Human-AI Collaboration in Research

Designing your own way of doing research with AI.

Sébastien Martin
Associate Professor of Operations · Northwestern Kellogg
AI-Accelerated Research in OM/OR · July 24, 2026

INTRODUCTION

Sébastien Martin

Northwestern Kellogg

Research

- Large-scale optimization
- Platform operations
- AI in operations
- AI in education

Teaching

- AI Foundations for Managers (new)
- Operations Management

Syllabus

sebastienmartin.info/aiml901/syllabus.html

INTRODUCTION

Today

1. AI can now do serious research
2. Computer agents
3. Reflections

AI can now do serious research

Even basic ChatGPT can make important research contributions.

Let's start a research task together.

LIVE

This week

The Jacobian conjecture falls

Levent Alpöge

The DGG conjecture falls

Dmitry Rybin

Terence Tao discusses it

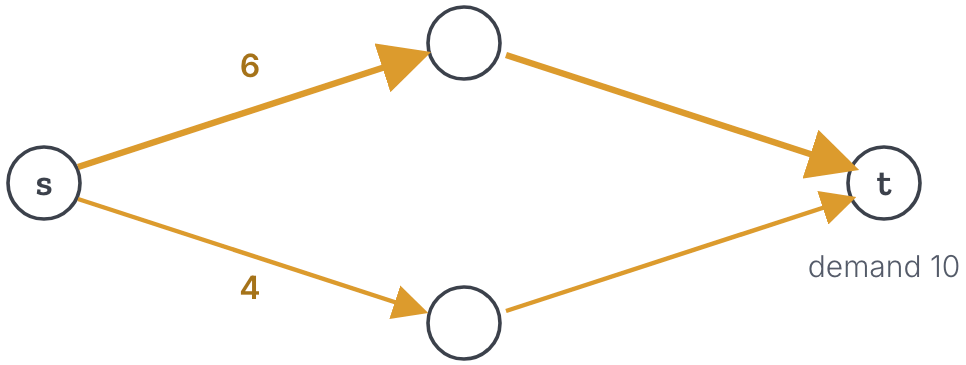
Sébastien's birthday

Mon Jul 20 — Tue Jul 21 — Wed Jul 22 — Fri Jul 24

The Dinitz–Garg–Goemans conjecture

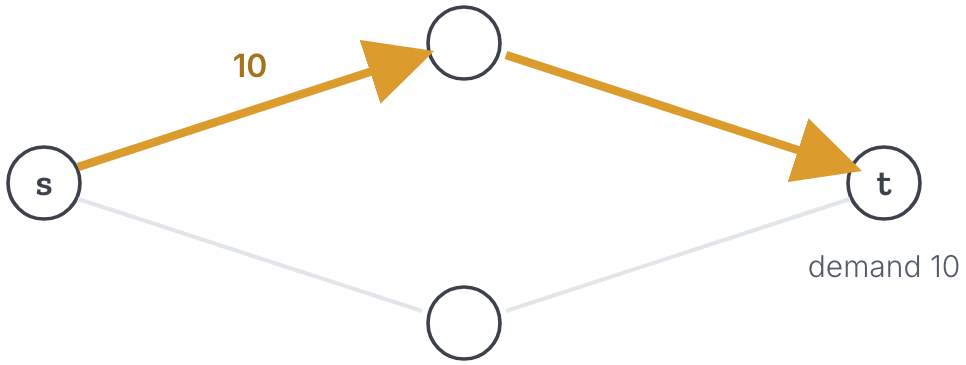
A fractional flow

min-cost — demands may split across paths



An unsplittable flow

each demand travels on one single path

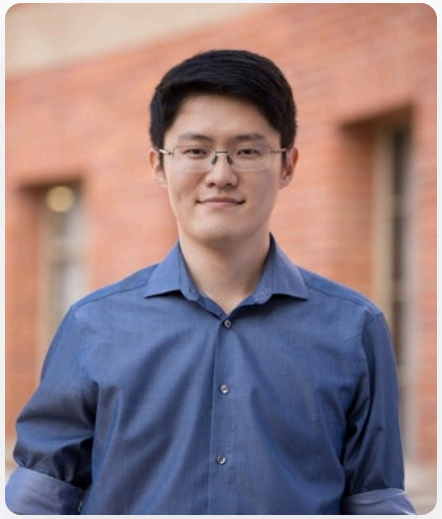


The conjecture (Goemans, open ~30 years): any fractional flow can be made unsplittable at no extra cost, adding at most d_{max} — the largest single demand — on any arc.

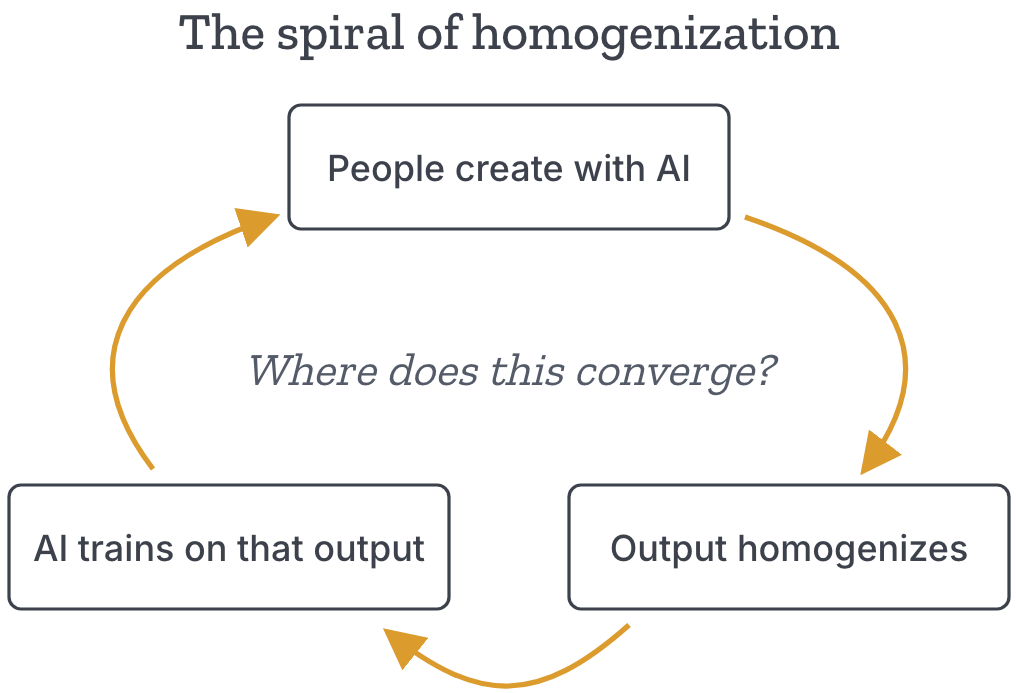
So what is our role now?

Human-AI Interactions and Societal Pitfalls

Francisco Castro
UCLA Anderson



Jian Gao
UCLA Anderson Ph.D.

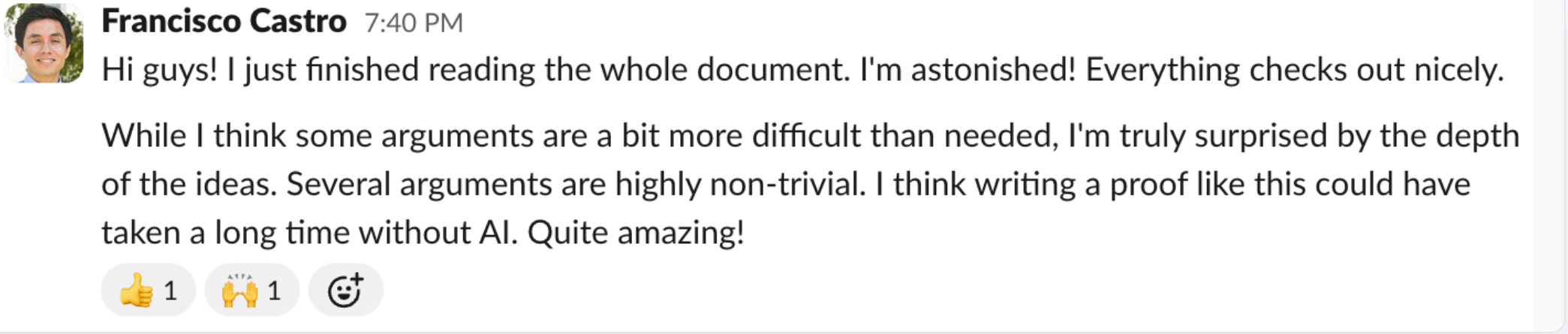


Human-AI Collaboration in Research

Designing your own way of doing research with AI.

Sébastien Martin
Associate Professor of Operations · Northwestern Kellogg
AI-Accelerated Research in OM/OR · July 24, 2026

This was real, creative research



So what was our role?

- We asked the right question.
- We designed the process and advised the AI along the way.
- We verified everything, and we own the result.

Computer agents

Why figuring out how to do research with AI is an operations management problem.

A quick recap of AI progress

2022	2023	2024	2025	2026
ChatGPT	GPT-4 & the AI wave	Agentic AI	Claude Code & coding agents	Claude Cowork & computer agents
AI can write and answer questions	AI can be really smart	AI can “reason” and use tools	AI can work on its own on complex tasks	AI can control a computer and do real work

Computer agents

CLAUDE CODE

& Cowork

Anthropic

Codex

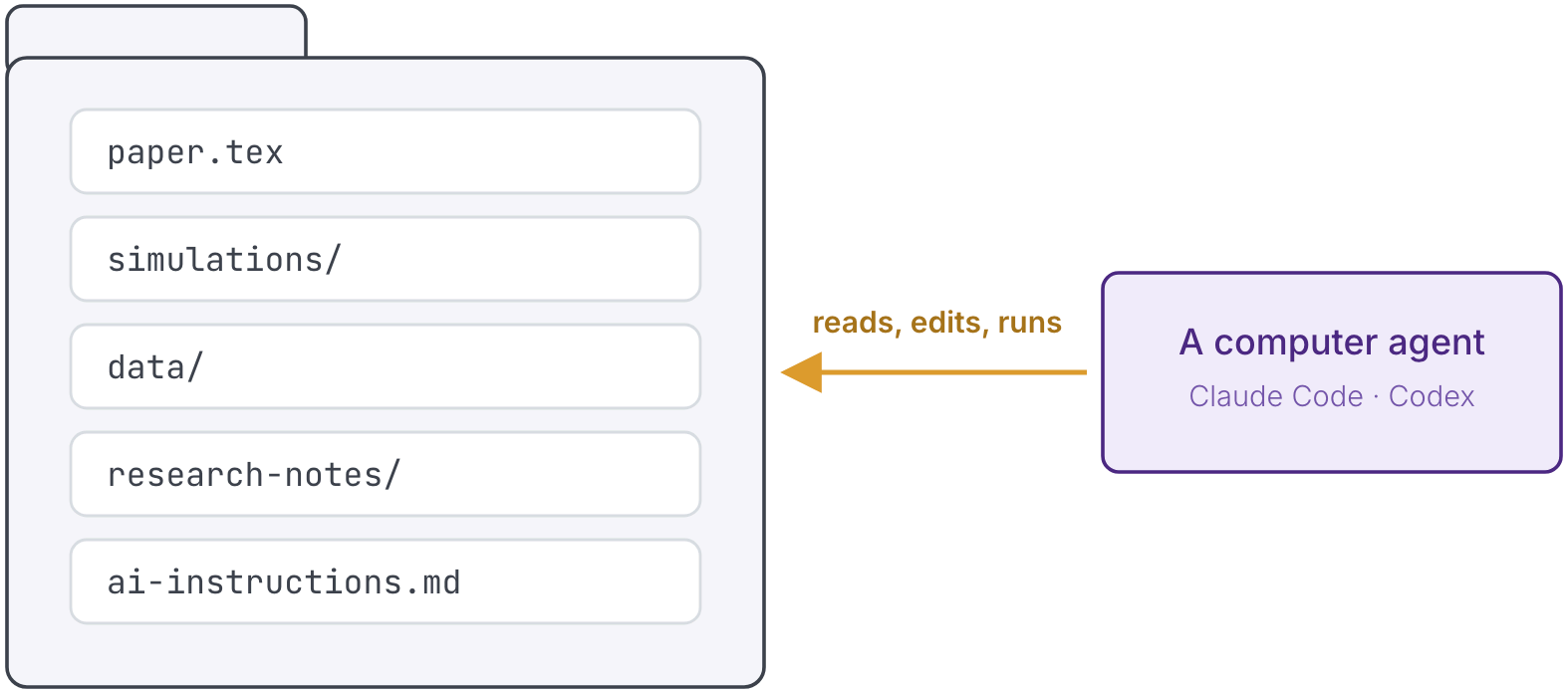
& Work

OpenAI

This is the same LLM, except that it can control your computer.

COMPUTER AGENTS

Give it your research folder



Like co-working with a PhD student in your Dropbox folder.

COMPUTER AGENTS

What does this unlock?

- Compile and fix your LaTeX
- Tame your TikZ figures
- Hunt down missing citations
- Run simulations while you sleep
- Write and edit the paper with you
- Write math directly in LaTeX
- Draft your slides
- Keep the folder organized
- Write notes to its future self
- Follow your instruction files
- Organize your literature
- Answer any question about the paper

The only skill it takes is not an AI skill: keeping a folder organized.
And the AI can help with that too.

How do you work with a PhD student?

The grant provider
you fund it, they do it

A small army
feedback, spread thin

A few students
a true co-researcher

An equal collaborator
when 1 + 1 = 3

You drive
the AI just speeds you up

Apologies for the analogy: AI does not replace PhD students.

COMPUTER AGENTS

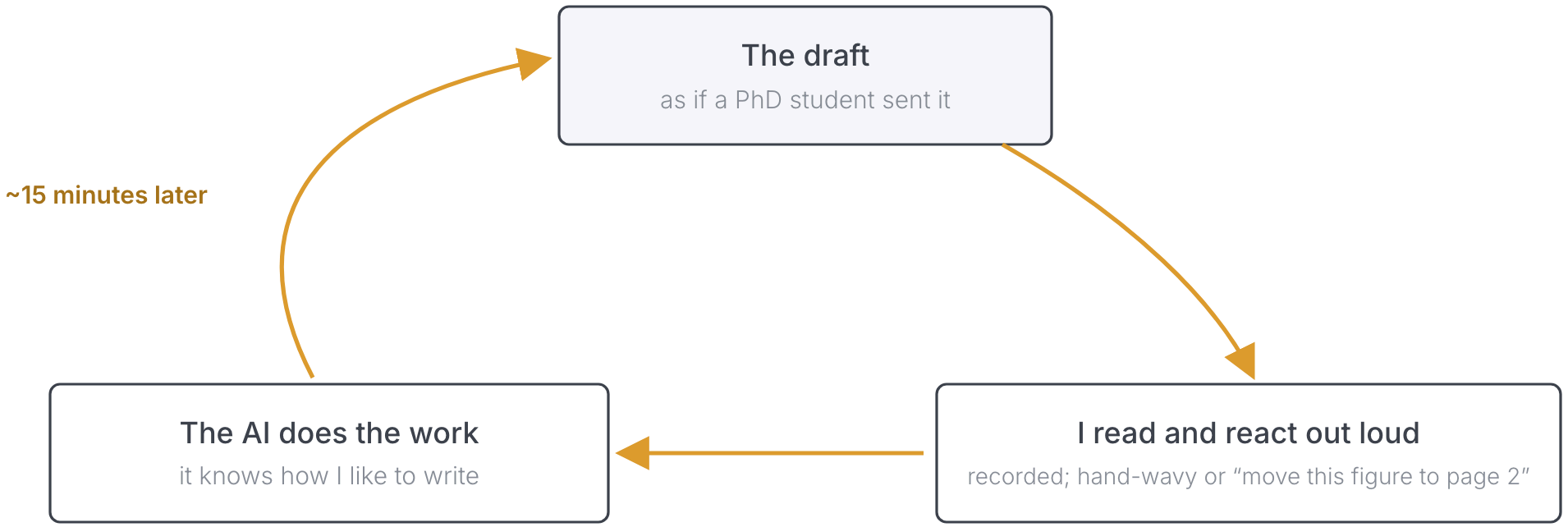
AI creates a new job: optimizing the research process

- Creating extremely personal and powerful research tools
- AI peer review
- Voice-first writing
- Reinventing how we work with PhD students and collaborators
- A literature second brain
- An automated paper machine
- Increasing the scope
- An automated research-lead machine
- A digital research twin
- Large research group coordination

The question is not whether to use AI in research, but how you want to use it. The sky is the limit, and there is room for innovation.

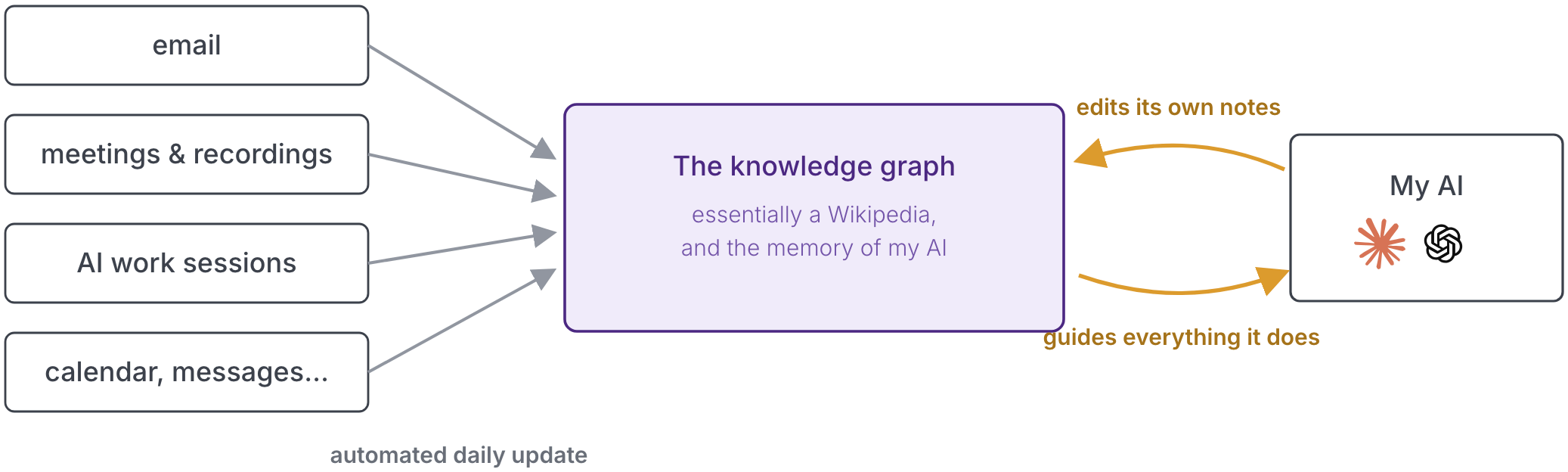
COMPUTER AGENTS

I talk, it writes LIVE



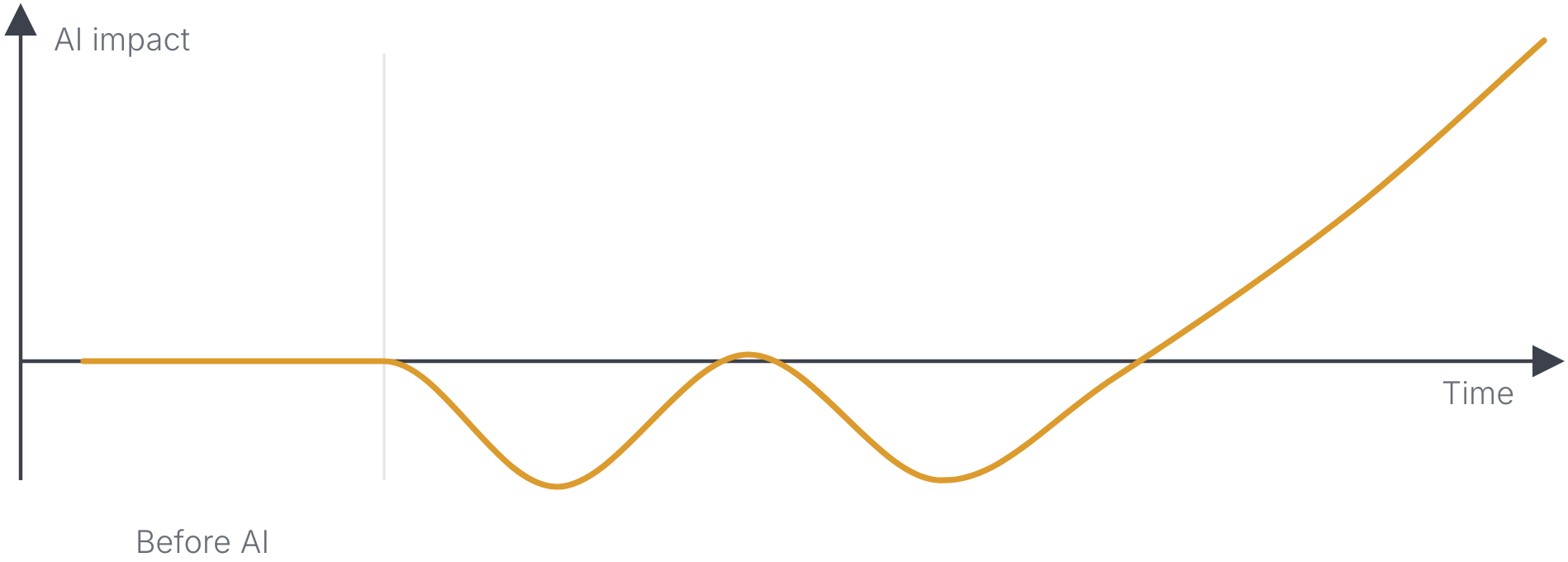
I no longer do the writing directly, but I iterate far more on the writing than I used to. And it is how this slide deck was made.

My approach: trying to build a second brain LIVE



Running quietly behind everything you saw today. Not sure I recommend it (it takes real care), but it works really well for me.

My own path with AI



Finding the perfect research process is real work. But it is work that keeps on giving.

Reflections

Where is all of this going?

REFLECTIONS

How to get started

1 · Get a computer agent

Claude Code or Codex — not the chat box. Ten minutes to install.

2 · Give it something real

A task from your actual research: a figure, a robustness check, a literature pass.

3 · Trust the process

The first sessions will be mediocre. Invest in the setup anyway — it compounds.

Already familiar? Keep building. The real work is finding the research process that works best for you: it takes time, and it needs to be updated as AI changes.

REFLECTIONS

Open questions

- AI can already do research autonomously.
- Which field is likely to change the most?
- Currently the hardest task is verification. What does this mean for peer review?
- What does authorship mean when you can run a project without deeply understanding it?
- How do we handle all this and still enjoy our jobs?

To me, all of this shows that the future of research is uncertain, not that it will be bad. The more I integrate AI in my research, the more empowered I feel. I am optimistic.

Let’s check in on our agent.

REFLECTIONS

Thank you!

sebastienmartin.info

sebastien.martin@kellogg.northwestern.edu

And please help us spread the word about this seminar series!