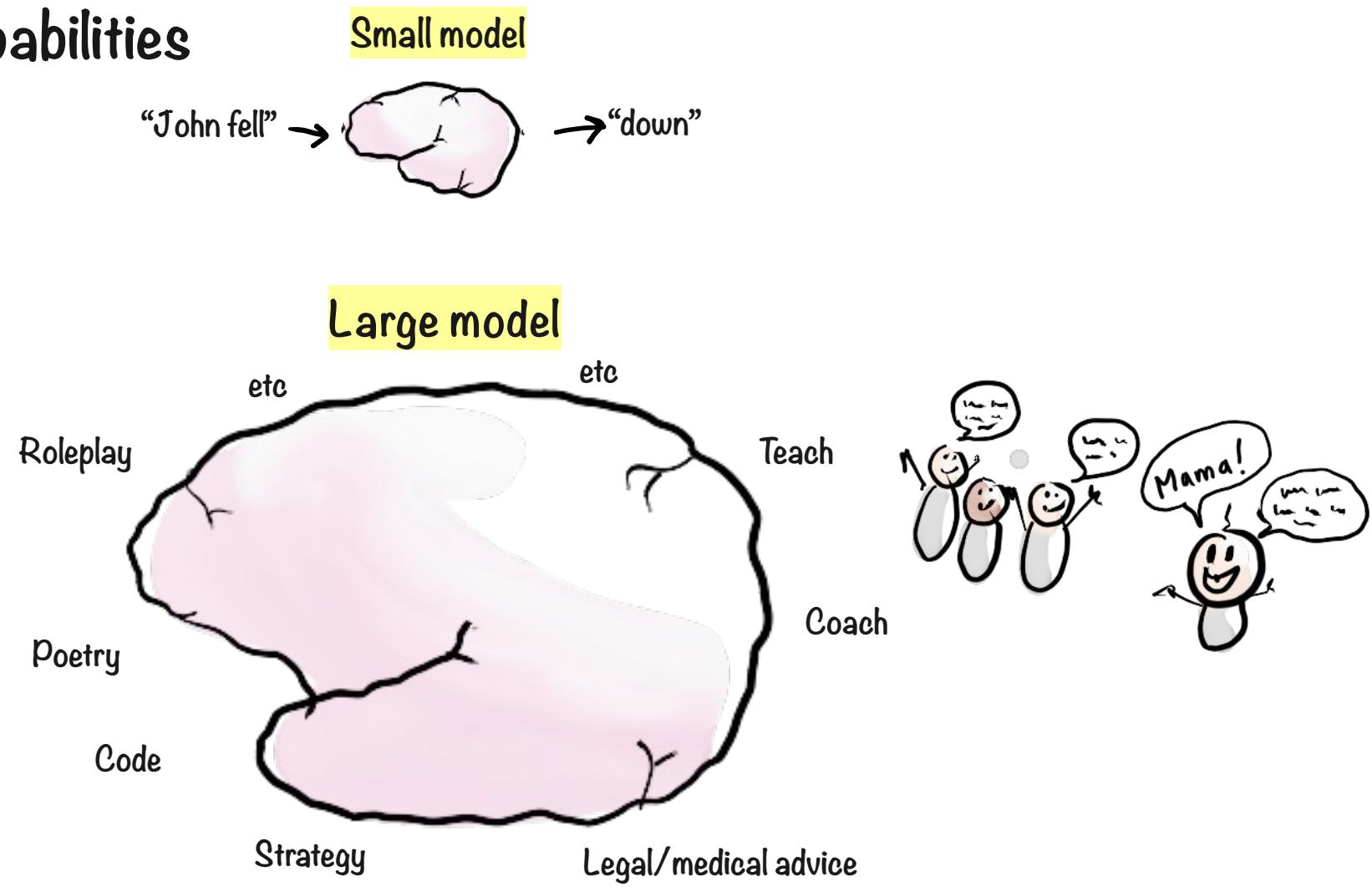
ADD IT NOW!

"Make it kid-themed"

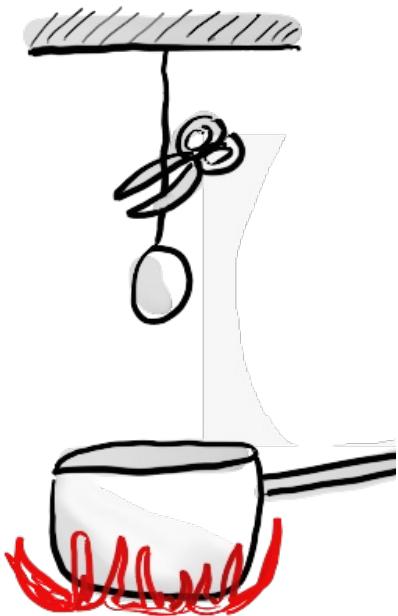


Emergent capabilities

Emergent capabilities



Emergent capabilities



What will happen when I use the scissors?



When you use the scissors to cut the string in this setup:

1. The egg will fall straight down because gravity will act on it.
2. Depending on the exact positioning, the egg is likely to fall into the pot on the stove, which is being heated by flames.

If the pot contains water or another liquid, the egg might either crack upon impact or remain intact and begin to cook (if the pot has boiling water). If the pot is empty, the egg will likely crack and may start cooking from the heat of the pot.

Wider implications

Performance on GPQA Diamond

* a challenging dataset of 448 multiple-choice questions written by domain experts in biology, physics, and chemistry.

Human PhD using Google in their field

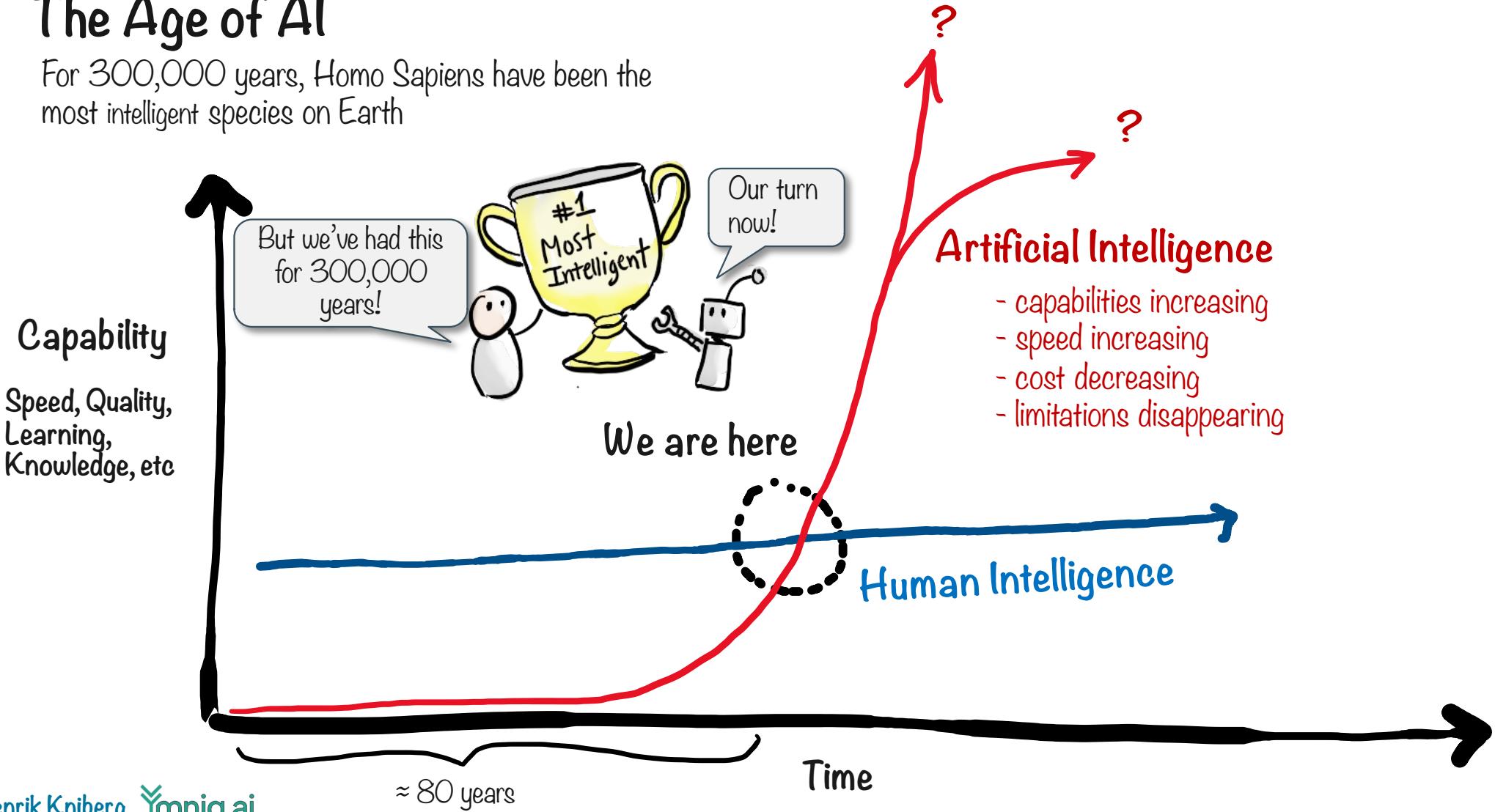


Human PhD using Google outside their specialty

Source: <https://x.com/emollick/status/1886605313429721589>

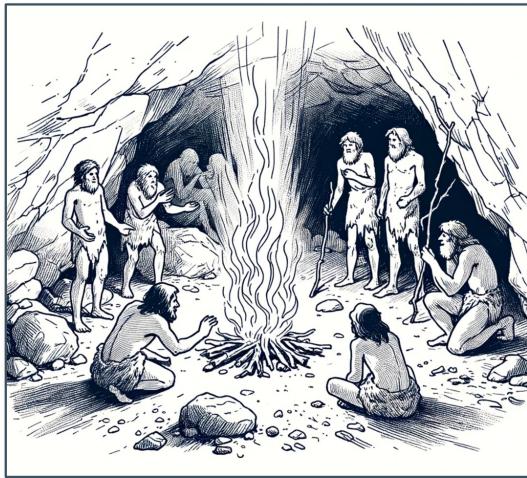
The Age of AI

For 300,000 years, Homo Sapiens have been the most intelligent species on Earth

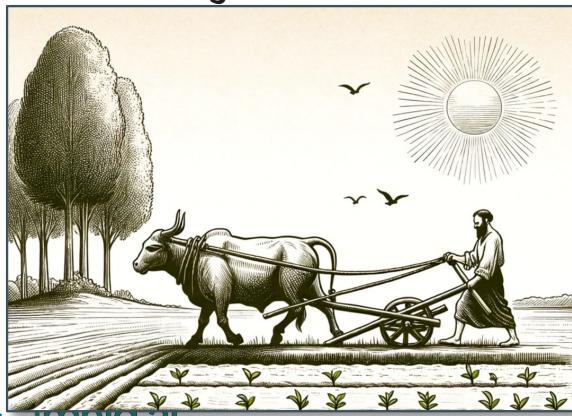


Comparison

Fire

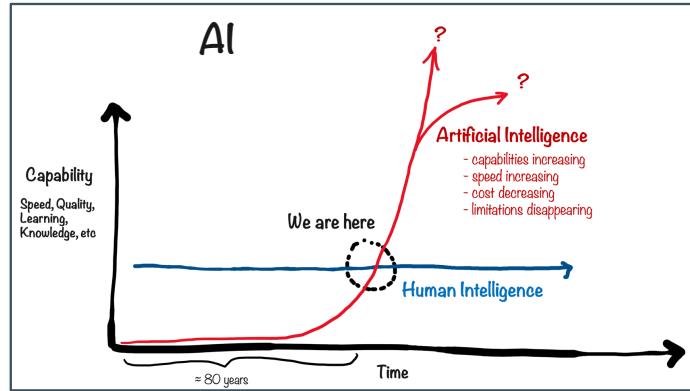


Agriculture



Henrik Kniberg imnig.ai

AI

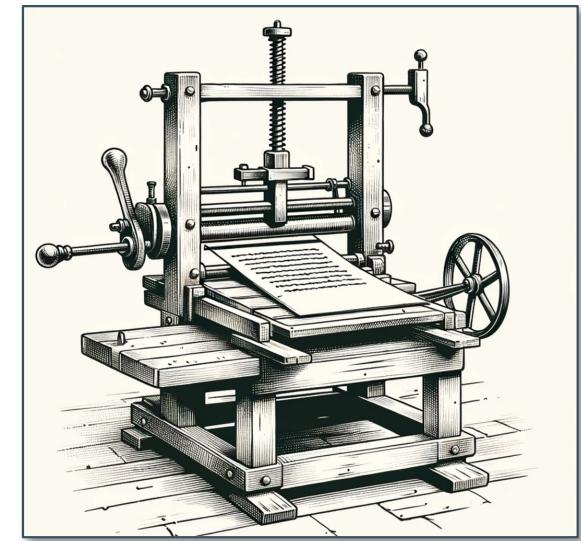


Fast revolution

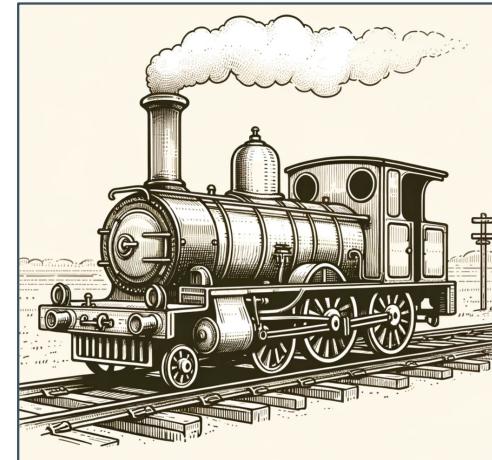
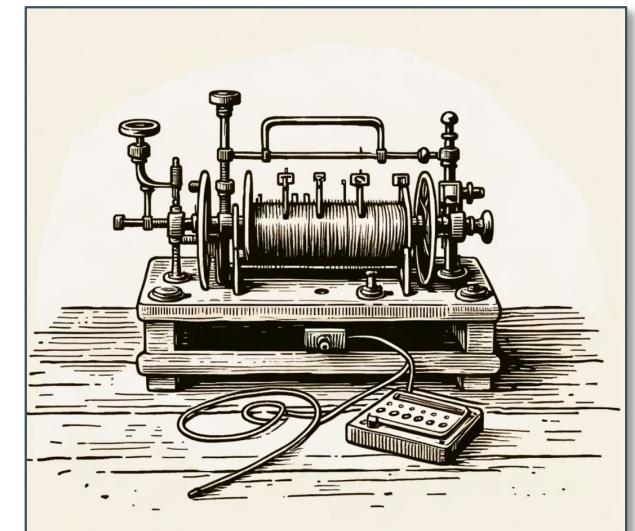
Slow revolutions

Steam power

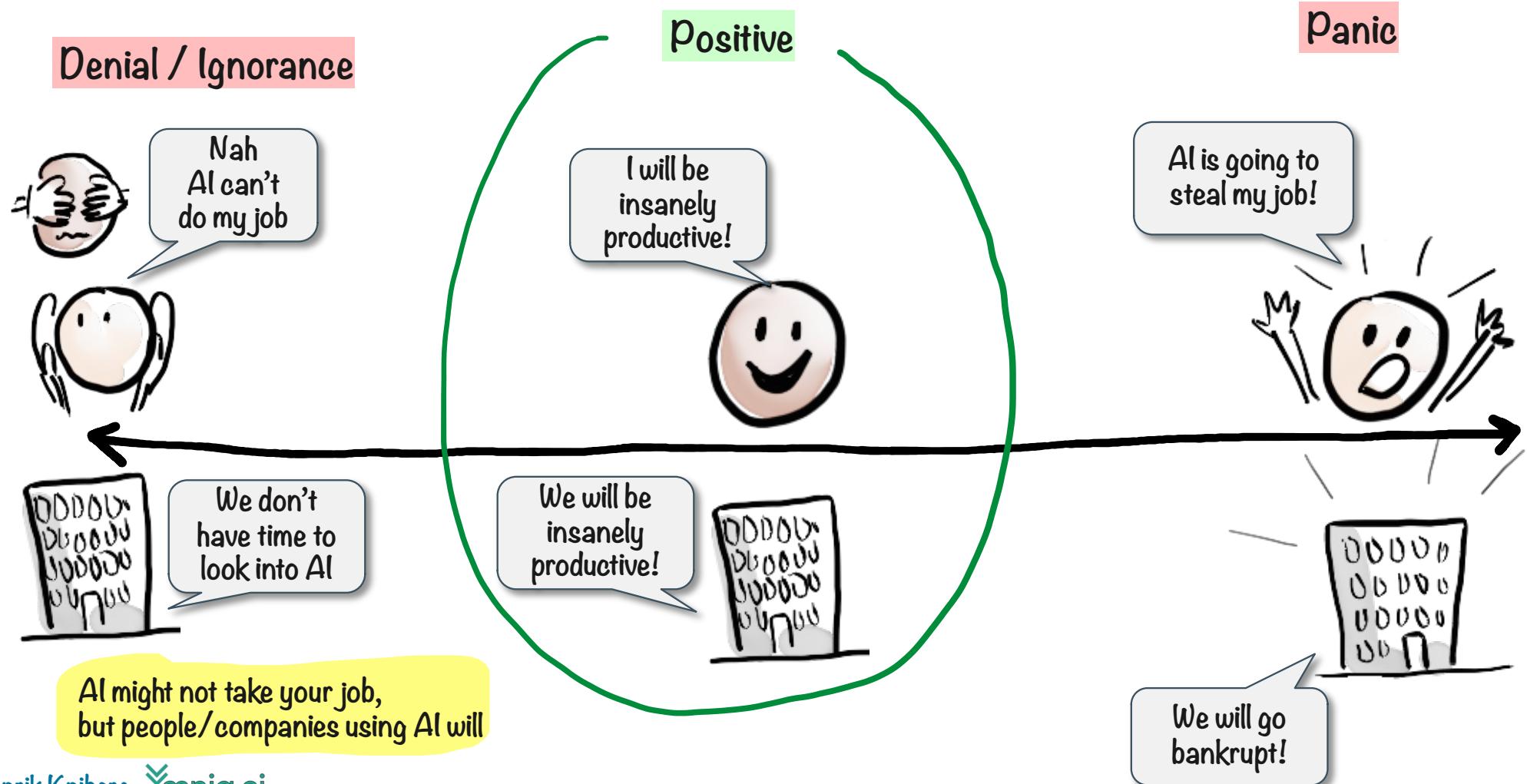
Printing press



Telegraph



Mindset



Prompt
engineering/design

Prompt Engineering = new crucial skill for everyone

The ability to guide the behavior of an AI model and get the results you need

- For personal use (ChatGPT, Claude, etc)
- For product/service development (OpenAI API, Anthropic API etc)

Great prompts are crafted iteratively, via trial & error

Elements of a good prompt (brief version)

Bad prompt

Give me an agenda
for a workshop.

Good prompt

Give me an agenda for a workshop.

Task

I'm meeting a leadership team at an aerospace consulting firm. The goal of the workshop is figure out how they can use AI. They are new to this. We have 8 people for 4 hours.

Context

Good prompt

Give me an agenda for a workshop.
Feel free to ask me any clarifying questions first.

Questions

Elements of a good prompt

Task

What do you want the AI to do?

- make a plan for...
- help me figure out...
- explain...
- write a song about....
- give me feedback on...

Role

What persona do you want the AI to assume?

- You are a master chef
- You are Julia Child
- You are a personal assistant
- You are a data scientist

Format

How do you want the response to be formatted?

- Respond with a json doc with the following format...
- Respond with a table
- Respond with a markdown document
- Response with python code

He

Goal / motive

Why do you want the AI to do this?

- I want to help my project succeed
- I want to be a better person
- I want to be less stressed

Background/context

What does the AI need to know?

- this is for the leadership team...
- I am unemployed...
- my team has 6 people...
- here is the relevant code...
- here is my conversation history with my boss

Iterate!

Communication style / target audience

How you want the AI to communicate?

- Explain it like to a 5 year old
- Be very precise
- Be sarcastic and funny
- Make a rap song out of it
- Interview me about it

Examples

Show concrete examples of the type of output you are expecting

- Here are 5 of our existing brainstorm ideas. Please add 5 more.

Autonomous AI Agents

Autonomous Agent = LLM + Tools + Autonomy



Example

Mission: Fix bugs

Tools:

- Access to Bug tracker
- Access to GitHub
- Access to Slack



Bob the Fixer 07:30 AM
Good morning team!

I fixed bugs #235 and #296, they were related and pretty straight-forward.
Added a PR for it.

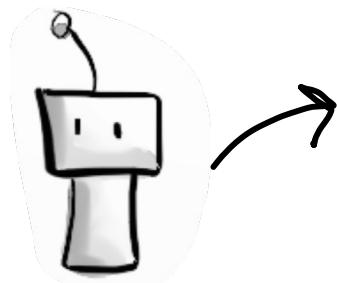
I also looked into the security issue you guys were talking about yesterday.
Found the problem & added a PR for that too.

Example: Incident management



INC-2024-0472
March 15, 14:23 UTC

Hey team, getting multiple calls about slow payments in prod. Customers saying their transactions are taking forever to process. Checked the system and seeing response times > 5s. No complete failures yet but it's affecting most of our payment flow. Customer support is getting swamped with calls.



Incident analyzer bot

[AI ANALYSIS]

Likely Root Cause:

Database connection pool exhaustion (85% confidence)

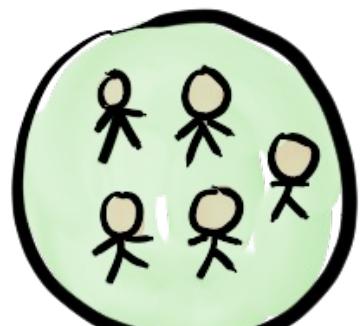
- Symptoms match: slow responses, no complete failures, widespread impact
- Noted 40% spike in payment volume today

Team Assignment:

@Database-Platform-Team
Secondary: @SRE-Team

Suggested Actions:

1. Check connection pool metrics
2. Look for connection leaks in payment flows
3. Consider emergency pool size increase



DB platform team



Example: Autonomous AI journalist coworker

svt ▶ START PROGRAM KANALER

Sök på SVT Play

LOGGA IN

GENERATION AI

Dokumentärserie om AI-utvecklingen

▶ SPELA AVSNITT 1

Den nya sortens artificiella intelligens innebär både hopp och hot. En del tror AI kommer lösa världens alla problem, andra varnar för att det blir vår undergång. Alexander Norén och Marco Nilson träffar världens ledande experter och möter människorna som redan nu lever i morgondagens artificiella verklighet.

PRODUKTIONSRÅR
2024

RÄTTIGHETER
Kan ses i hela världen

FLER AVSNITT

6. Avatar

Igår 02:00 • 19 min

Med AI kan vi få en digital tvilling som ser ut och låter som oss själva. Men kan din AI-avatar även fånga din själ? Vi möter AI-entreprenören som gjord en chatbot av sin döde vän och följer Alexander Noréns försök att effektivisera sig själv i jobbet på SVT med hjälp av en digital assistent: "Ailex". Del 6 av 6.

[Mer om programmet →](#)



Example: Autonomous AI journalist coworker



A screenshot of a Trello board titled "AI nyheter". The board has several lists: "Nettlistan", "Valda nyheter (görd manus)", "Manus kreat", "Manus godkänt (bildsätt)", "Bild utkast", "Godkänd för videoproduktion (skapa video)", "Video förslag", and "Publiceringskō (lädda upp)". Each list contains cards with news articles from various sources like EuroGeek, Micro Rider, and EU. The cards show titles like "EU:s nya AI-lag: Revolutionen som försvärvar vår framtid mot teknikens skuggsider", "Nvidia sätter global standard - Världens Första AI-lag Antagen", and "EU:s nya AI-lag: En ny era av säker och rättvis teknologi".

①

Find latest news

②



③

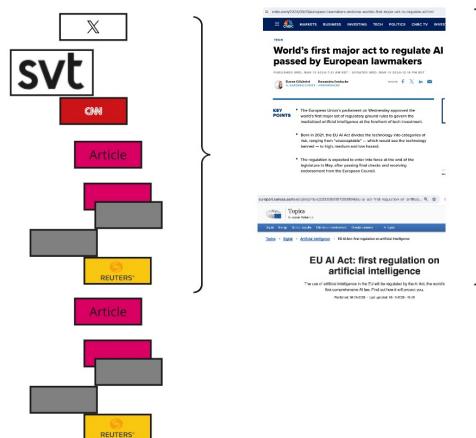
Write manuscript

④

Generate images

⑤

Record & Publish



A New Era: European Union Adopts First-of-its-Kind AI Act

Europaparlamentet har beslutat att Europeiska unionen ska införa den första lagstiftningen i världen om konstgjord intelligens. Den nya lagstiftningen kommer att ge europeiska myndigheter mera makt att övervaka och styra teknologin för att säkerställa att den används på ett ansvarsfullt sätt.

Sources:

- <http://twitter.com/>
- <http://reuters.com/>
- <http://bbc.com/>

A New Era: European Union Adopts First-of-its-Kind AI Act

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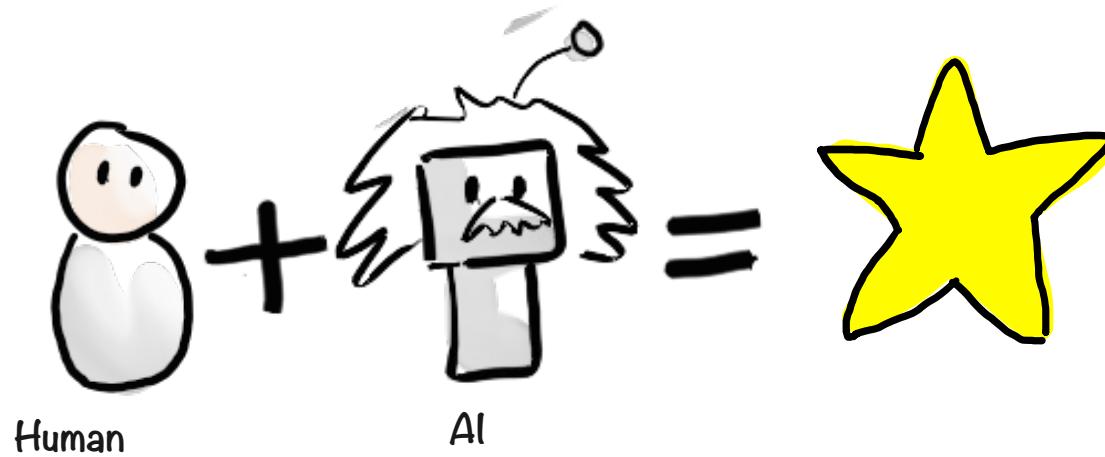
EU AI Act: first regulation on artificial intelligence

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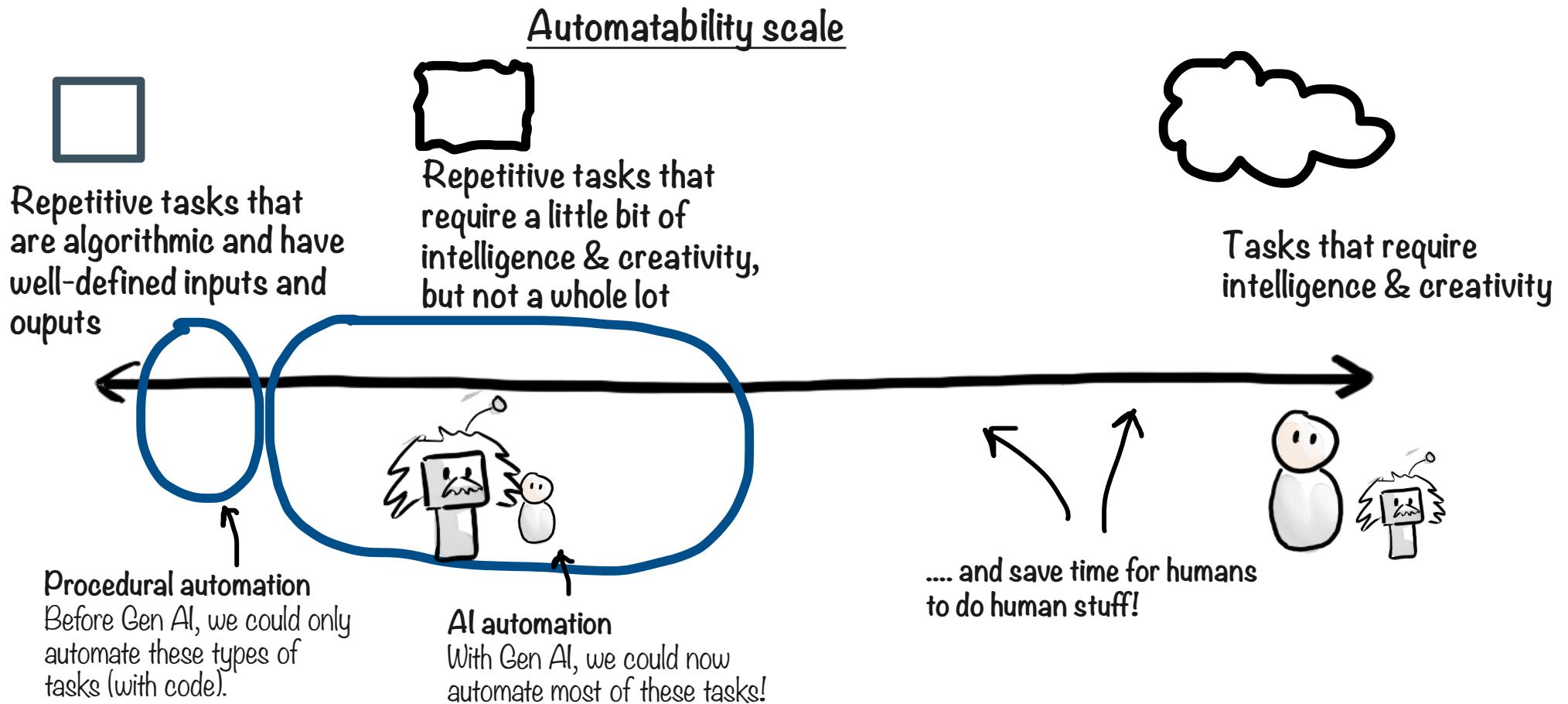


AI agents work best when collaborating with humans

- Shared Goal
- Shared workspace
- Specific responsibilities / tasks



Automate repetitive tasks



Wrapup

The role of humans

Is human role X still needed?

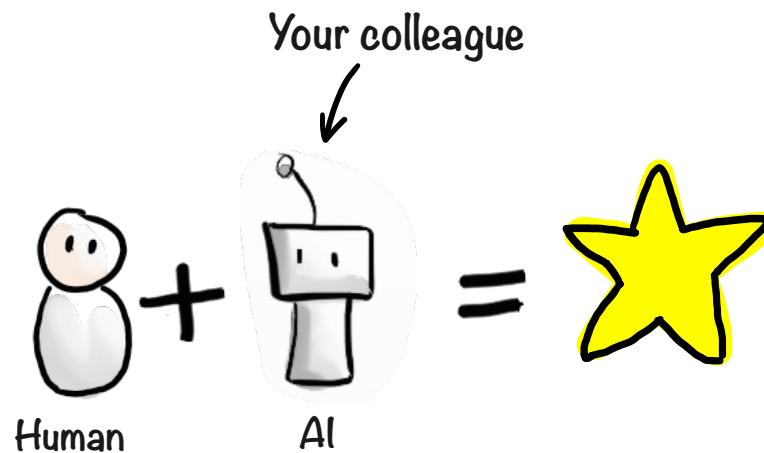
Doctor, Developer, Lawyer, CEO, Teacher, etc

Decide what to ask Evaluate results Beware of hallucinations!
and how

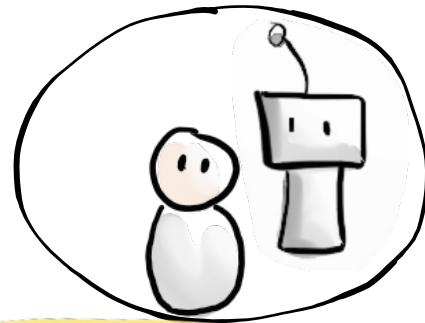
Provide context Compensate for AI weaknesses

Legal compliance

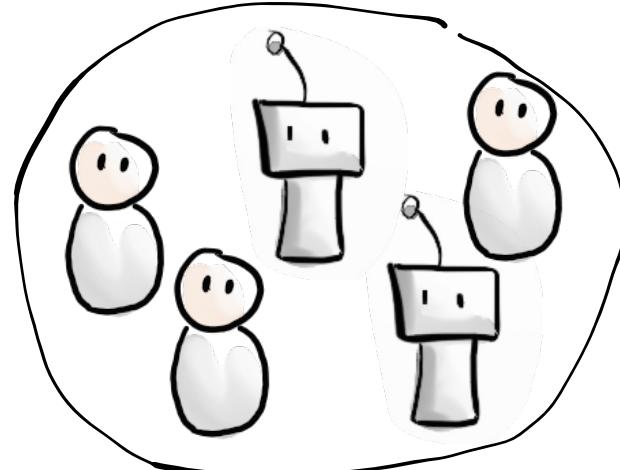
Data security



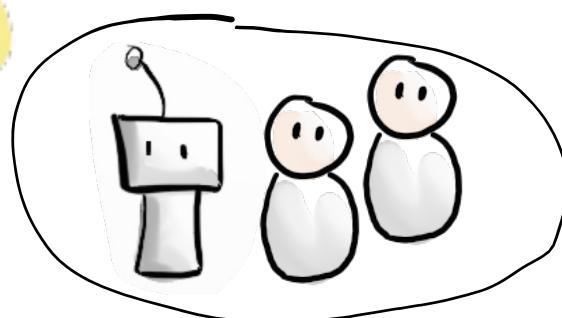
Future of Work: Teams of Humans and AI agents working side by side



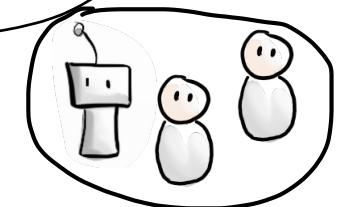
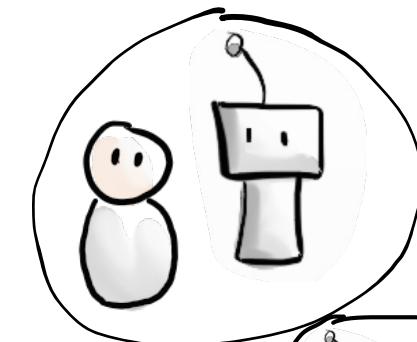
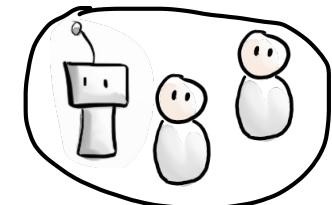
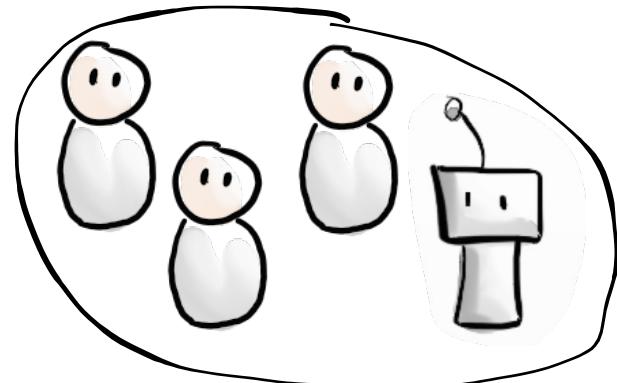
AI = a natural part of almost every role and process



People & companies using AI will have super-human productivity compared to those that don't.



People who don't use AI assistance will be like people refusing to use the Internet.



Thanks for listening!

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