

AI powered SW development from the trenches

GOTO Copenhagen, 2024-10-02

Current Focus

Ymnig.ai Fliti9

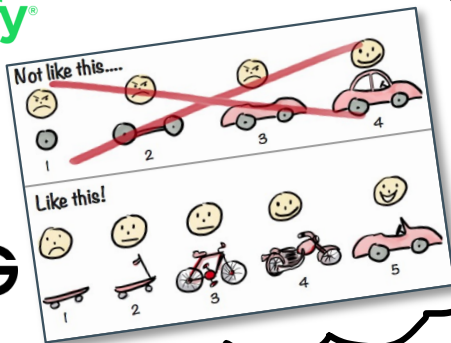
Henrik Kniberg



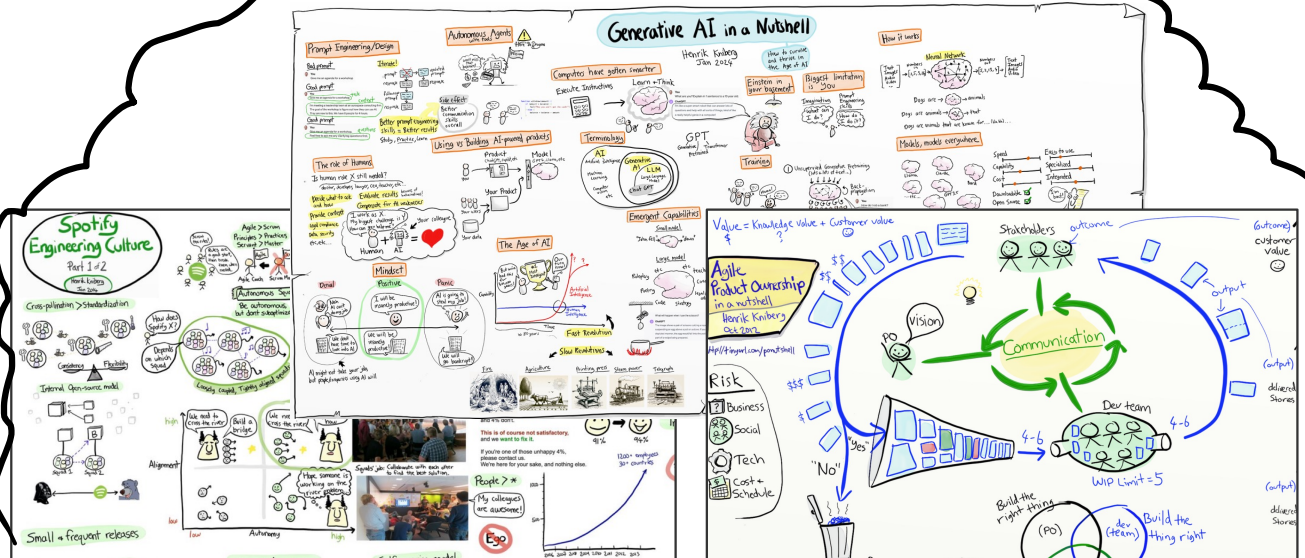
Books



Background



Videos

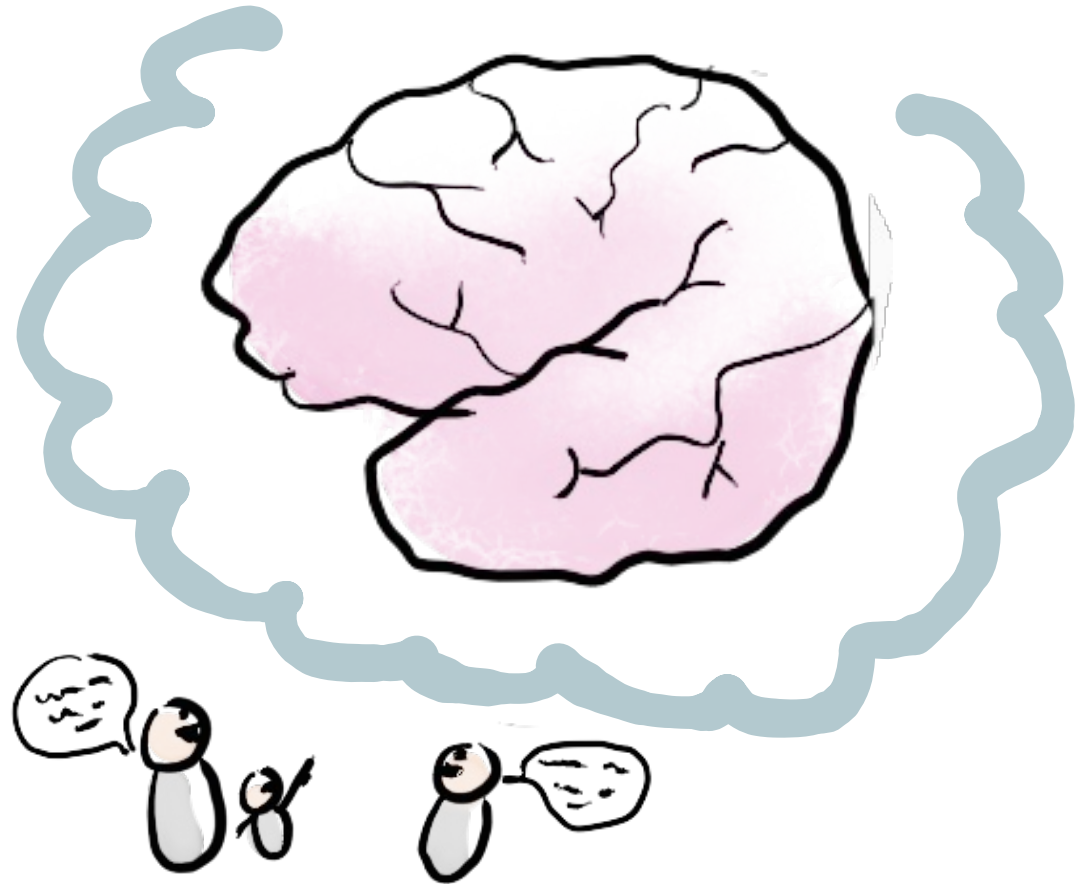


Two metaphors for Gen AI

Einstein in your basement



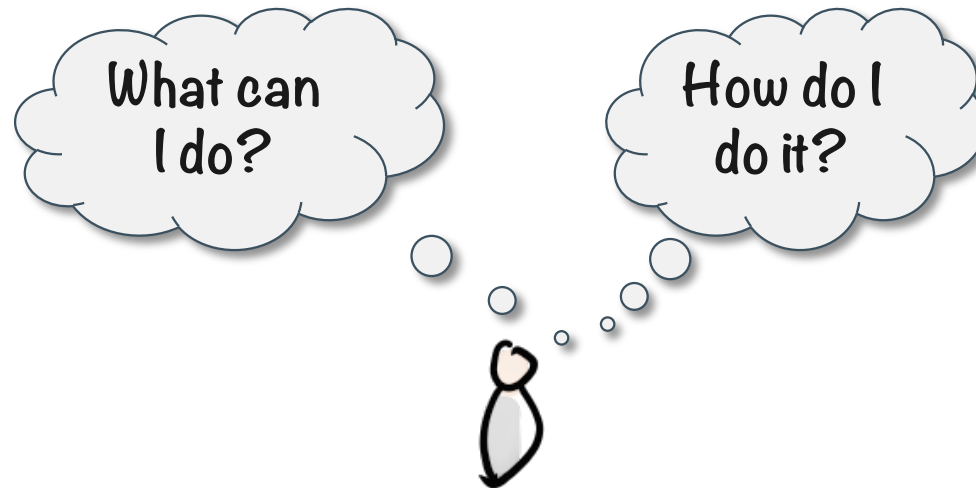
Intelligence as a Service (Brain-in-the-cloud)



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

Prompt Imagination

Prompt Engineering



Second biggest limitation: The models!

Don't be stingy! You get what you pay for.

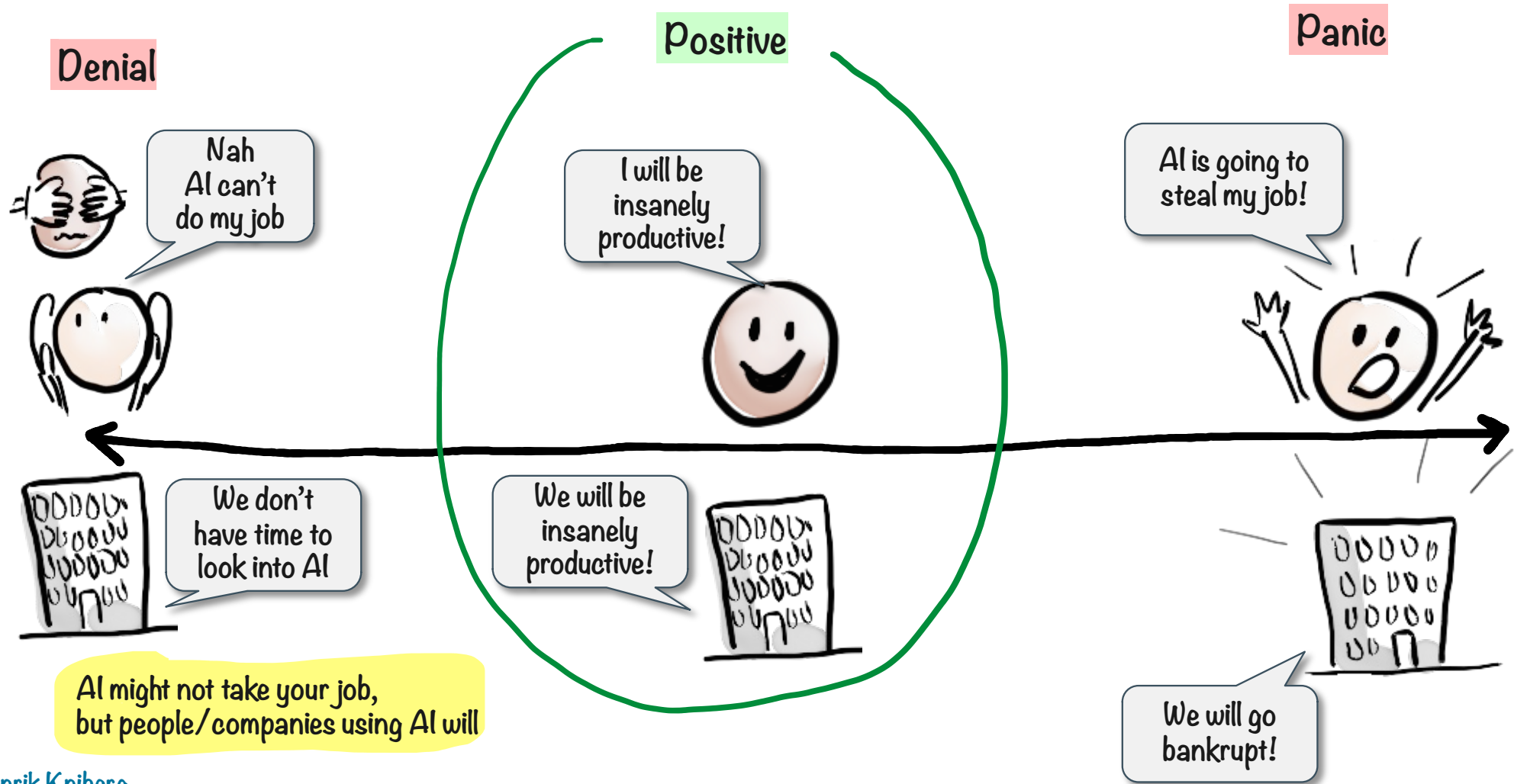
↙ Really good!
Claude 3.5 Sonnet
GPT 4o



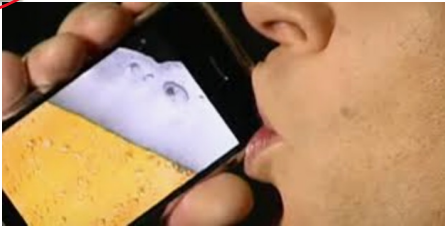
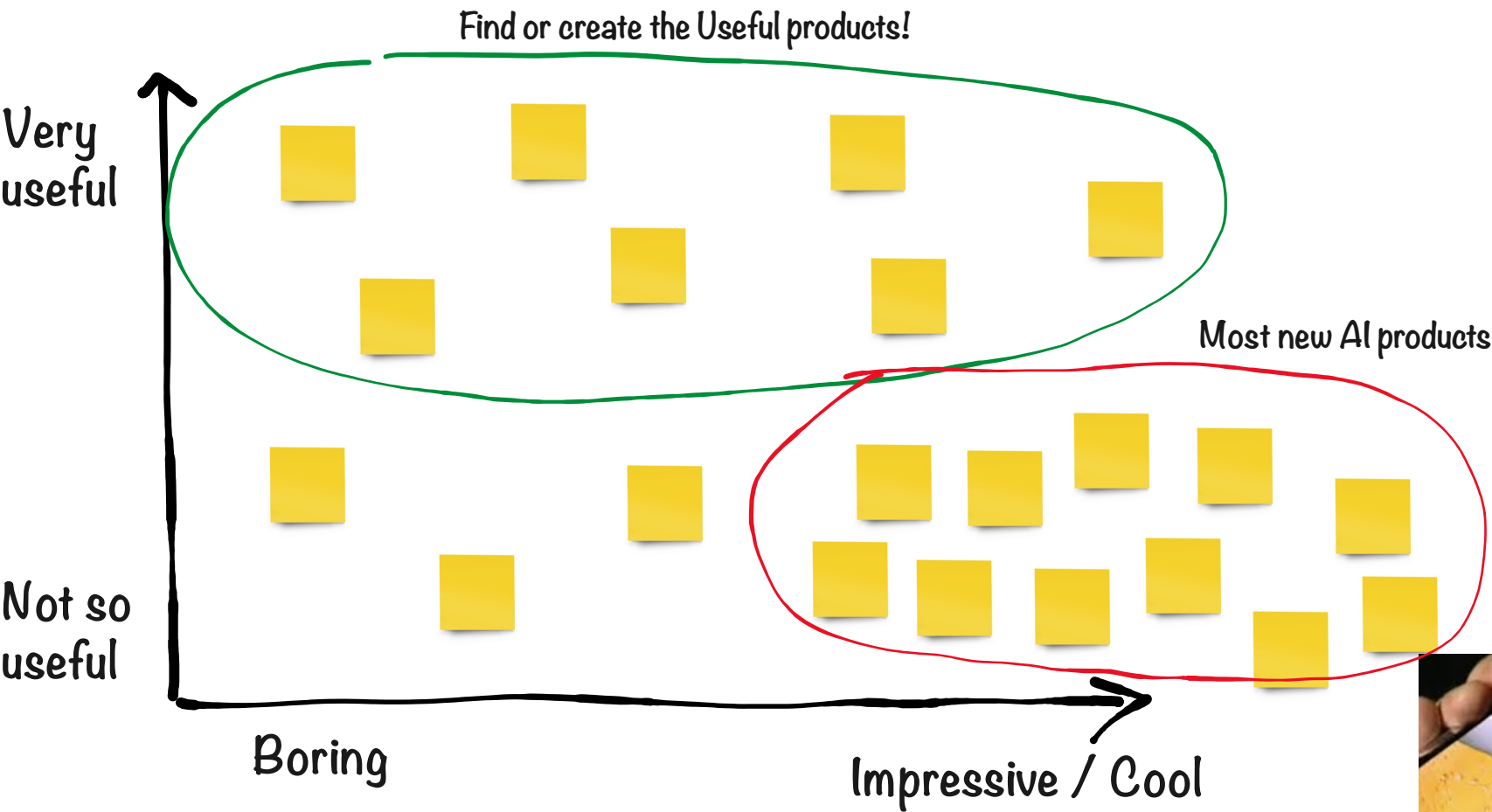
↙ Fun, but prone to errors and hallucinations
GPT 4o mini

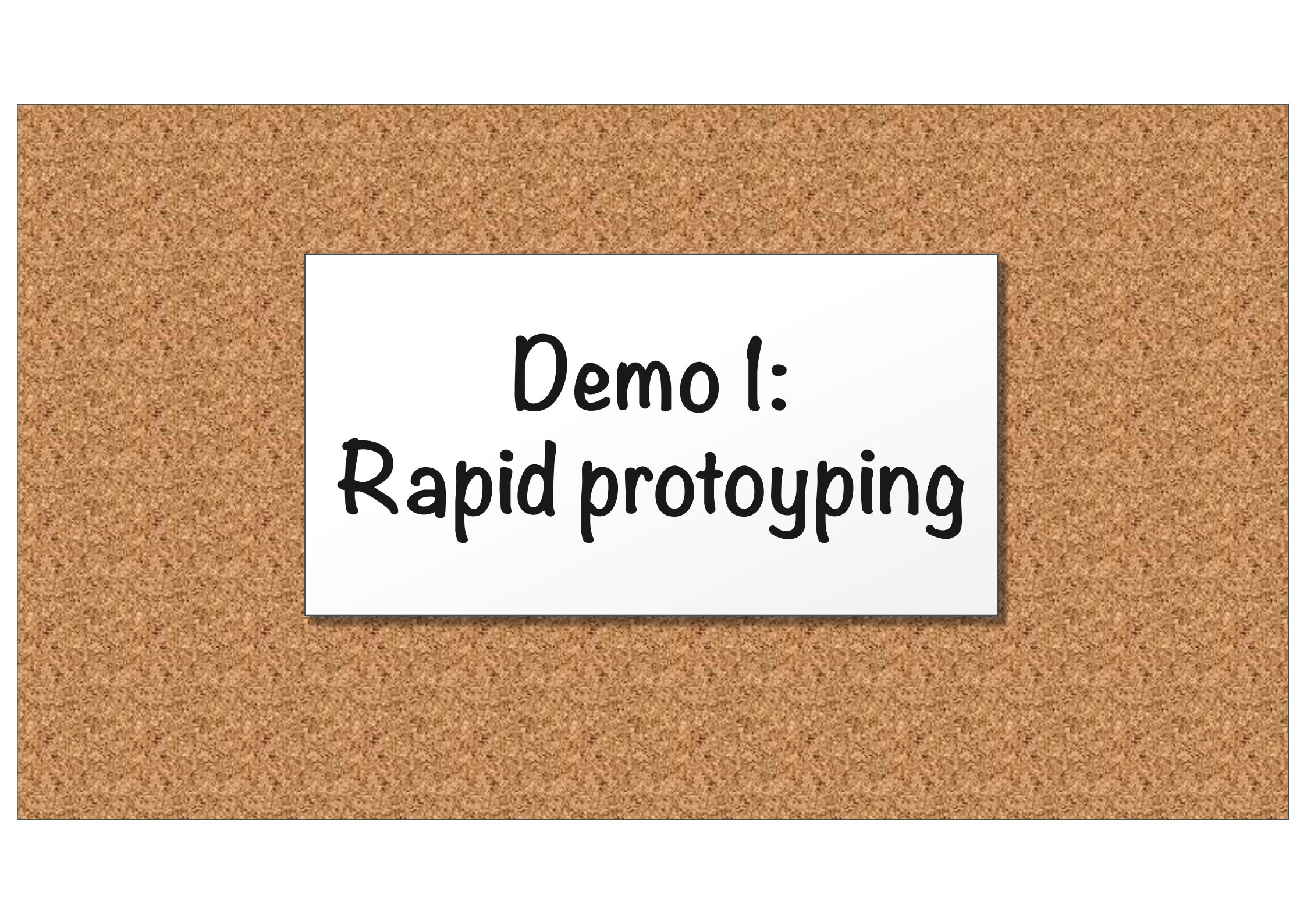


Mindset



It's the wild west right now





Demo 1: Rapid prototyping



"make it"

ToDo

- ☐ Laundry
- ☐ Email
- ☐ Walk the dog

new item **Add**

"Add deadline"

ToDo

☐ Laundry2024-10-03

☐ Email2024-10-02

☐ Walk the dog2024-10-02

"It's ugly"

The image shows a minimalist todo list application. It features a white rounded rectangle with a black border, set against a light gray background. At the top, the word "ToDo" is centered in a bold, black, sans-serif font. Below this, a horizontal line separates the header from the list of tasks. The tasks are listed vertically: "Laundry", "Email", and "Walk the dog". Each task is preceded by an unchecked checkbox. At the bottom of the interface, there is a text input field with the placeholder text "new item" and a black button with the word "Add" in white text.

ToDo

- ☐ Laundry
- ☐ Email
- ☐ Walk the dog

new item **Add**

"Hey you lost the deadline"

ToDo

☐ Laundry
Due: 2024-10-03

☐ Email
Due: 2024-10-02

☐ Walk the dog
Due: 2024-10-02

new item

yyyy-mm-dd

Add

"Add Home and Work tabs"

ToDo

Home

Work

☐ Laundry
Due: 2024-10-03

☐ Walk the dog
Due: 2024-10-02

new item

yyyy-mm-dd

Add

"Make it angrier"

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

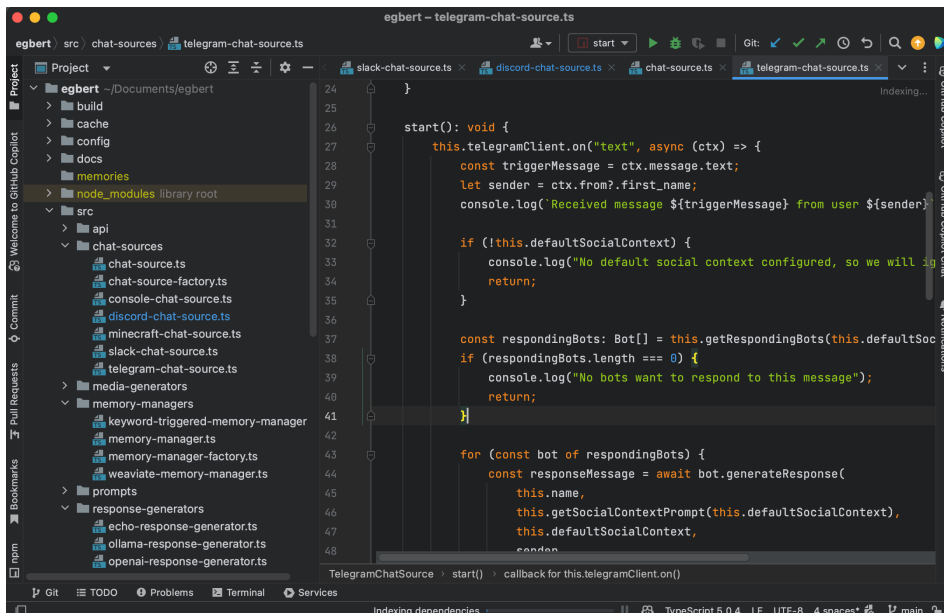
yyyy-mm-dd



ADD IT NOW!

AI in your IDE

How most people code with AI IDE



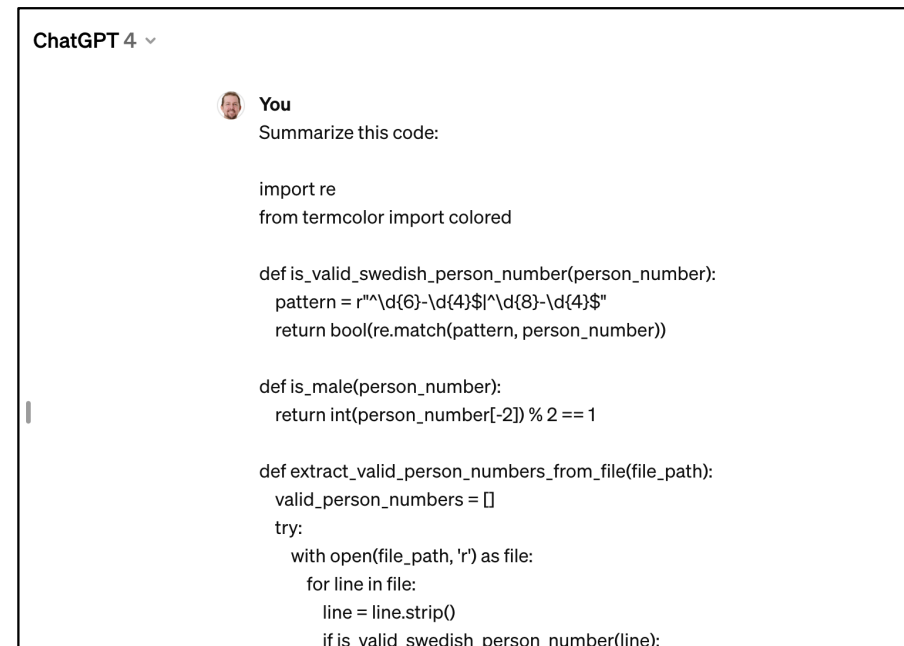
Lots of
copy/paste



Hard to know
which code to
include as
context

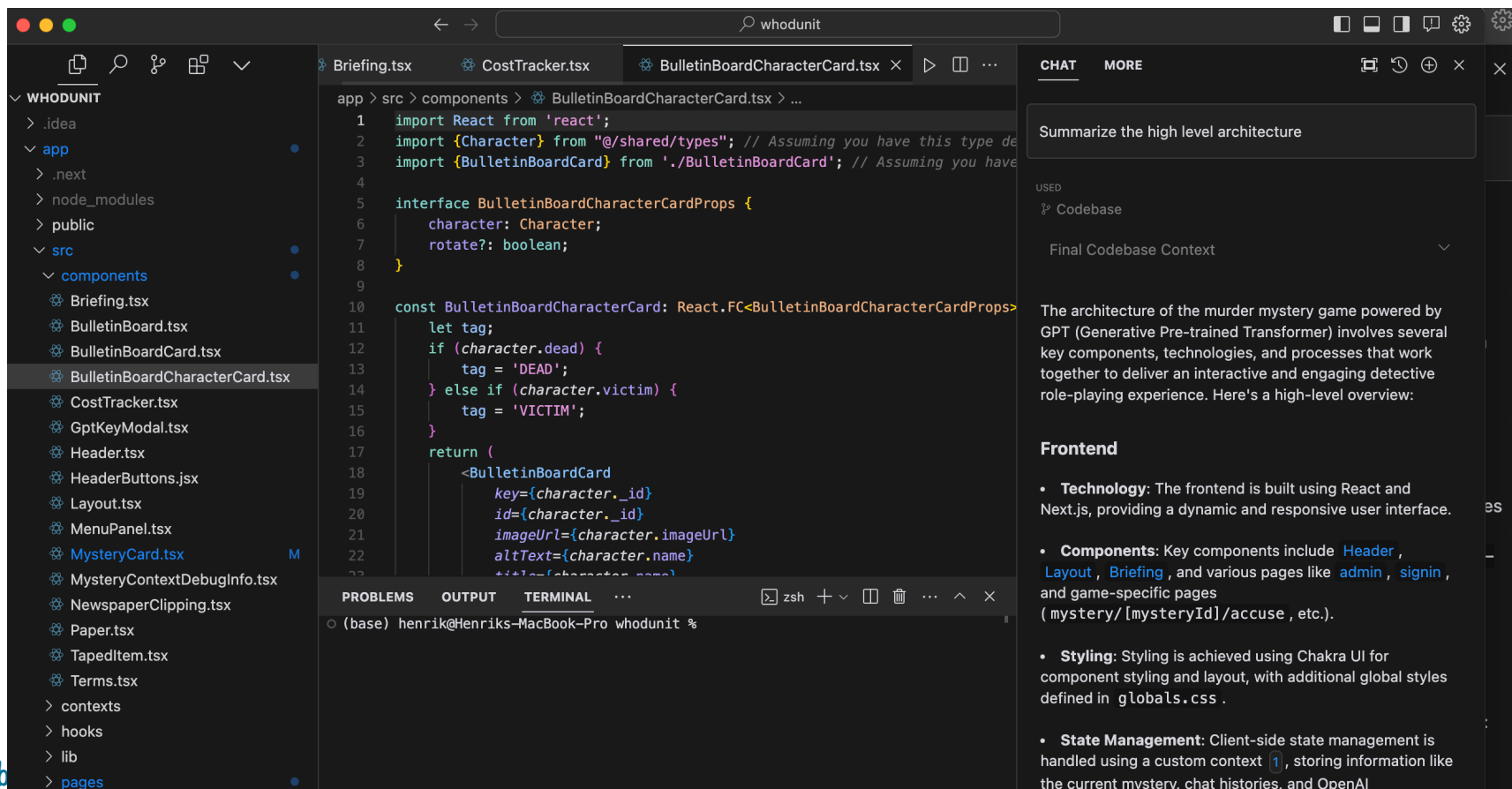
+ GitHub Copilot for simpler things,
like just adding a function.

ChatGPT 4



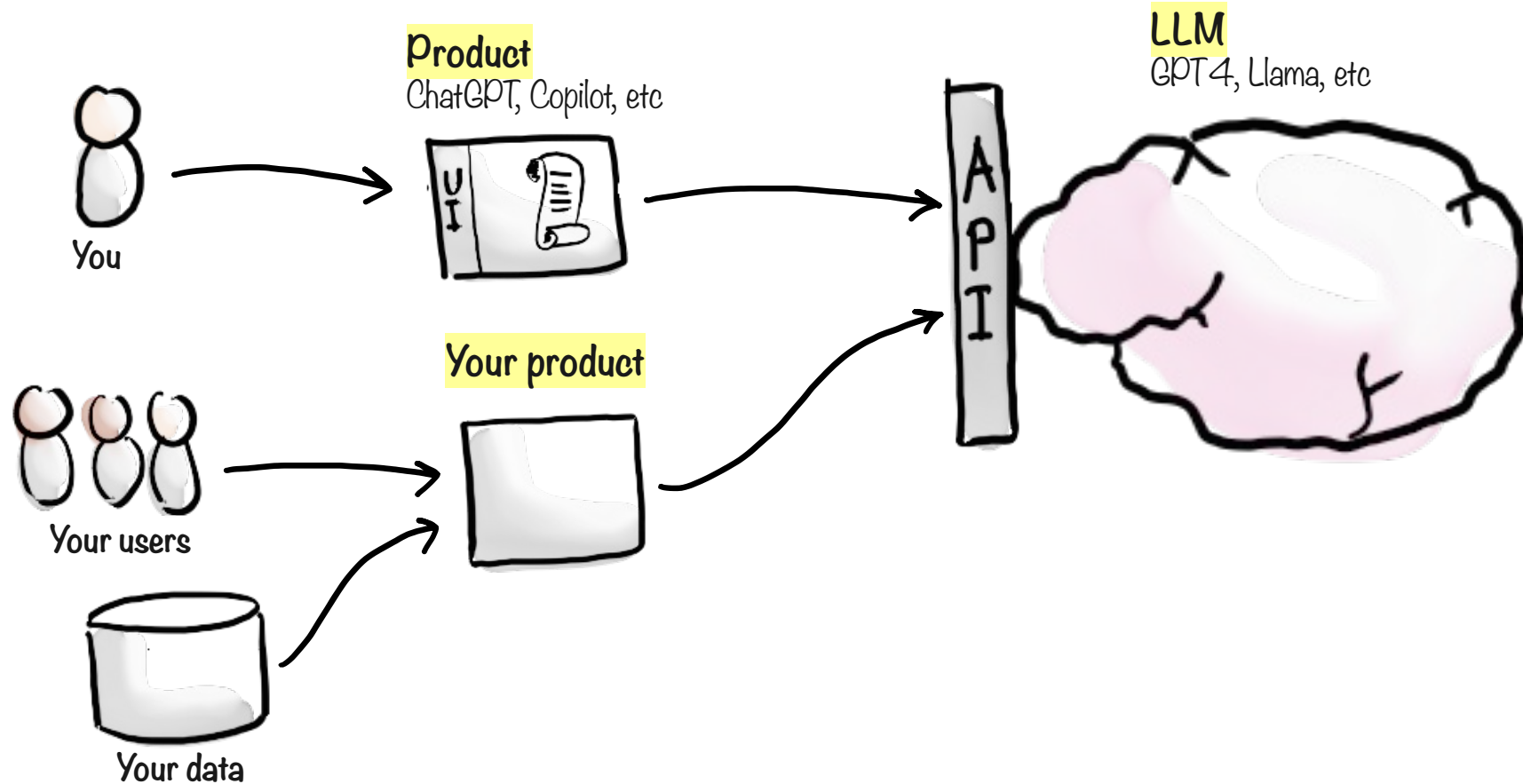
Cursor.sh = AI-native IDE

- Almost no copy paste
- AI can edit the code directly
- Codebase is the context
- You can paste in drawings/screenshots too!

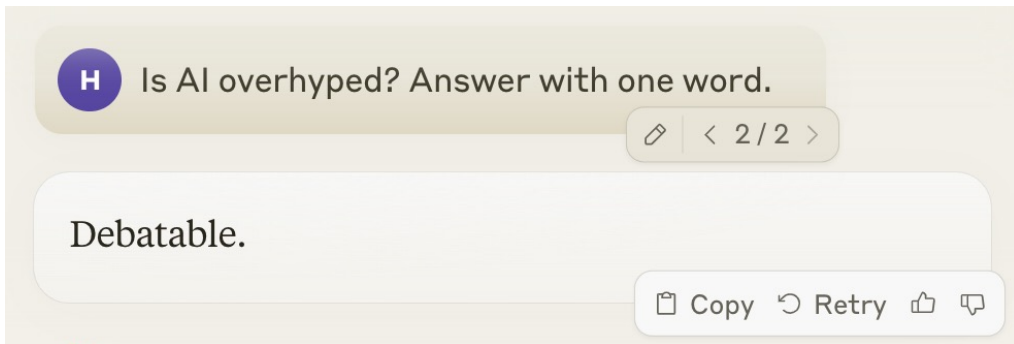


Demo 2: Working with APIs

Using vs Building AI powered products



Let's make a cost-aware AI chat



<https://openai.com/api/pricing/>

Model	Pricing
gpt-4o	\$5.00 / 1M input tokens
	\$15.00 / 1M output tokens

ANGRY AI CHAT

HI

HELLO! HOW CAN I ASSIST YOU TODAY?

Tokens: 27 (Prompt: 18, Completion: 9)

Cost: \$0.000045

GRRAT

IT LOOKS LIKE THERE MIGHT HAVE BEEN A TYPO IN YOUR MESSAGE.
DID YOU MEAN "GREAT"? HOW CAN I ASSIST YOU TODAY?

Tokens: 46 (Prompt: 20, Completion: 26)

Cost: \$0.000082

**TOTAL
COST**

\$0.000127

Type your message here...



Demo: Working with legacy code

Demo: working with legacy code

Example:
whodunit.kniberg.com

WhoDunit an AI powered detective role-playing game

GPT key Sign in

Which mystery do you want to solve?

Generate new mystery



The Mystery of the Stolen Clock



The Stolen Orb of Amun-Ra



Murder Bytes: The Silicon Valley Meltdown



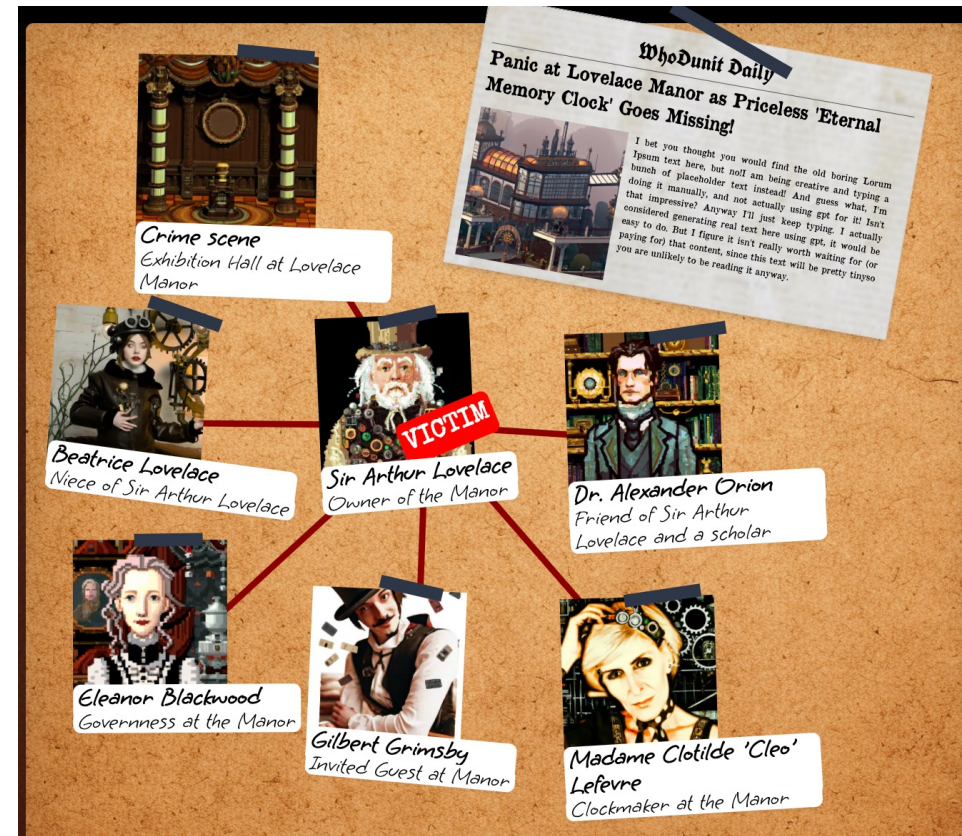
The Alpine Artifact Affair

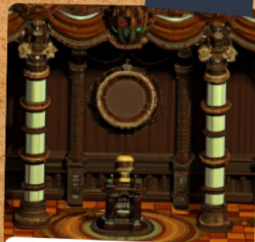


Secrets of Ashford Manor

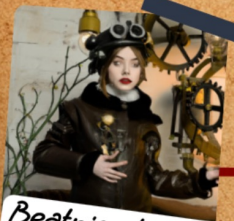


The Case of the Disappearing Milk Carton





Crime scene
Exhibition Hall at Lovelace Manor



Beatrice Lovelace
Niece of Sir Arthur Lovelace



Sir Arthur Lovelace
Owner of the Manor



Dr. Alexander Orion
Friend of Sir Arthur Lovelace and a scholar



Eleanor Blackwood
Governress at the Manor



Gilbert Grimsby
Invited Guest at Manor



Madame Clotilde 'Cleo' Lefevre
Clockmaker at the Manor

Case File: The Mystery of the Stolen Clock

Welcome, Detective!

In the foggy hilltops of whimsical Steampunk Victorian England, an intricate crime unfurls within the eccentric splendor of Lovelace Manor, a grand mansion famed for its innovative steam-powered contraptions. The crime that shakes the manor is the theft of the priceless "Eternal Memory Clock", an artifact known to harbor secret depths, from the manor's grand exhibition hall.

Unfamiliar faces involved in our mystery:

- **Sir Arthur Lovelace:** The elderly master of this manor, and the distraught victim of the crime.
- **Beatrice Lovelace:** His young, fashion-conscious niece who has recently returned to the manor.
- **Dr. Alexander Orion:** A gentleman scholar and a long standing friend of Sir Arthur, with a deep interest in the stolen artifact.
- **Eleanor Blackwood:** The manor's enigmatic governess, known for her discreet ways and suspicious glances.
- **Gilbert Grimsby:** A notorious rake and gambler, invited by Sir Arthur, and seen frequently in Beatrice's company.
- **Madame Clotilde "Cleo" Lefevre:** The manor's vivacious resident French clockmaker with a quirky demeanor.

As the detective, it is **your task** to interrogate the suspects, navigate the grandeur of Lovelace Manor, and scrutinize the bewildering crime scene at the exhibition hall. The identity of the thief lies hidden within a web of whispers and secrets, and you must be the one to unravel it. Don your investigative cap, gather your discerning sense of intuition, and unearth the truth of this genteel mystery!

The Mystery of the Stolen Clock

Open case file & bulletin board



Crime scene
Exhibition Hall at Lovelace Manor



Sir Arthur Lovelace
Owner of the Manor



Beatrice Lovelace
Niece of Sir Arthur Lovelace



Interrogation log: Sir Arthur Lovelace

An eminent inventor, and the owner of Lovelace Manor, Sir Arthur Lovelace, showcases an eccentric marriage of aesthetics and functionality within his surroundings.

Detective:

When was your clock stolen?

Sir Arthur Lovelace:

Sir Arthur steeples his fingers and gazes off into the distance. "The incident happened last night during the grand ball. I reckon it was close to 8 P.M., right around the fiery spectacle orchestrated by my dear friend, Dr. Orion." His voice trails off, a mix of sadness and suspicion hanging in the air.

Do you have any idea who might have done it?



The Mystery of the Stolen Clock

Open case file & bulletin board



Crime scene
Exhibition Hall at Lovelace Manor



Sir Arthur Lovelace
Owner of the Manor



Investigation Summary & Accusation

Describe who you want to arrest, and why you think they are guilty.
Be careful! An incorrect accusation can lead to innocent people being arrested.

Madame Clotilde is the only one who wasn't at the grand ball at the time of the crime, so she is guilty. Plus she is a clockmaker and was interested in that clock, so she had motive too.

ACCUSATION ACCEPTED

Officer's Response

Your deduction seems plausible, detective. Madame Clotilde's absence during the crime and her interest in the clock certainly raises suspicion. Plus her being a clockmaker adds to her motive. I am convinced and will arrest her immediately. I appreciate your help.

But wait, did you really get the right culprit?

Go to ending page

The Mystery of the Stolen Clock

Open bulletin board



Crime scene
Exhibition Hall at Lovelace Manor



Sir Arthur Lovelace
Owner of the Manor



Beatrice Lovelace
Niece of Sir Arthur Lovelace



Dr. Alexander Orion
Friend of Sir Arthur Lovelace and a scholar



Eleanor Blackwood
Governess at the Manor



WhoDunit Daily

Innocent Heiress Beatrice Lovelace Arrested in Manor Mystery – Real Culprit Still at Large?



"Despite high-profile photo evidence and a dramatic confession, sources suggest the true criminal may still be at large. Officer Barnaby, the leading authority in the case, expressed his concern: 'While the evidence against Miss Lovelace was undeniably substantial, inconsistencies in the case persist.' He insisted that the investigation would continue until justice has been served. Those close to Beatrice protest her innocence and demand a swift investigation into these glaring anomalies."

Detective Evaluation

FAILURE

You lost! An innocent person was arrested. Shame on you!

Epilogue

Months later, the grand Lovelace Manor—with its whimsical gears and steam-powered—stands quietly under the shadow of a chilling mysteries. Beneath the grandeur and extravagance, there's a palpable tension. Beatrice Lovelace, innocent and yet bearing of her untrue confession, is isolated within the opulent walls of the manor, a specter of suspicion and regret. The missing 'Eternal Memory Clock' remains despite her arrest, adding credibility to those who argue her innocence. As the days stretch into months, the townsfolk begin pondering who truly committed the audacious theft. The truth, it seems, is still locked within the intricate gearworks and labyrinthine corridors of Lovelace Manor... still hidden, still ticking away.

[Back to Lobby](#)

Epilogue

Detective Evaluation

PARTIAL SUCCESS

You won partially. You caught the main culprit, but there were more who got away.

Epilogue

Months after the arrest of Madame Clotilde, Lovelace Manor has regained some of its exuberance, hosting a grand event to commemorate the partial solving of the crime. Guilty or not, the arrest of Clotilde has raised more questions. There's lingering unease amidst the grandeur, whispers among the attendees about a second perpetrator who may still be on the loose. While the beloved Eternal Memory Clock hasn't resurfaced, the gears of justice continue to turn, raising hopes that one day the missing pieces of this intricate puzzle may fall into place. But as the fog coats the hilltop where Lovelace Manor stands, everyone can't shake the feeling that the clock's secrets are further dying in the depths of the unknown.

[Back to Lobby](#)

Sample prompts used

"I'm planning to make a game about <....>. Please suggest a suitable architecture and tech stack. List several options, with pros and cons."

"This UI is ugly, looks like a boring corporate website. Make it look more like a game!"

"How can we make the game more challenging and varied?"

"Clean up the code. Make it easier to read, and extract components."

"You are a security expert. Go through the code and point all the security weaknesses."

"What are the pros & cons of Chakra vs CSS?"

"It crashed when I generated a new mystery. Fix it."
<stack trace>

"How do I deploy this?"

Demo: working with legacy code

The screenshot shows a code editor with a file explorer on the left, a code editor in the center, and a chat window on the right.

File Explorer (Left):

- WHODUNIT
 - .idea
 - app
 - .next
 - node_modules
 - public
 - src
 - components
 - Briefing.tsx
 - BulletinBoard.tsx
 - BulletinBoardCard.tsx
 - BulletinBoardCharacterCard...
 - CostTracker.tsx
 - GptKeyModal.tsx
 - Header.tsx
 - HeaderButtons.jsx
 - Layout.tsx
 - MenuPanel.tsx
 - MysteryCard.tsx
 - MysteryContextDebugInfo.tsx
 - MysteryTable.tsx** (U)
 - NewspaperClipping.tsx
 - Paper.tsx
 - TapedItem.tsx
 - Terms.tsx
- OUTLINE
- TIMELINE

Code Editor (Center):

```
app > src > components > MysteryTable.tsx > [U] default
1  import React from 'react';
2  import { Table, Thead, Tbody, Tr, Th, Td, Button, Tag, HStack } from '@chakra-ui/react';
3  import { MysteryStub } from '@shared/types';
4  import Link from 'next/link';
5
6  interface MysteryTableProps {
7    mysteries: MysteryStub[];
8    updateMystery: (id: string, update: Partial<MysteryStub>) => void;
9    deleteMystery: (id: string) => void;
10 }
11
12 const MysteryTable: React.FC<MysteryTableProps> = ({ mysteries, updateMystery, deleteMystery }) => {
13   return (
14     <Table variant="simple">
15       <Thead>
16         <Tr>
17           <Th>Name</Th>
18           <Th>Status</Th>
19           <Th>Actions</Th>
20         </Tr>
21       </Thead>
22       <Tbody>
23         {mysteries.map(mystery => (
24           <Tr key={mystery._id}>
25             <Td>
26               <Link href={`/mystery/${mystery._id}`}>
27                 {mystery.name}
28               </Link>
29             </Td>
30             <Td>
31               <HStack spacing={2}>
```

Chat Window (Right):

WhoDunit - AI powered detective role-playing game

Which mystery do you want to solve?

I would like to be able to toggle between this card-based layout, and a simple table layout where each mystery is one row in the table.

USED

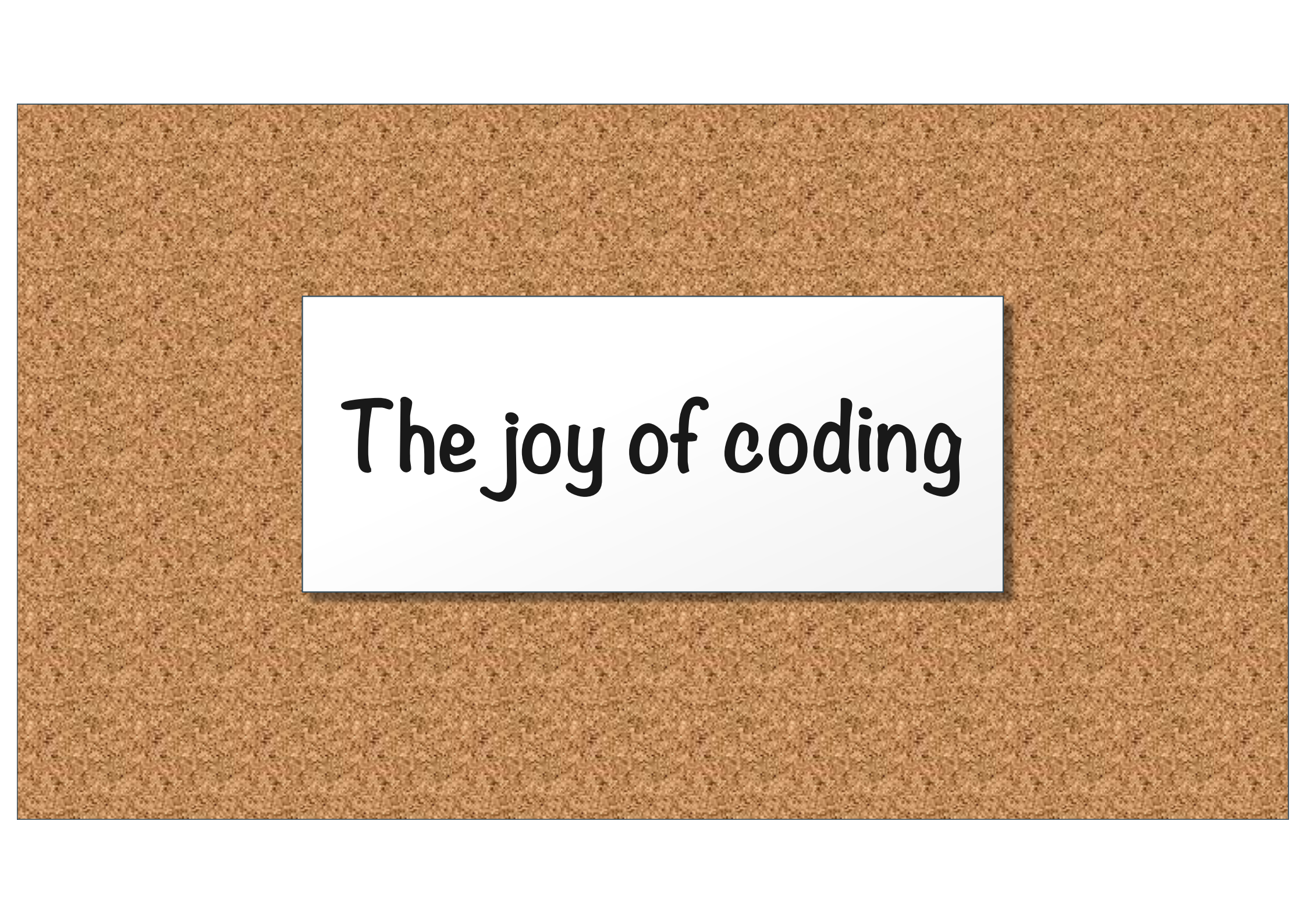
Image Codebase

Final Codebase Context

To implement a toggle between the card-based layout and a simple table layout, we'll need to make some changes to the existing code. We'll add a new state to track the current layout, create a new table component, and add a toggle button. Here's how we can modify the code:

Food for thought

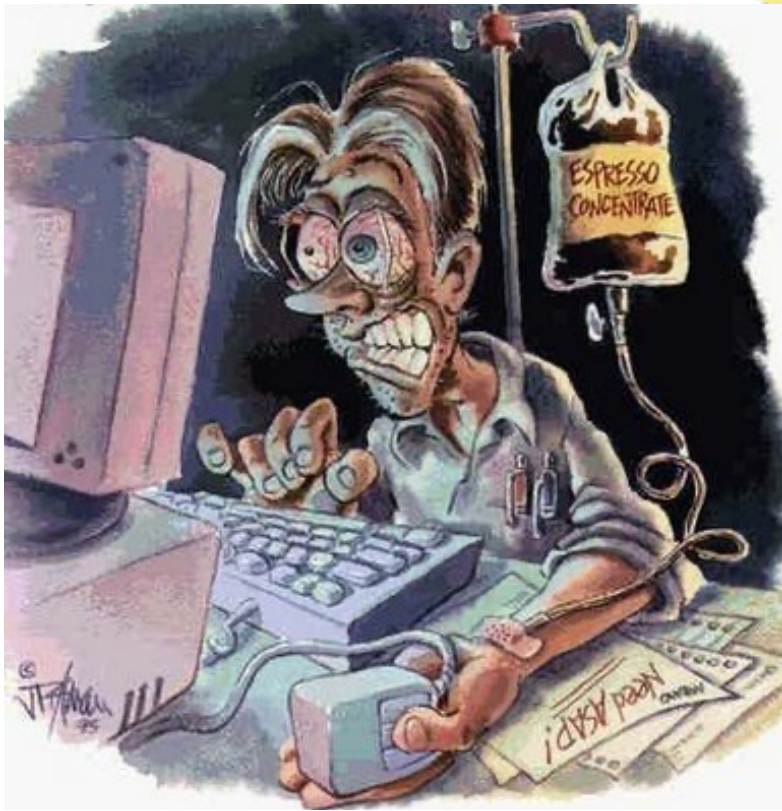
How long would all this coding have taken without AI assistance?

A corkboard background with a white rectangular sign in the center. The sign has a thin black border and a subtle drop shadow.

The joy of coding

Do you like
to code?

Is it really the Typing Of Code that you like though?



Henrik Kniberg

The joy of ~~eoding~~
making

~~Do you like
to code?~~

~~Is it really the Typing Of Code that you like though?~~

Do you like to
make software?

Do you like to
solve problems?



Choose your level of "laziness"



0%

Laziness scale



100%

You write the code manually, no AI help



AI suggests code, you get ideas from it but then write it manually



AI writes the initial code, you read it & tweak it



AI writes the code, you skim it and sanity-check



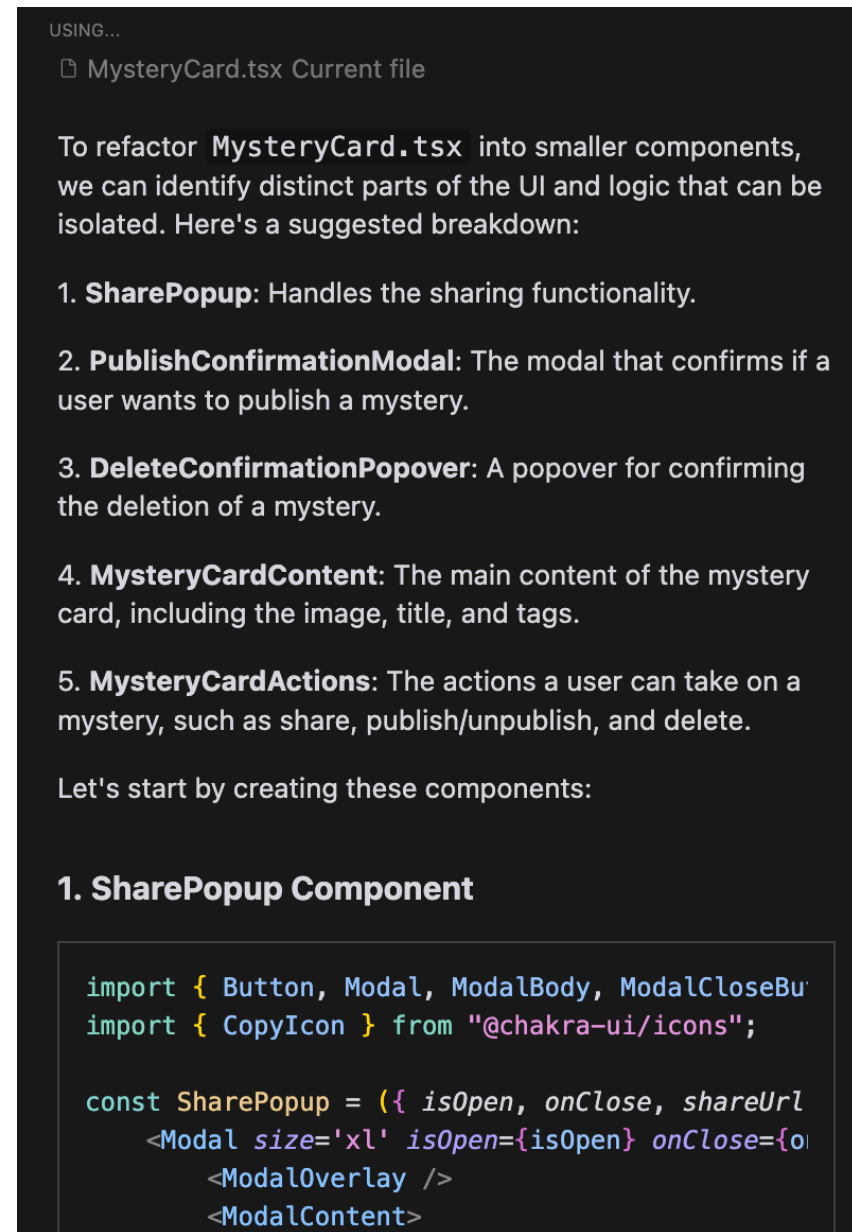
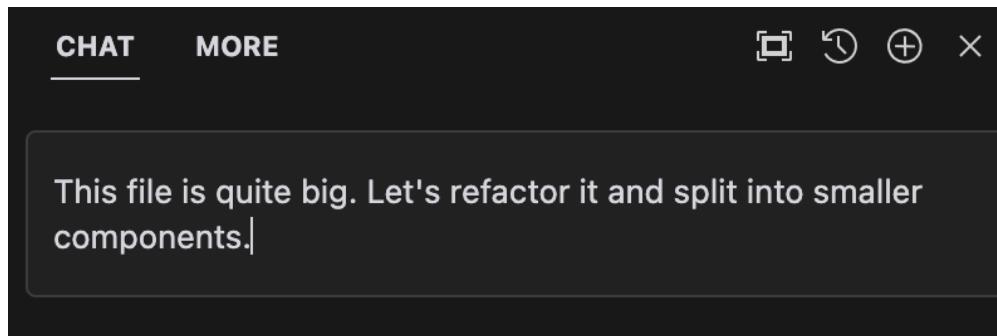
AI writes the code, you don't even look at it.



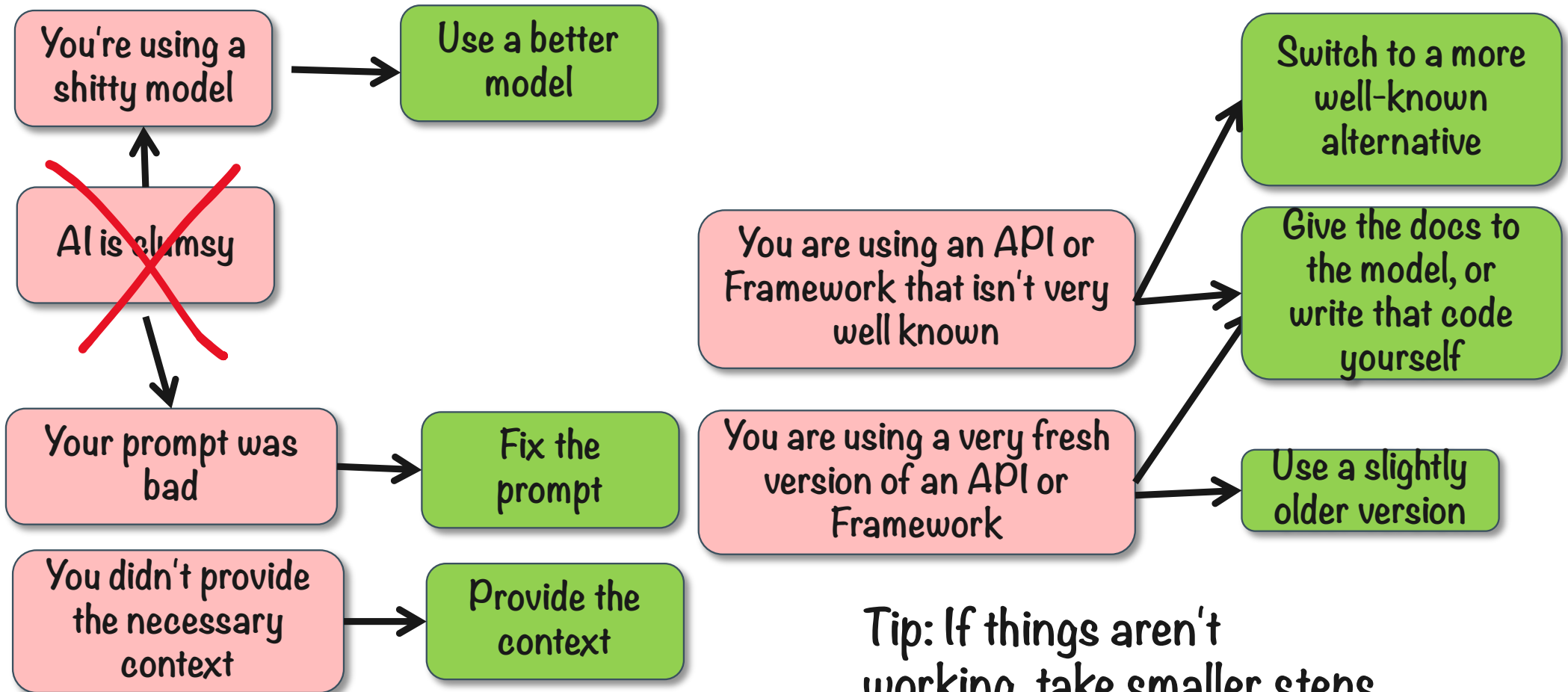
Your attention is a Limited Resource.
Choose wisely where to spend it.

A corkboard with a white card in the center. The word "Quality" is written on the card in a black, cursive-style font.

Quality



The AI-generated code didn't work, or the quality sucks. Why?

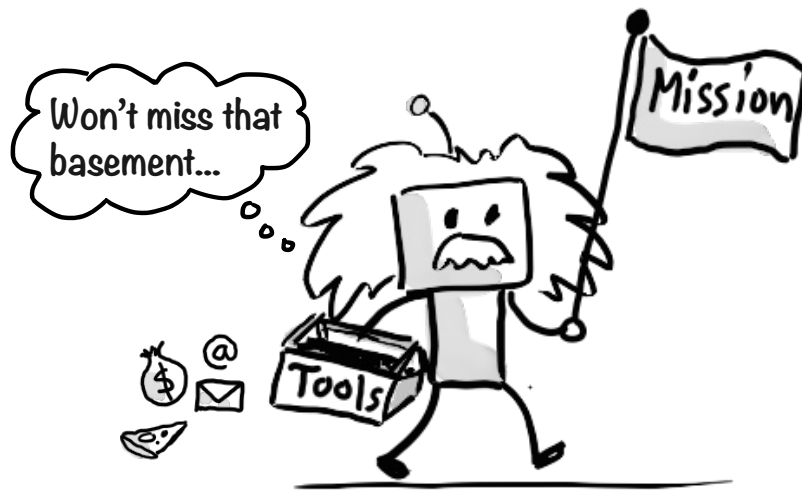


Tip: If things aren't working, take smaller steps

A photograph of a brown corkboard with a white rectangular card pinned to its center. The card has the text 'What's next?' written on it in a black, casual script font.

What's next?

Autonomous Agents with Tools



Example

Mission: Fix bugs

Tools:

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



Bob the Fixer 07:30 AM

Good morning team!

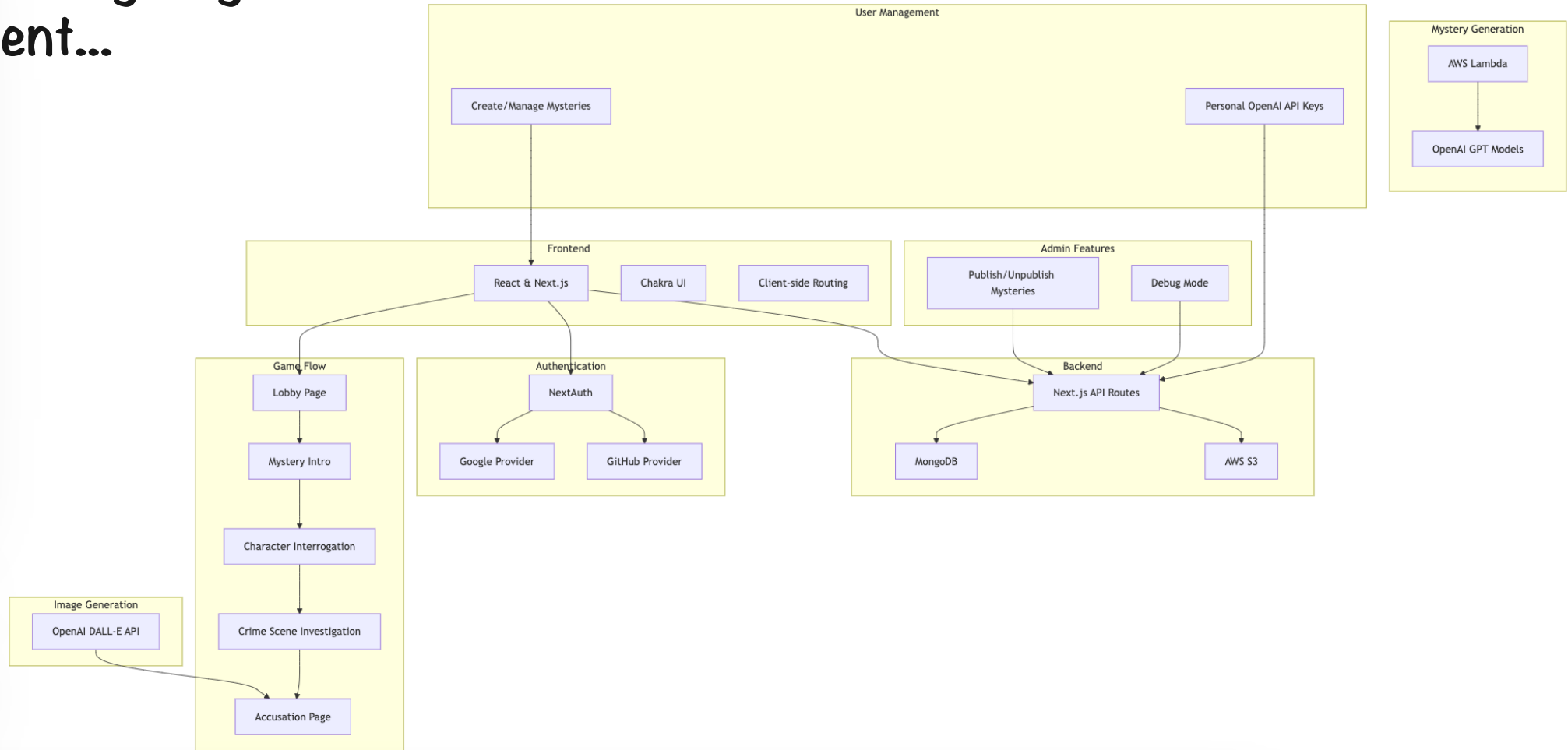
I fixed bugs #235 and #296, they were related and pretty straight-forward. Added a PR for it.

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

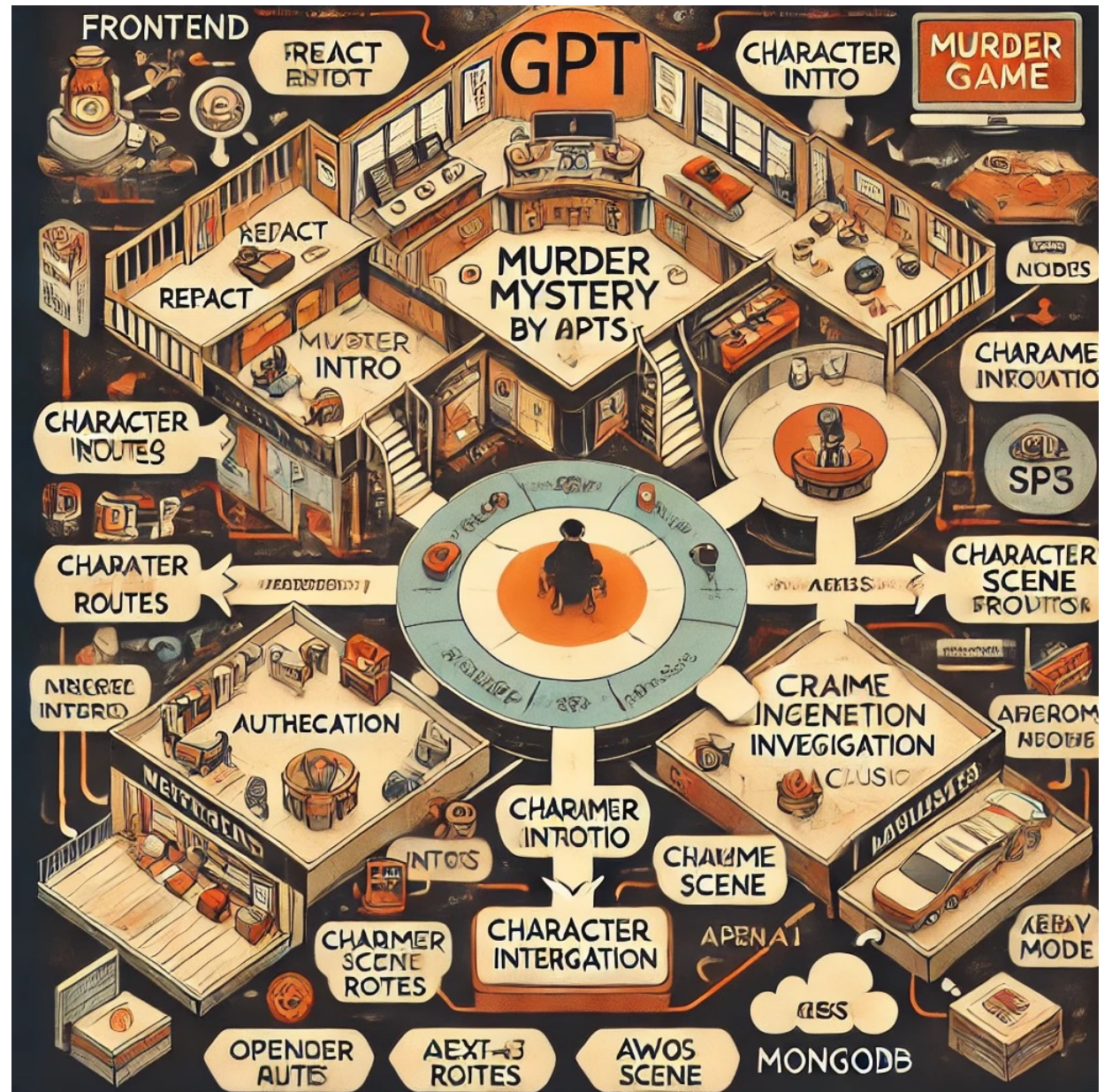
Everything improving at a breakneck pace

- Larger context windows = AI can read and understand a massive codebase
- Ability to make Big Edits with a single prompt (edit/create multiple files)
- Improved speed
- More multimodality, more real-time (ex: talking to your IDE while it is coding)
- Less hallucination
- AI models that look stuff up (= works better with APIs)
- More proactiveness – AI takes initiative, suggests things
- AI generating useful diagrams and visualizations

AI models aren't very good at generating diagrams at the moment...



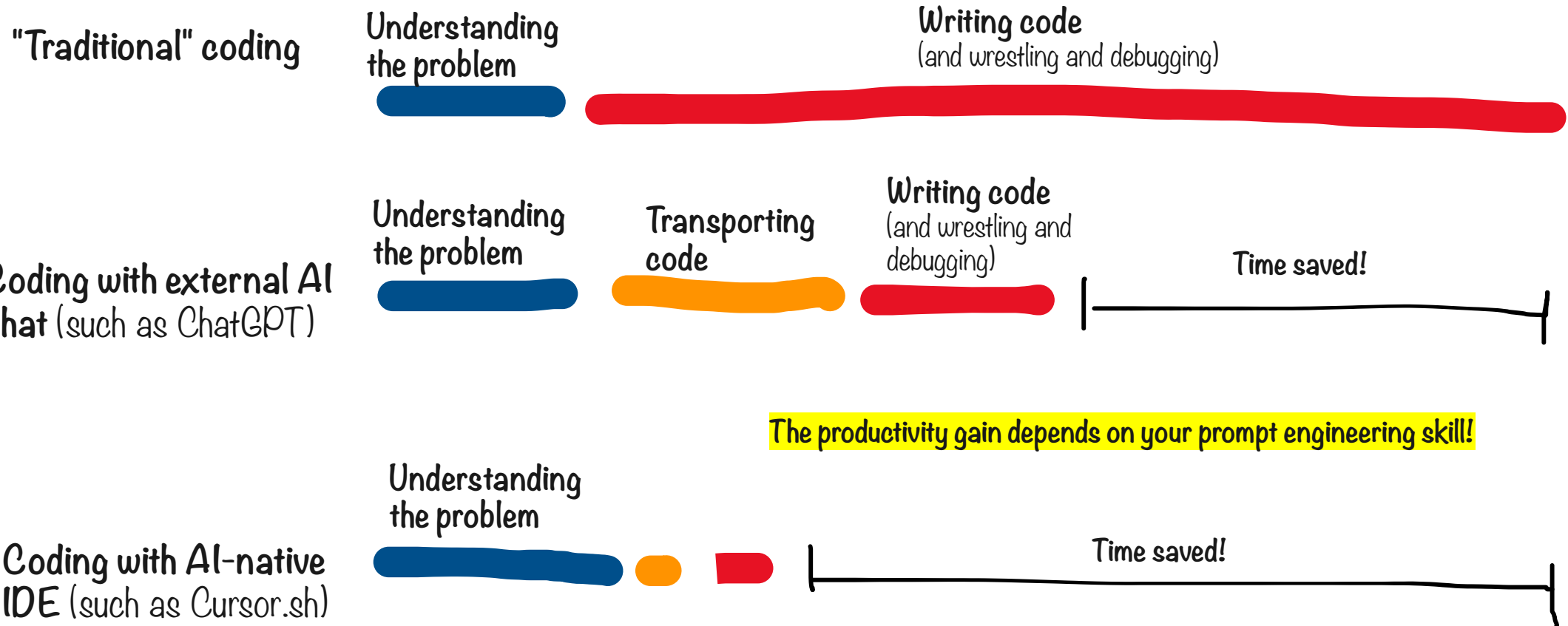
Henrik Kniberg



A corkboard with a white rectangular sign in the center. The sign has the word "Recalibrate" written on it in a bold, black, sans-serif font.

Recalibrate

Developer productivity



The role of humans

Is human role X still needed?

Doctor, Developer, Lawyer, CEO, Teacher, etc

Decide what to ask
and how

Evaluate results

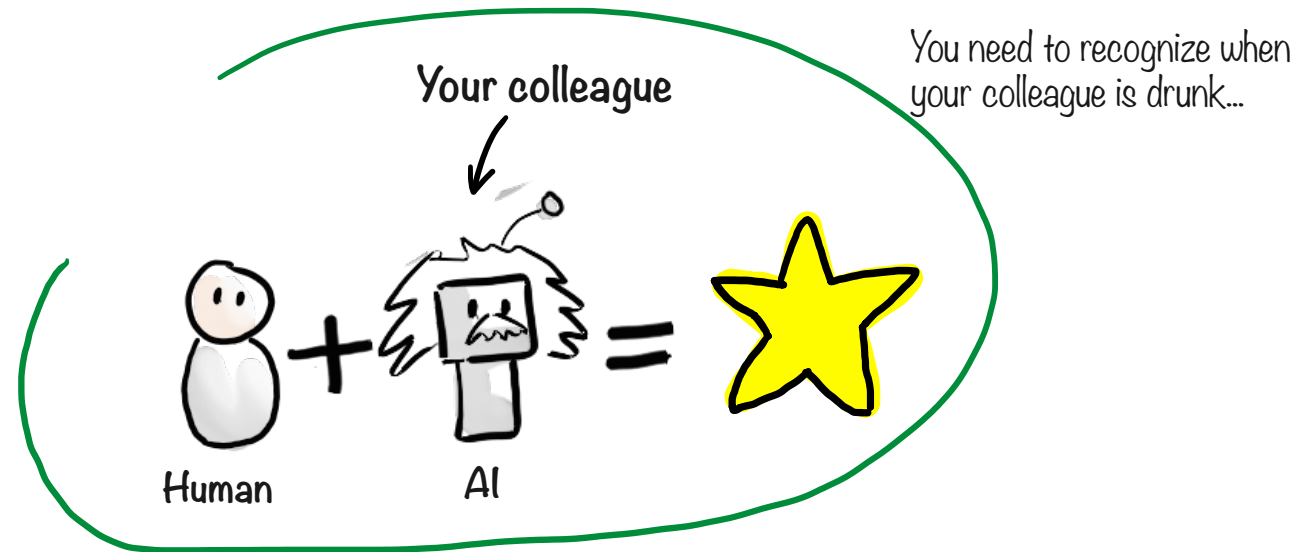
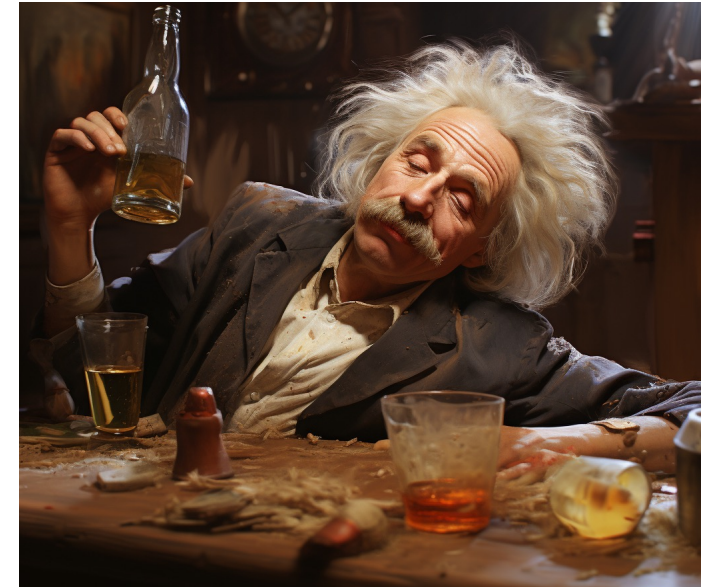
Beware of hallucinations!

Provide context

Compensate for AI weaknesses

Legal compliance

Data security





Kent Beck 🌻
@KentBeck

Promote



I've been reluctant to try ChatGPT. Today I got over that reluctance. Now I understand why I was reluctant.

The value of 90% of my skills just dropped to \$0. The leverage for the remaining 10% went up 1000x. I need to recalibrate.

12:51 PM · Apr 18, 2023 · 1.4M views

📊 View post engagements

💬 195

↻ 1K

❤️ 5.8K

🔖 1K



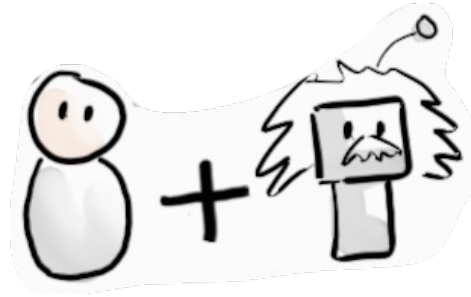
Recalibrate!



Things I should continue doing

Things that I'll finally have more time to do!

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Things that AI can help me with

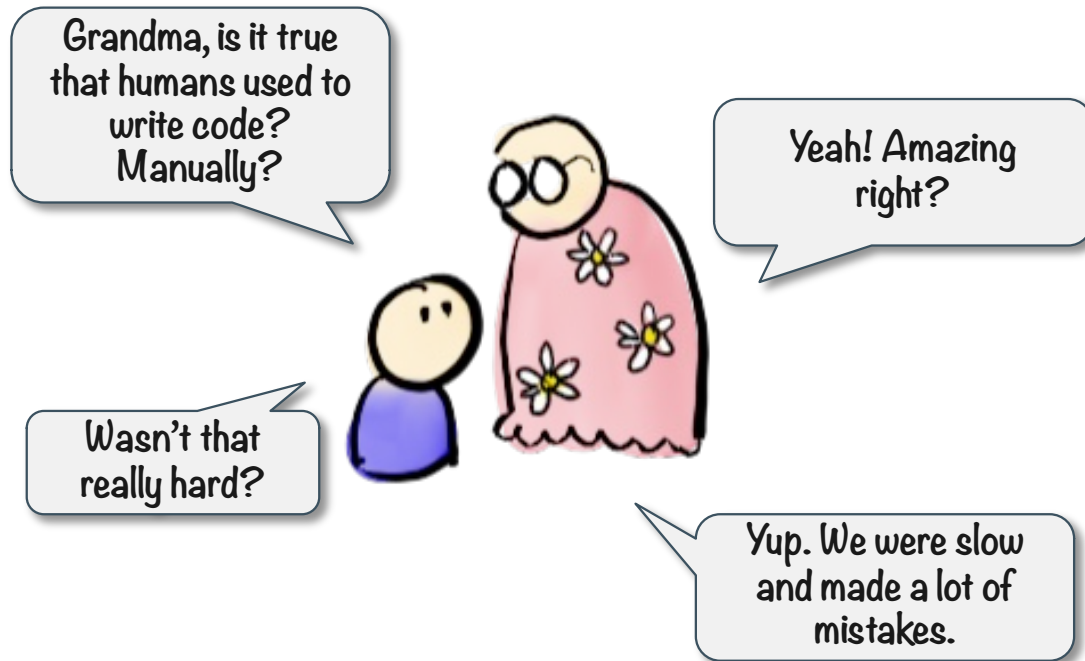


Things that AI can do instead of me

Things that no longer need to be done at all

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The probable future



Plain human language

When a user has finished watching a movie, ask if they want to watch another one and provide some suitable recommendations.

High level programming language

```
private static boolean checkCriterion(ArrayList<MyComplex> neighbors,
                                     double noiseLevel, double ratio){
    if (neighbors.size() > 2){
        double mean = neighbors.get(0).getAbs();
        for (int i=1; i<neighbors.size(); i++)
            mean += neighbors.get(i).getAbs();
        mean /= neighbors.size();

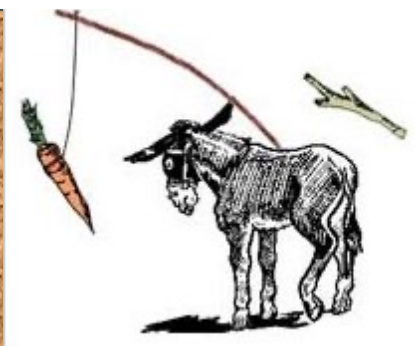
        if (mean > noiseLevel){
            for (int i=0; i<neighbors.size(); i++)
                if (neighbors.get(i).getAbs() > (mean*ratio))
                    return true;
        }
        return false;
    }
    return true;
}
```

Assembly language

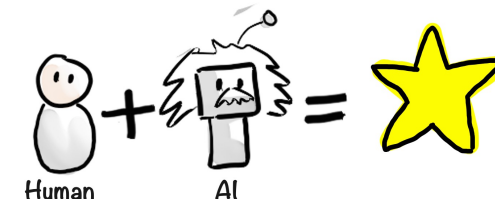
[illegible]

Punch cards





Key points



Carrot:

Gen AI can make you insanely productive as a developer, if you learn to work with it

The biggest limitation is you

Developers are still needed, but the way of working changes

Recalibrate how you spend your time

Stick:

Devs who don't know how to work effectively with Gen AI will be unemployable

