How Economists Think About AI

GRAHAM TAYLOR

SCHOOL OF ENGINEERING
CENTRE FOR ADVANCING RESPONSIBLE AND ETHICAL ARTIFICIAL INTELLIGENCE
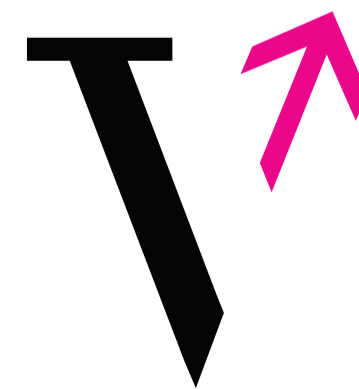UNIVERSITY OF GUELPH

VECTOR INSTITUTE FOR ARTIFICIAL INTELLIGENCE

CANADA CIFAR AI CHAIR

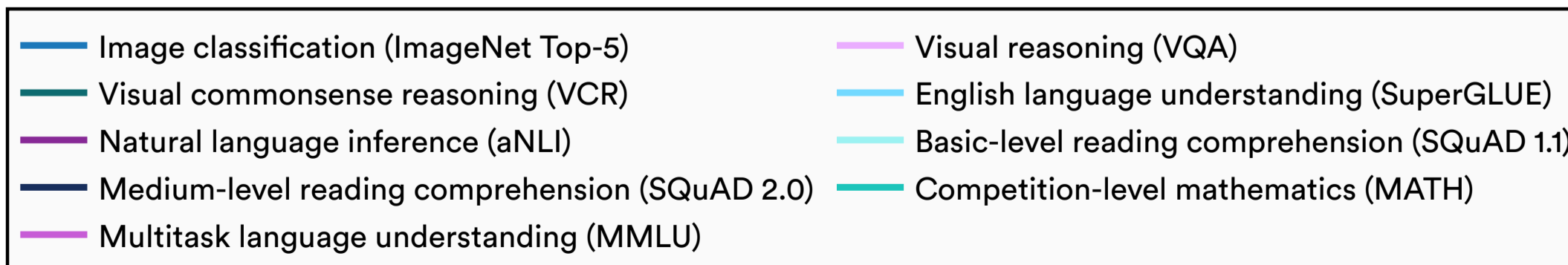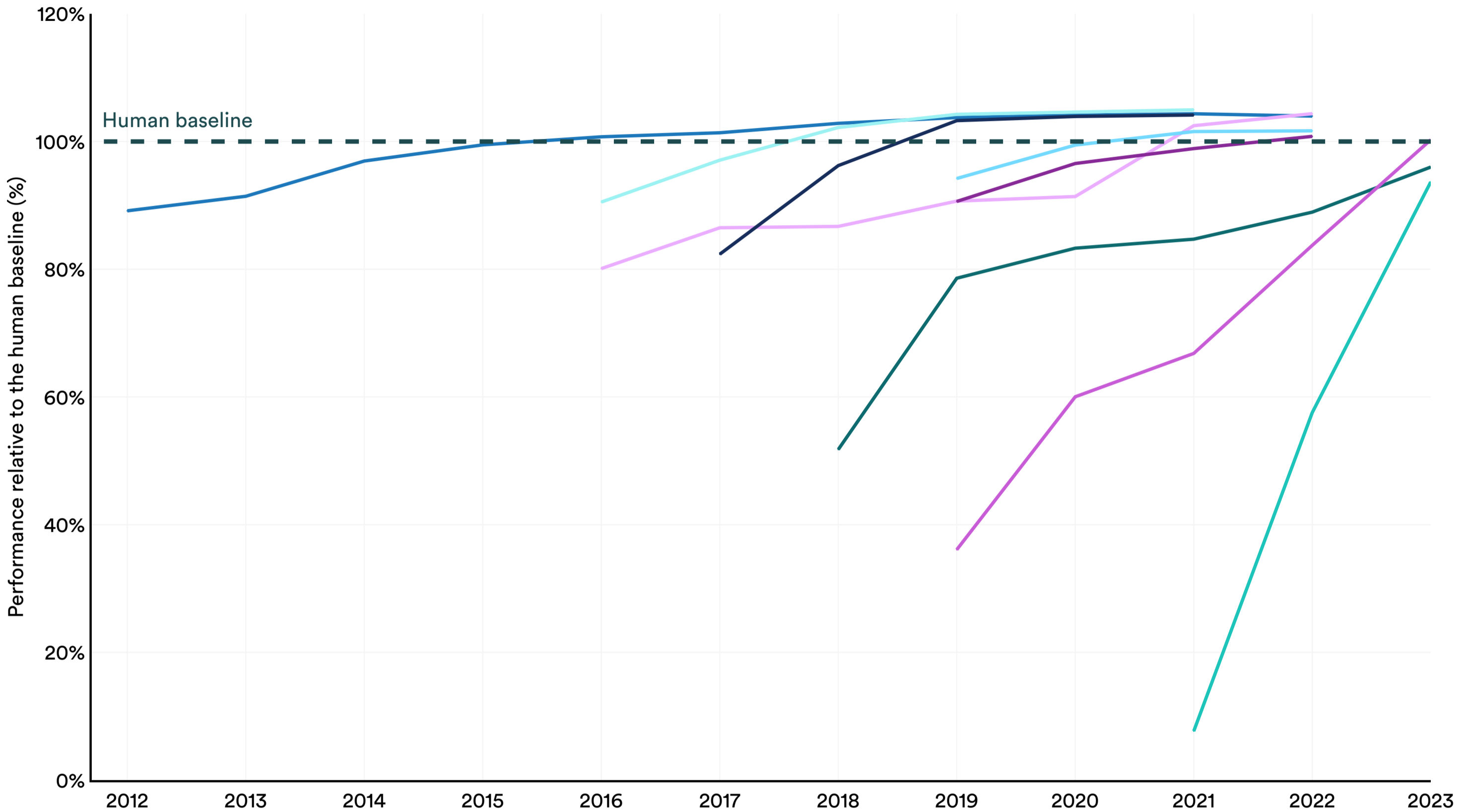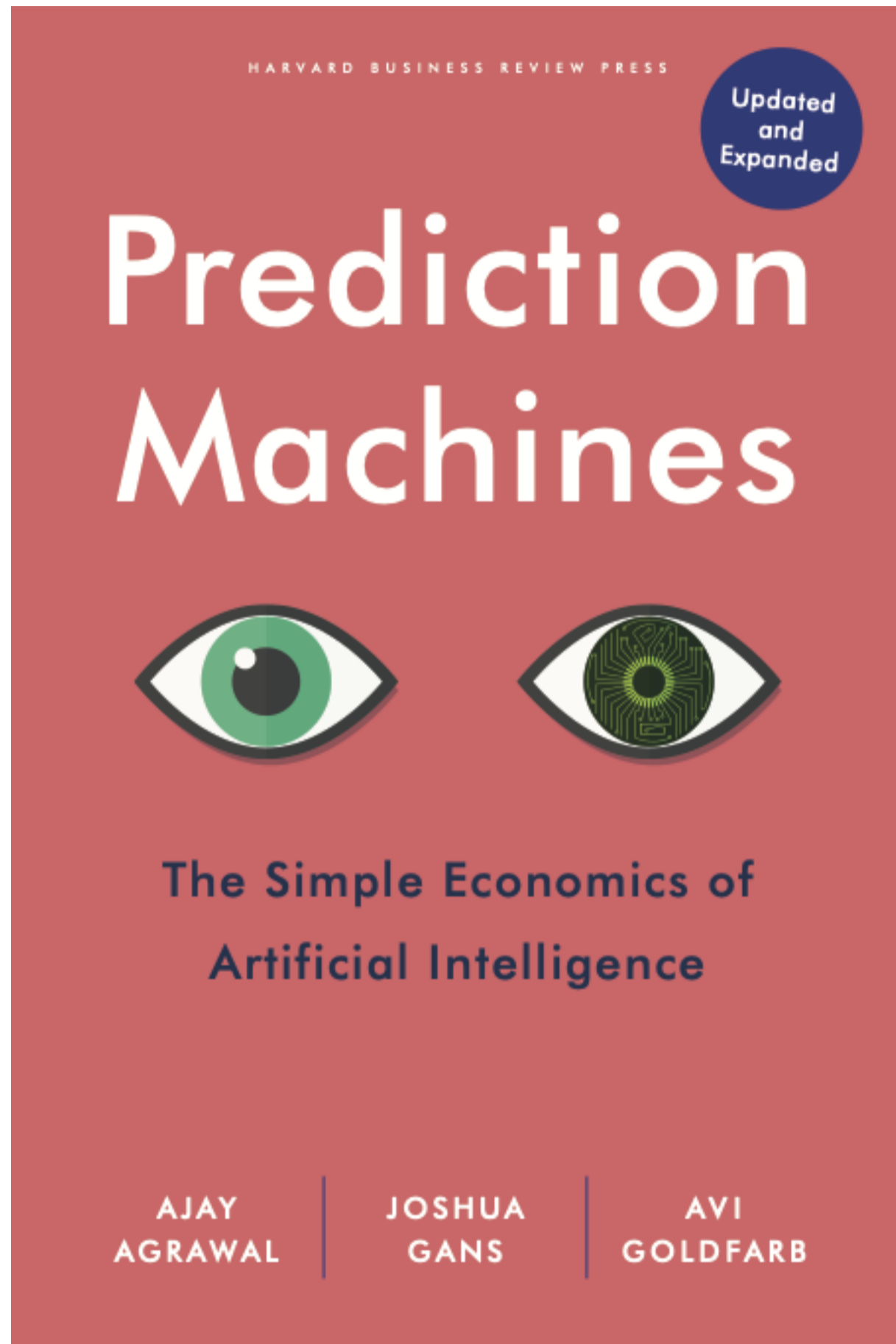# Select AI Index technical performance benchmarks vs. human performance

Source: AI Index, 2024 | Chart: 2024 AI Index report

Legend:
- Image classification (ImageNet Top-5)
- Visual commonsense reasoning (VCR)
- Natural language inference (aNLI)
- Medium-level reading comprehension (SQuAD 2.0)
- Multitask language understanding (MMLU)
- Visual reasoning (VQA)
- English language understanding (SuperGLUE)
- Basic-level reading comprehension (SQuAD 1.1)
- Competition-level mathematics (MATH)

via Stanford HAI AI Index Report 2024

Explaining AI like an Economist

figure reproduced from Ajay Agrawal

Explaining AI like an Economist

$
Cost of
Prediction

2023

figure reproduced from Ajay Agrawal
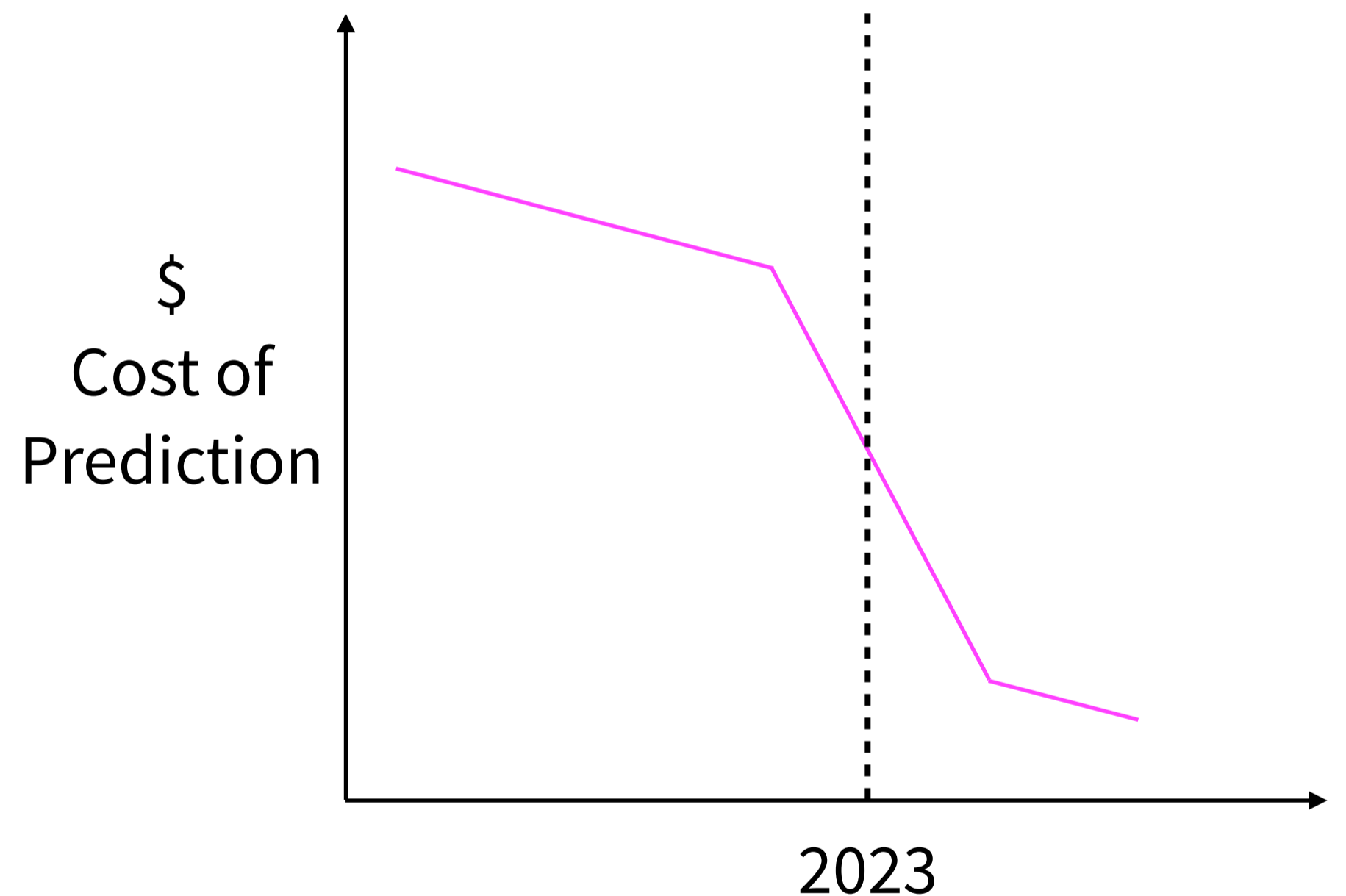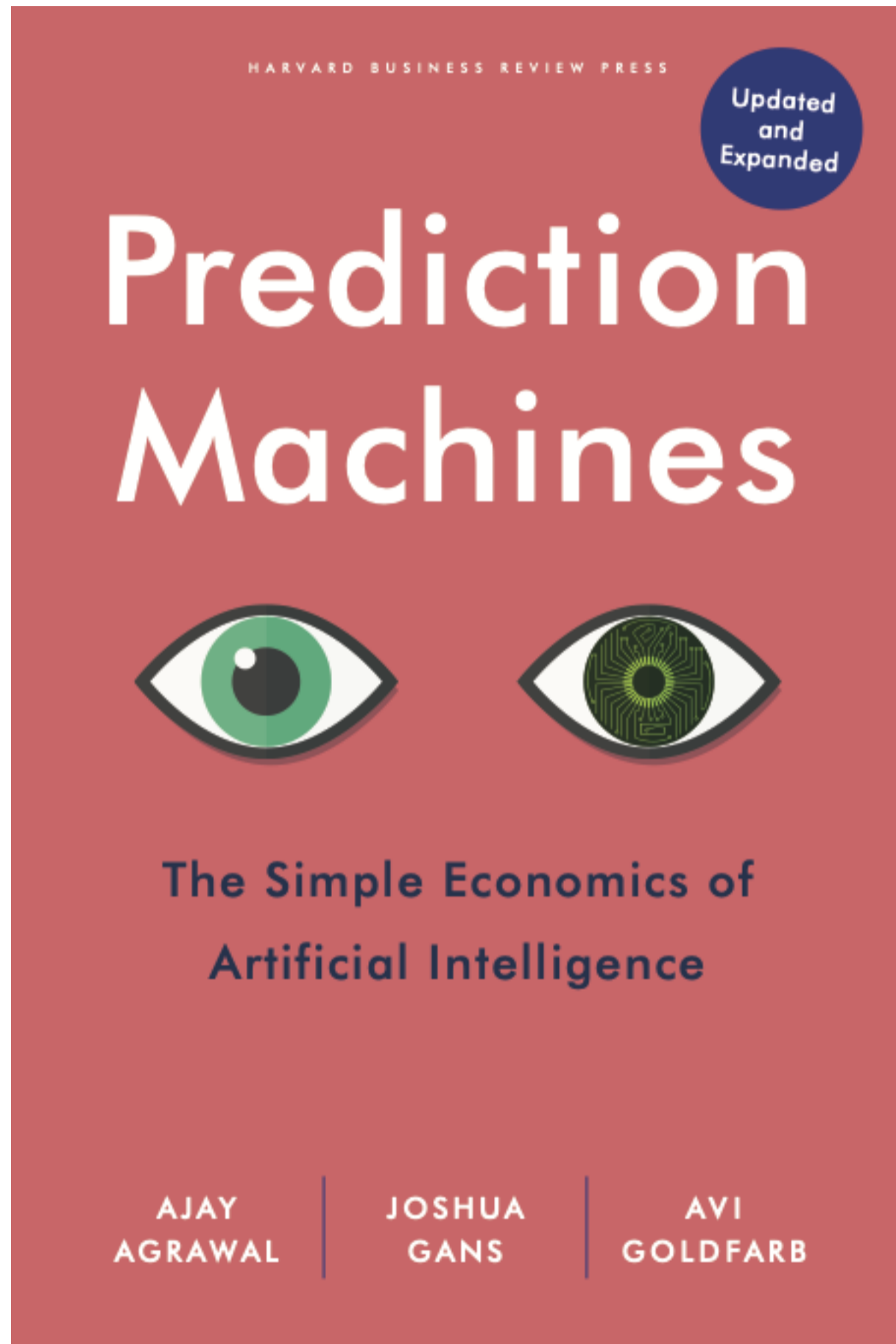
Human Prediction — Human Judgment

Human Prediction | Human Judgment

decouple

AI Prediction

reproduced from Ajay Agrawal

Human Prediction | Human Judgment

decouple

AI Prediction | Human Judgment

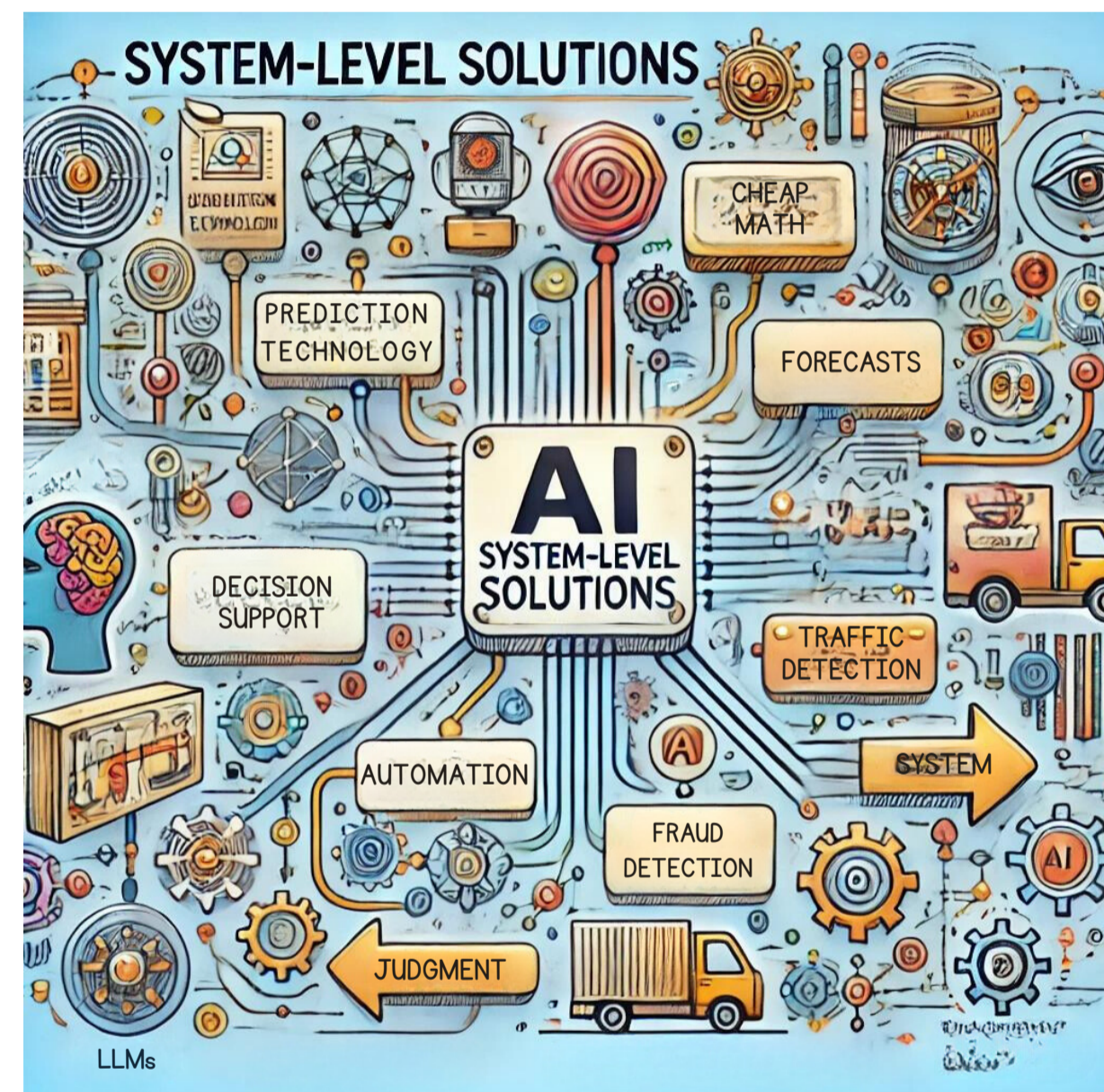*reproduced from Ajay Agrawal*
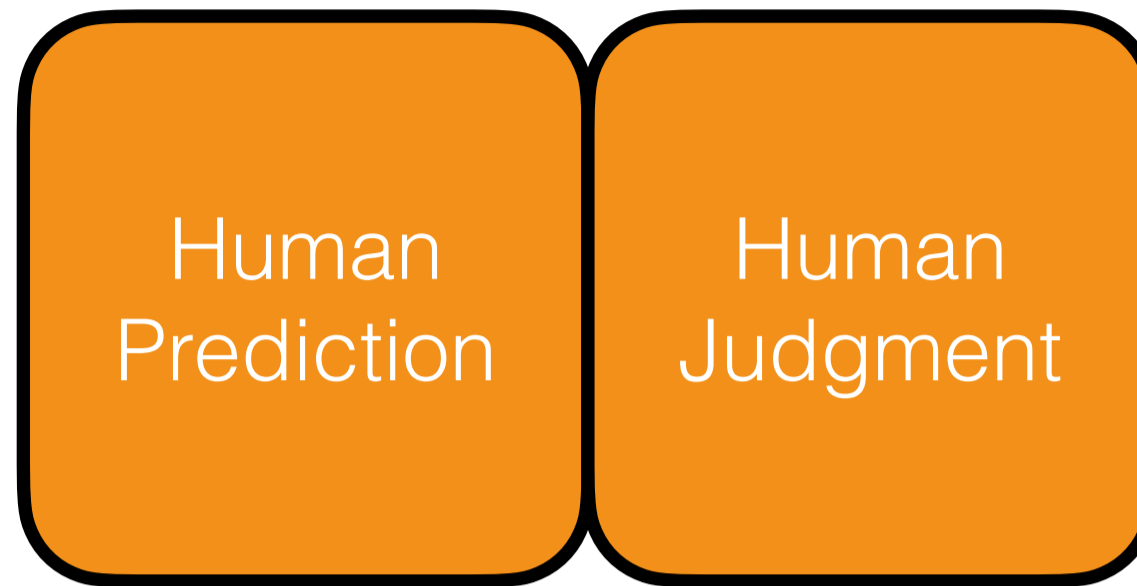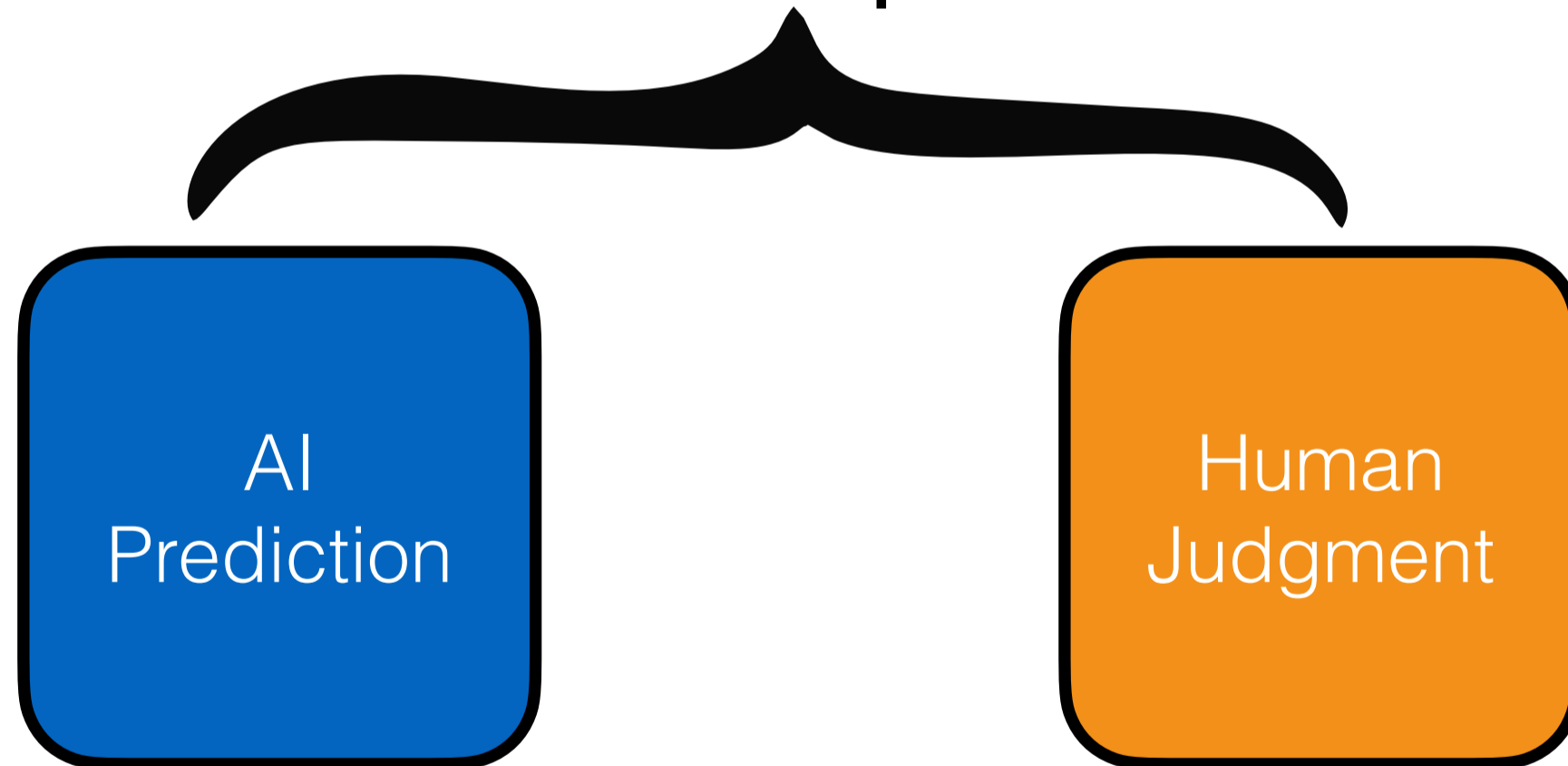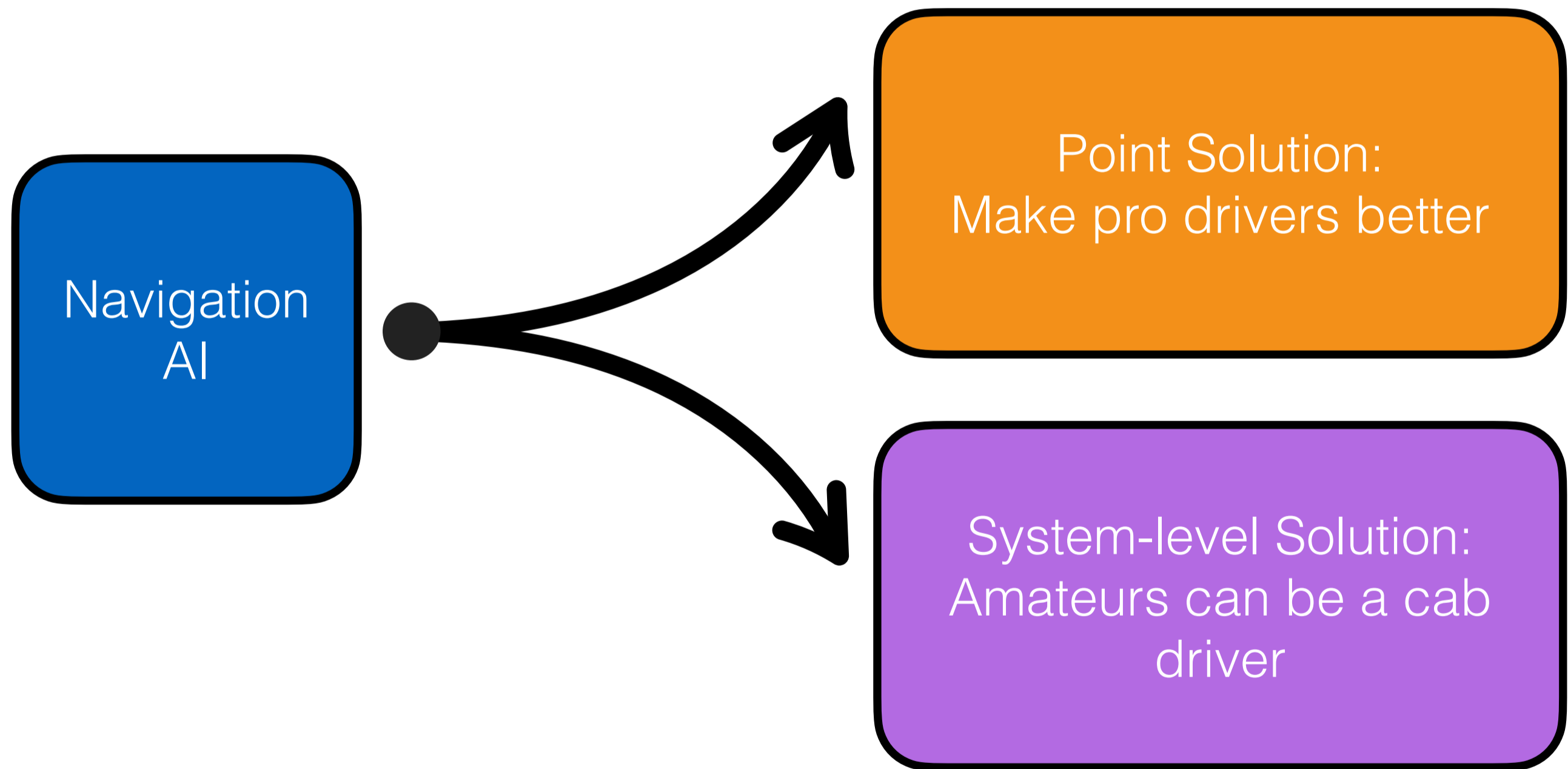
Power and Prediction

The Disruptive Economics of
Artificial Intelligence

AJAY AGRAWAL | JOSHUA GANS | AVI GOLDFARB

SYSTEM-LEVEL SOLUTIONS

PREDICTION TECHNOLOGY

CHEAP MATH

FORECASTS

DECISION SUPPORT

AI SYSTEM-LEVEL SOLUTIONS

TRAFFIC DETECTION

AUTOMATION

FRAUD DETECTION

SYSTEM

JUDGMENT

AI

LLMs

Point vs. System-level Solutions

Navigation AI

Point Solution:
Make pro drivers better

System-level Solution:
Amateurs can be a cab driver

figure adapted from Joshua Gans
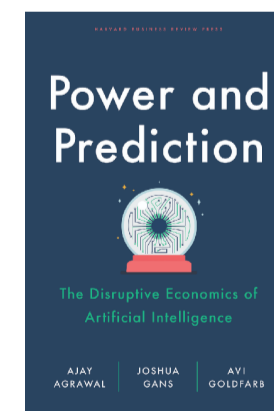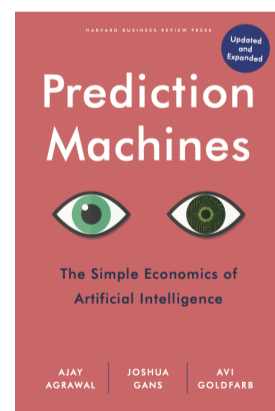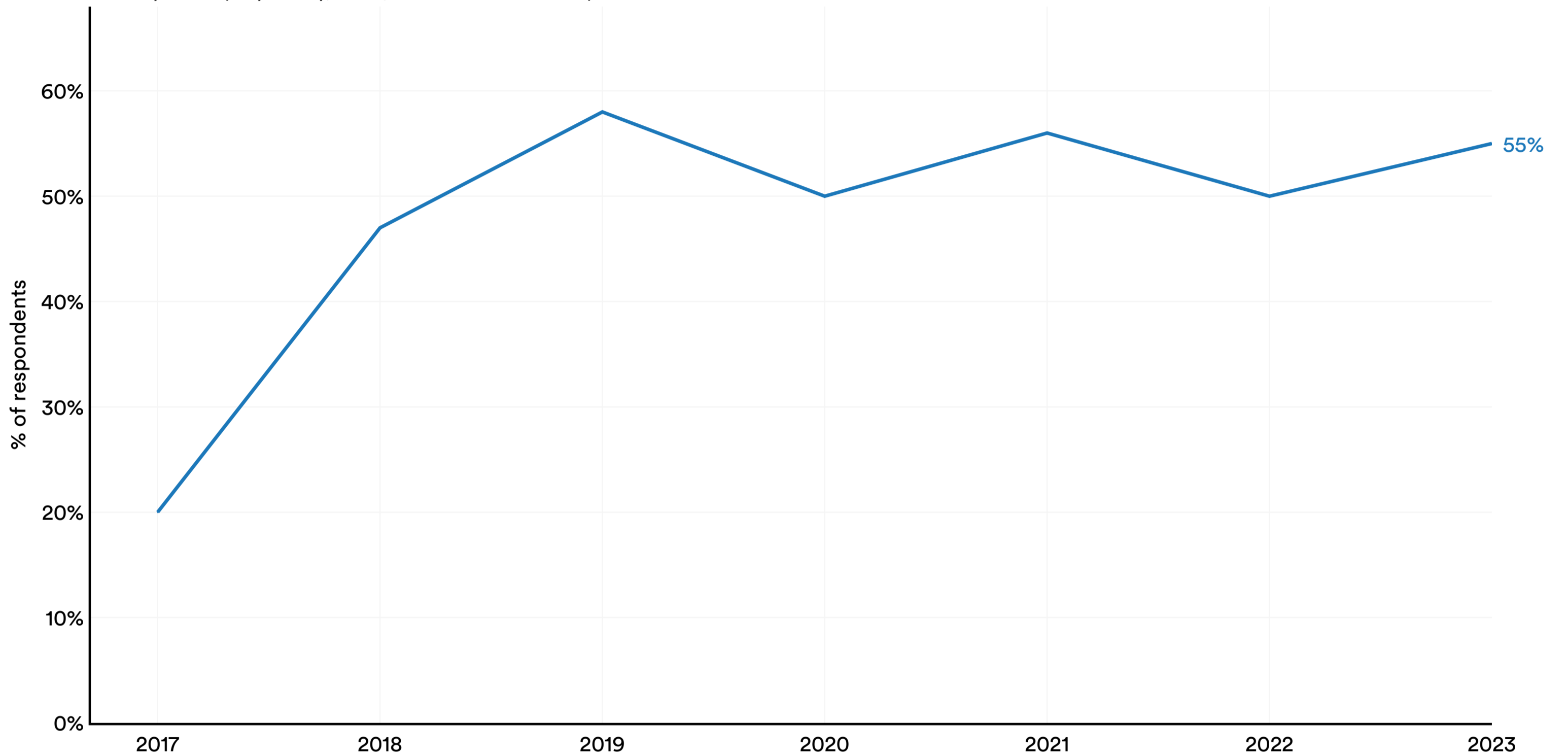
Share of respondents who say their organizations have adopted AI in at least one function, 2017–23

Source: McKinsey & Company Survey, 2023 | Chart: 2024 AI Index report

% of respondents

55%

2017 2018 2019 2020 2021 2022 2023

via Stanford HAI AI Index Report 2024

The "in-between times"

via Sciencemuseum.org

image from Wikimedia, idea from Joshua Gans

Recap

- Today's AI is Prediction Technology

- Prediction is important to decision making

- Decision making is everywhere

- Prediction ≠ decision making

adapted from Joshua Gans

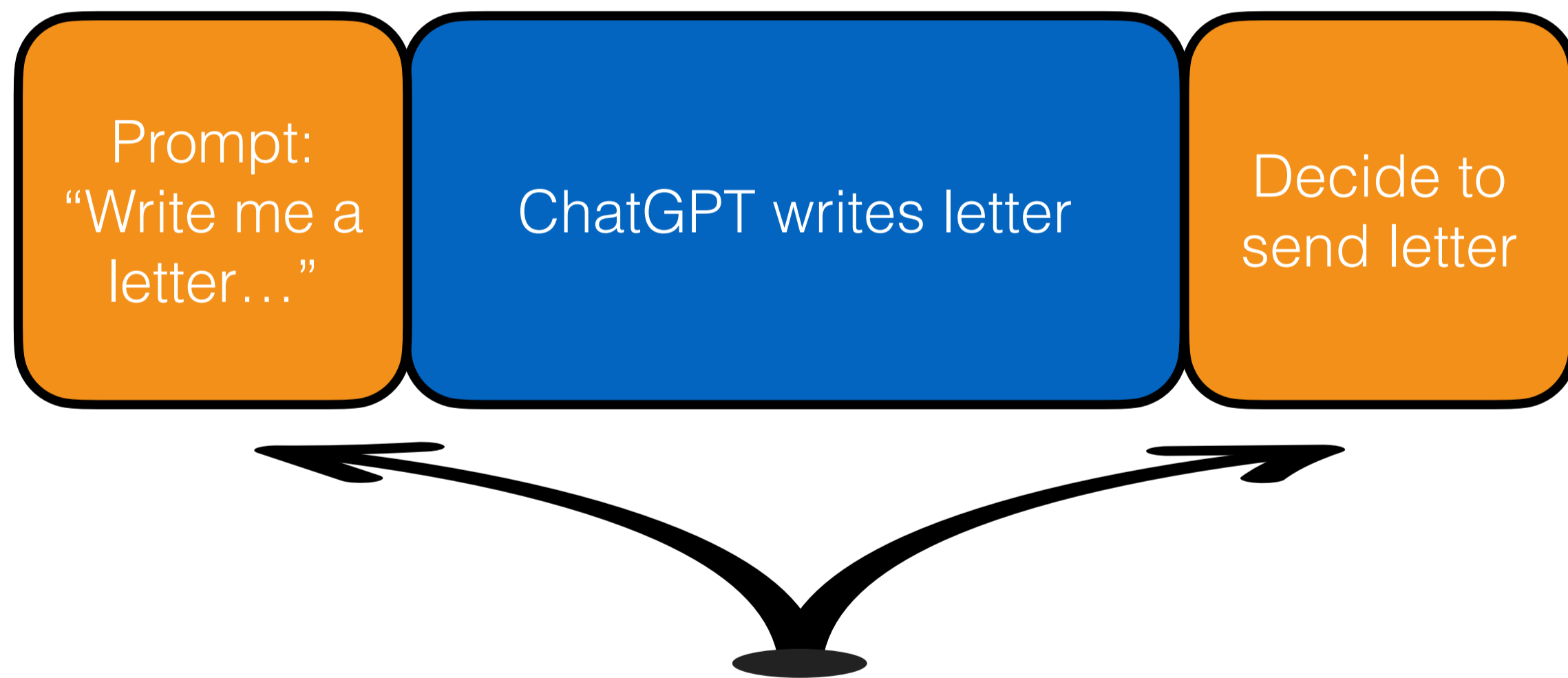# When do AI Systems become Disruptive?

- **Key question**: Is it the same person making the decision when prediction & decision making were coupled vs. decoupled?

- If it is not, then this is where disruption happens

- Judgment still needs to come from people

Human Prediction | Human Judgment

decouple

AI Prediction

Human Judgment

reproduced from Ajay Agrawal
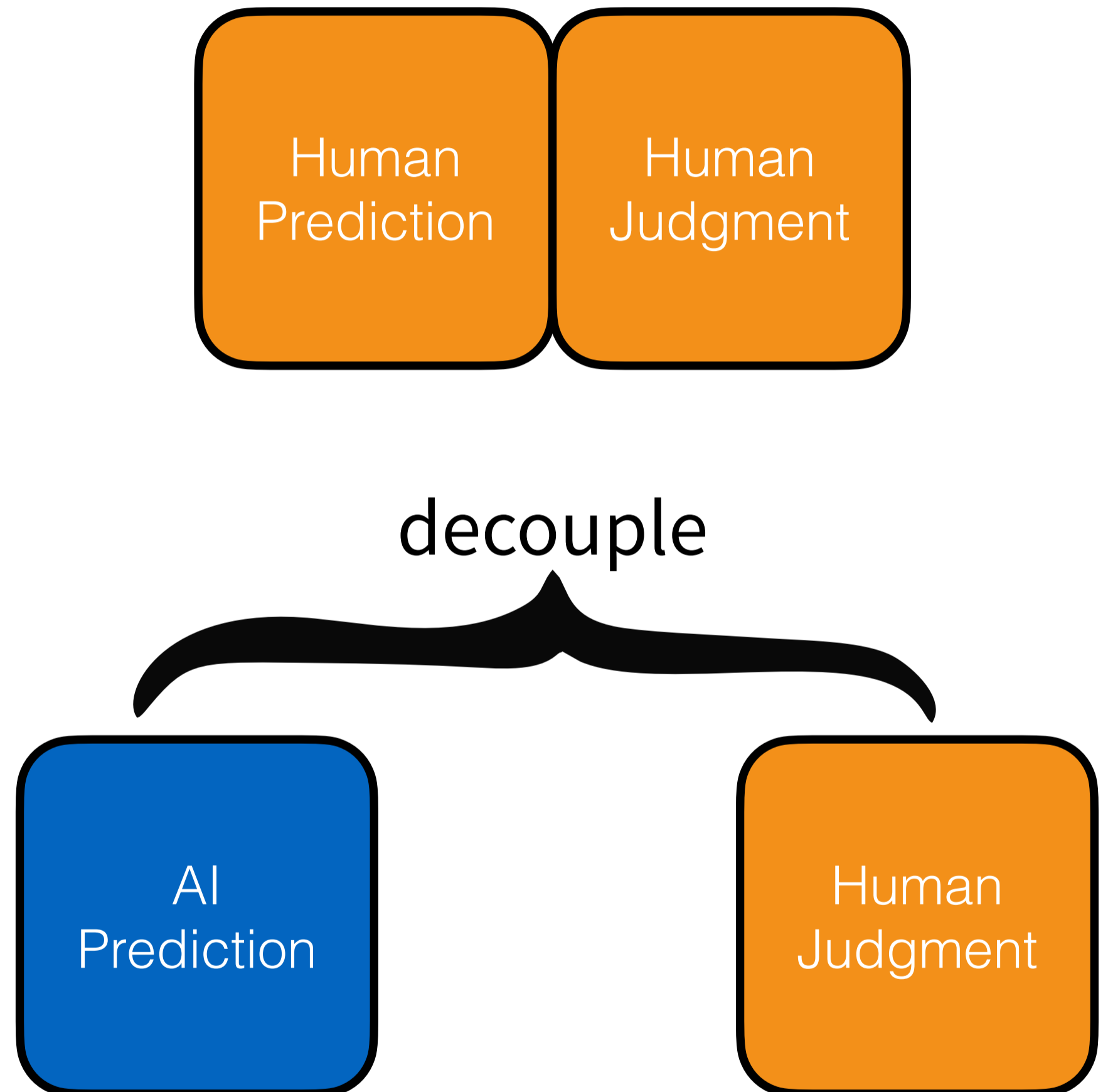
What about ChatGPT?

ChatGPT still requires human judgment.

Task: Write a letter

| Prompt: "Write me a letter…" | ChatGPT writes letter | Decide to send letter |

The most skillfull parts aren't changed

adapted from Joshua Gans
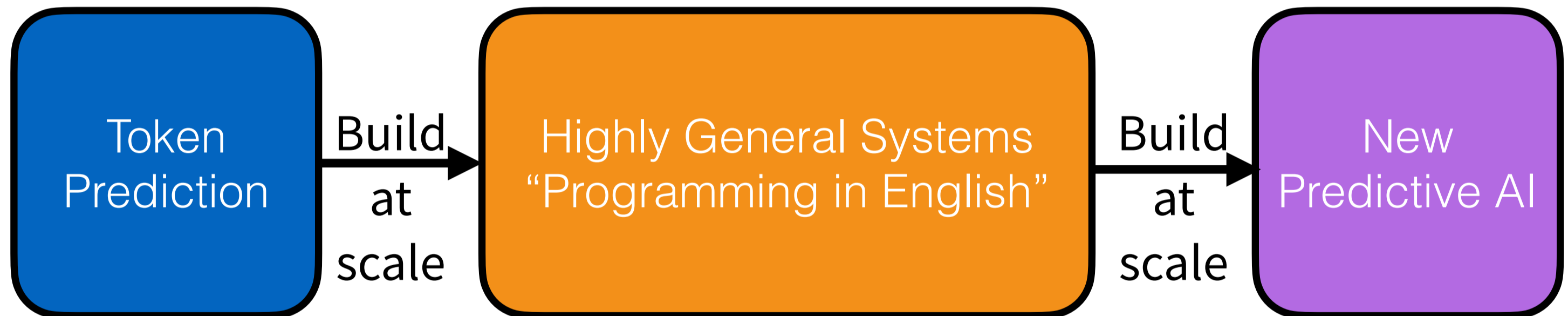
Is Generative AI different than Predictive AI?
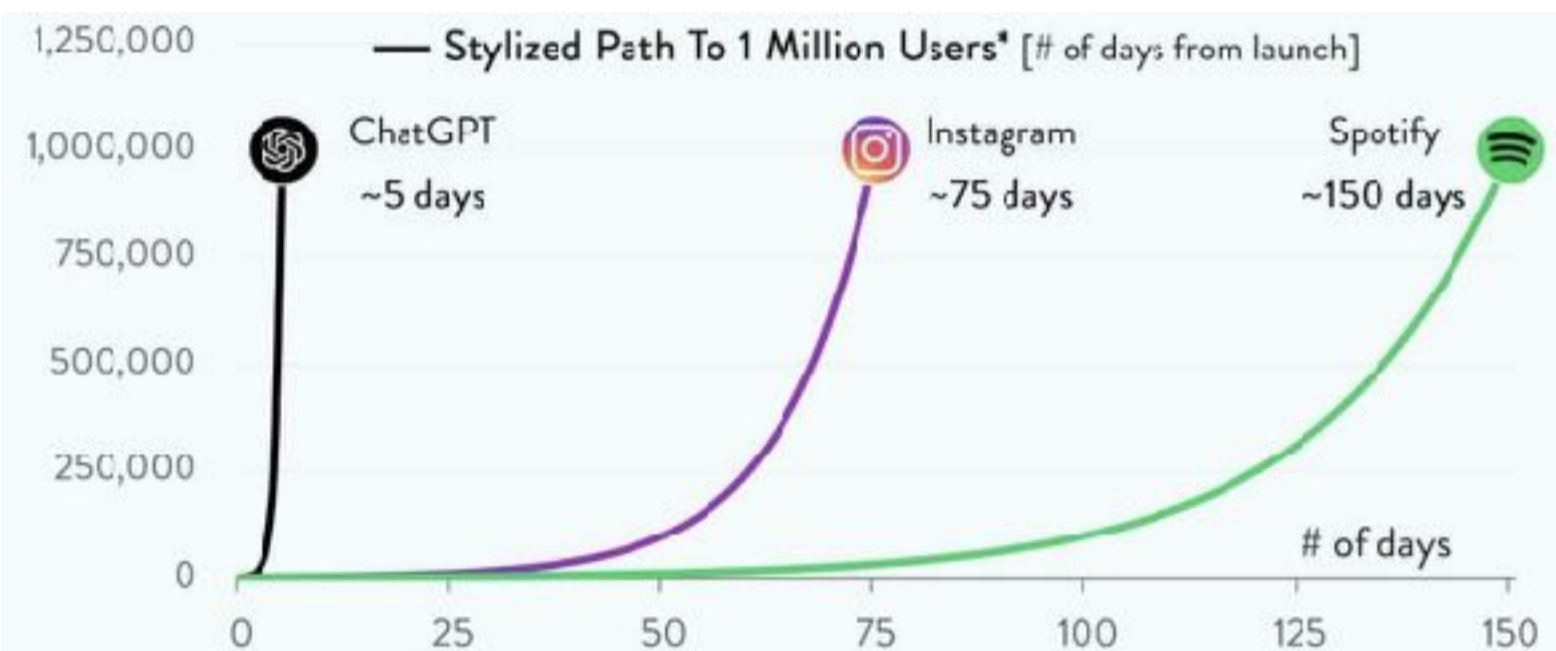
- Within two months of launching ChatGPT set a record of growth of 100M monthly users

- It is estimated to have 400M *weekly* active users

- Over 2M developers use the platform, including >92% of Fortune 500 companies

via Contrary Research, OpenAI

"What you're excited about isn't actually AI; it's user experience design. This AI revolution is actually a design revolution"

- Cassie Kozyrkov, CEO at Data Scientific, ex-Chief Decision Scientist, Google
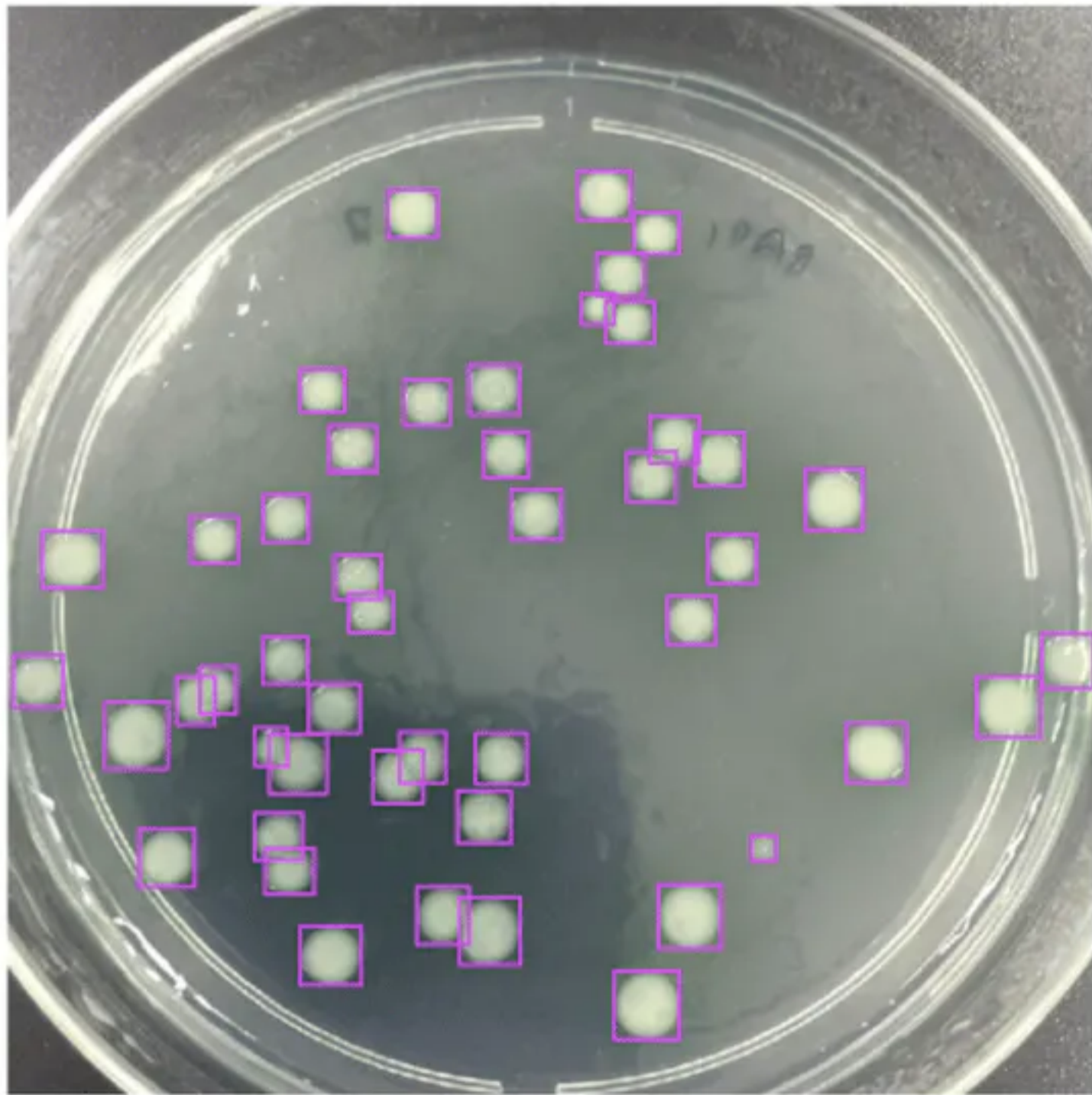
Prediction Enables GenAI
GenAI Enables More Prediction

```
┌──────────────┐  Build   ┌────────────────────────────┐  Build   ┌──────────────┐
│    Token     │   at     │   Highly General Systems   │   at     │     New      │
│  Prediction  │─ scale ─▶│  "Programming in English"  │─ scale ─▶│ Predictive AI│
└──────────────┘          └────────────────────────────┘          └──────────────┘
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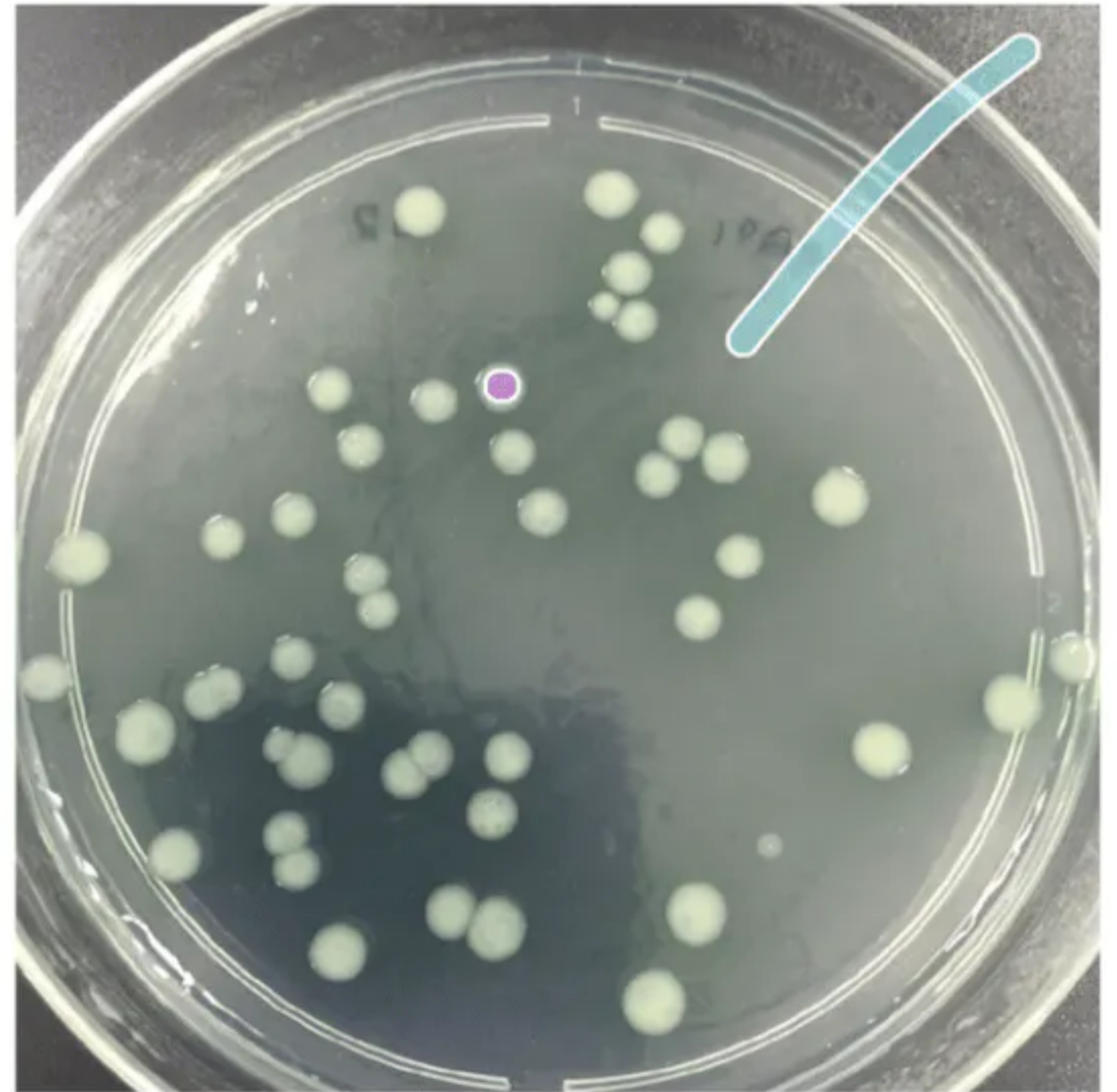
Building Vision Models in Seconds with Visual Prompting

Object Detection — **47 boxes** in **5 minutes**

Visual Prompting — **2 strokes** in **10 seconds**

via Landing AI

Economic Impact from AI

The AI people consciously interact with is only a small portion of their total AI interactions over the last 10 years

Generative AI: $2.6 to $4.4 trillion

Non-Generative AI: $11.0 to $17.7 trillion

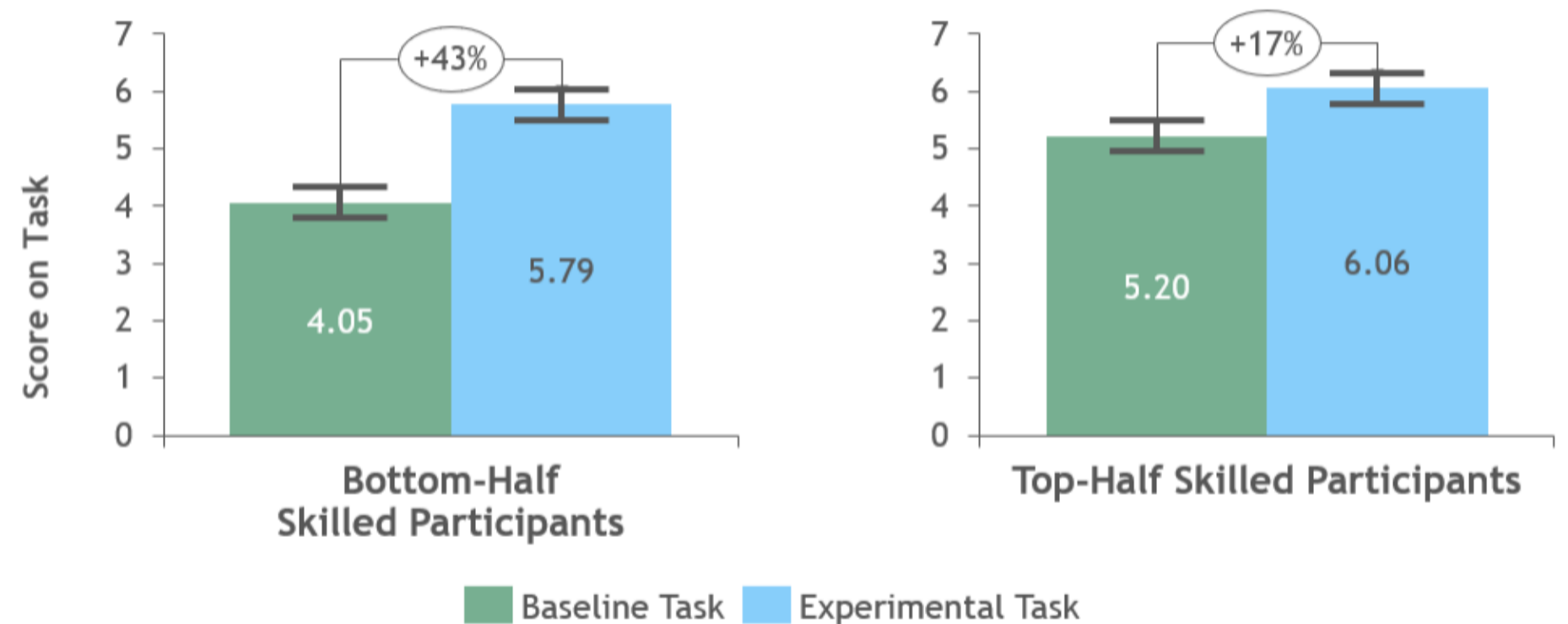*via McKinsey & Company Report: The economic potential of generative AI*

Why the hype?

- OpenAI figured out the scale and UX that made *foundation models*

    - accessible

    - applicable

- It's a skill-leveler
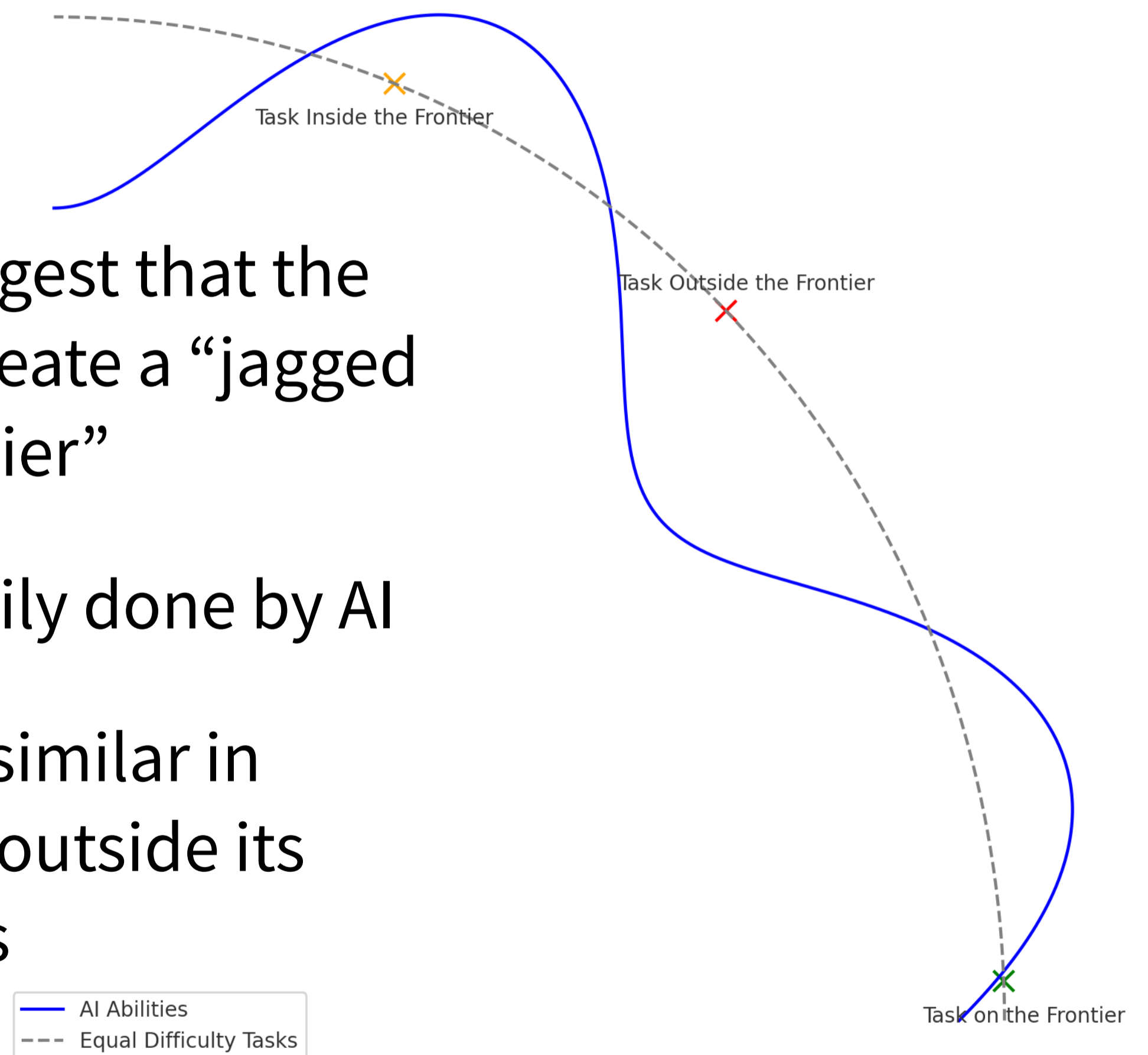
- Anyone can level up by "programming in English"
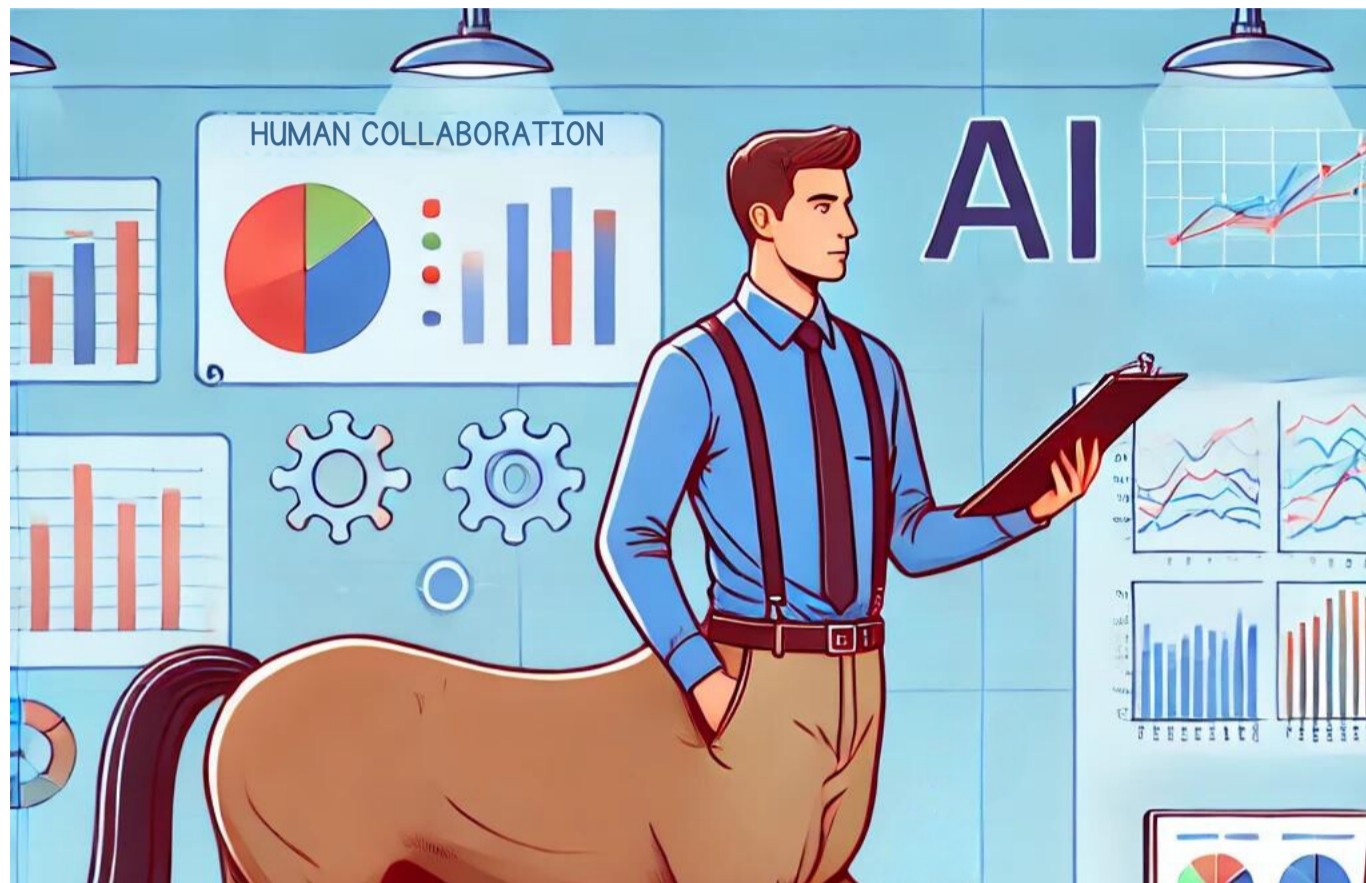
via Dell'Acqua et al.

Where Does it Work?
The Jagged Frontier of AI Capabilities

- Dell'Aqua et al. suggest that the capabilities of AI create a "jagged technological frontier"

- Some tasks are easily done by AI

- Others, seemingly similar in difficulty level, are outside its current capabilities

Task Inside the Frontier

Task Outside the Frontier

Task on the Frontier

— AI Abilities
-- Equal Difficulty Tasks

via Dell'Aqua et al. (2023)

How to Use AI Systems

**Centaurs split tasks between AI and themselves.**

- Discern which tasks are best suited for human intervention and which can be managed by AI
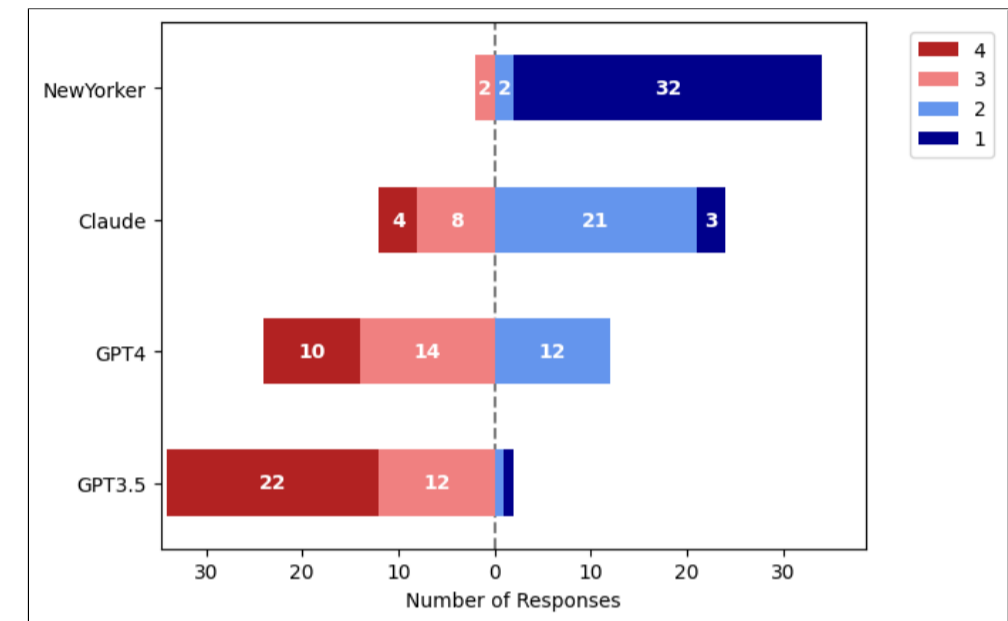
- Delegate
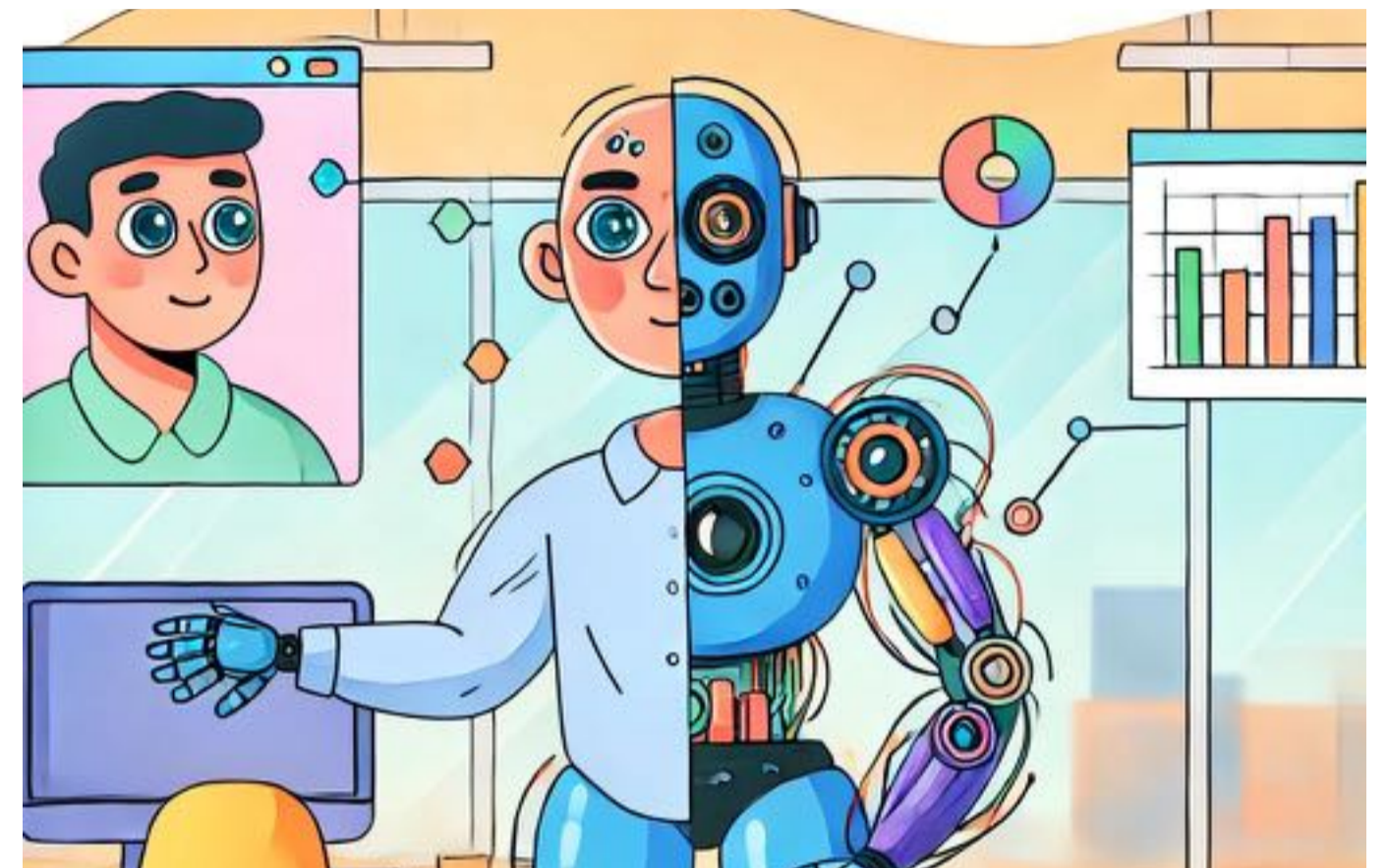
Cyborgs integrate AI with every task.

- Don't just delegate tasks; they intertwine their efforts with AI at the very frontier of capabilities

- Alternating responsibilities at the subtask level

adapted from Ethan Mollick

When to Use AI?
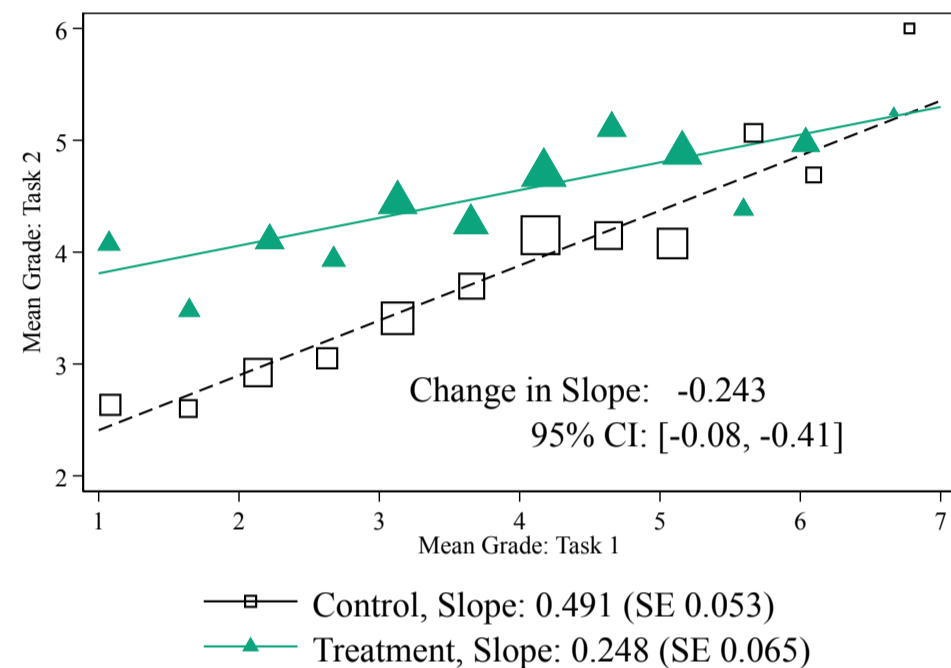
The skill gaps between writers narrows when they use GPT-4 to help them (Noy & Zhang, 2023)

But people preferred New Yorker stories to AI written ones (Chakrabarty et al, 2024)

"A_____ it does the tasks you want to do least so that yo_____ e ones you both like best and are best at."

via Ethan Mollick

Which AI should I use?

- All the GPT-4 class commercial models are capable and have their own quirks and advantages/ disadvantages

- You won't go wrong with using any of them but I recommend >10 hours of experimentation on each different platform so that you can understand the nuances

- Then you can choose between them at a task level

Beyond the Frontier

- Both commercial providers and the open source community are releasing better models at least every six months

- It is fine to be focused on today, building working AI applications and prompts that account for the limits of present AIs

- There is also a lot of value in building ambitious LLM applications that will work when "better LLM brains" are released in six months

adapted from Ethan Mollick

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