

# Competences for working with Generative AI

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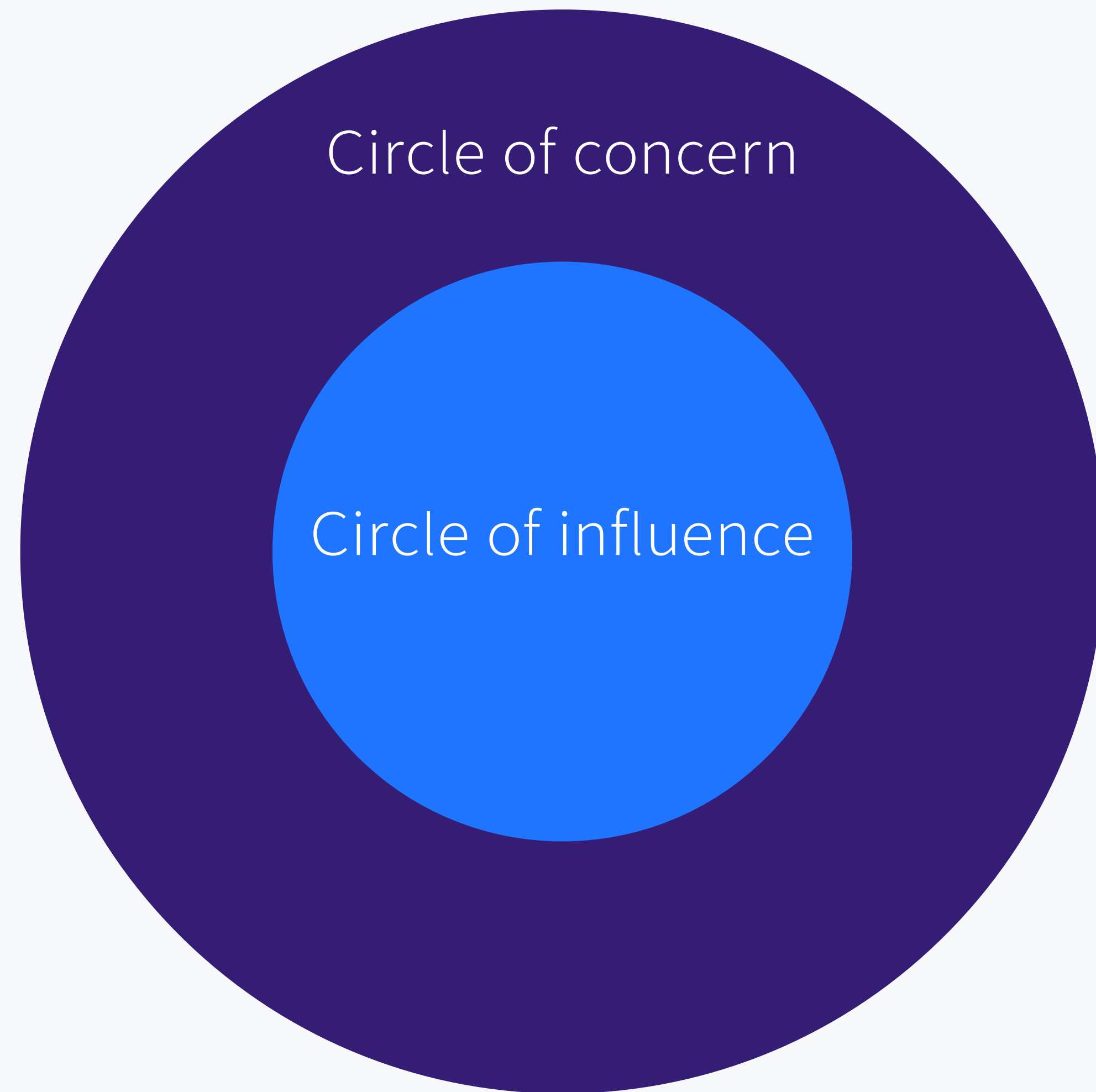
PhD in Human-Computer interaction from RWTH Aachen  
University, Germany

Previously:

Assistant professor at University of Zurich  
Lecturer at Swansea University, UK

**Research:** Improving how computer can help people do better  
and transparent science <https://chatw.ch>





Purpose: **Inspire you with some ways to involve AI to make your work more delightful**

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Out of scope (but I could share my thoughts later):

- Fairness of using AI to make decisions
- Intellectual properties issues of using data to train AI
- Effect of GenAI on education, culture, and human creativity
- Will AI take my job?
- How will GenAI change the economy?
- Will superintelligence kill us all?

- Mental models for thinking about AI 5 concepts
- A way to answer the question “Do I need AI?” 2 techniques
- Implications on how to work with AI 3 points

Quicknotes with  
slide number

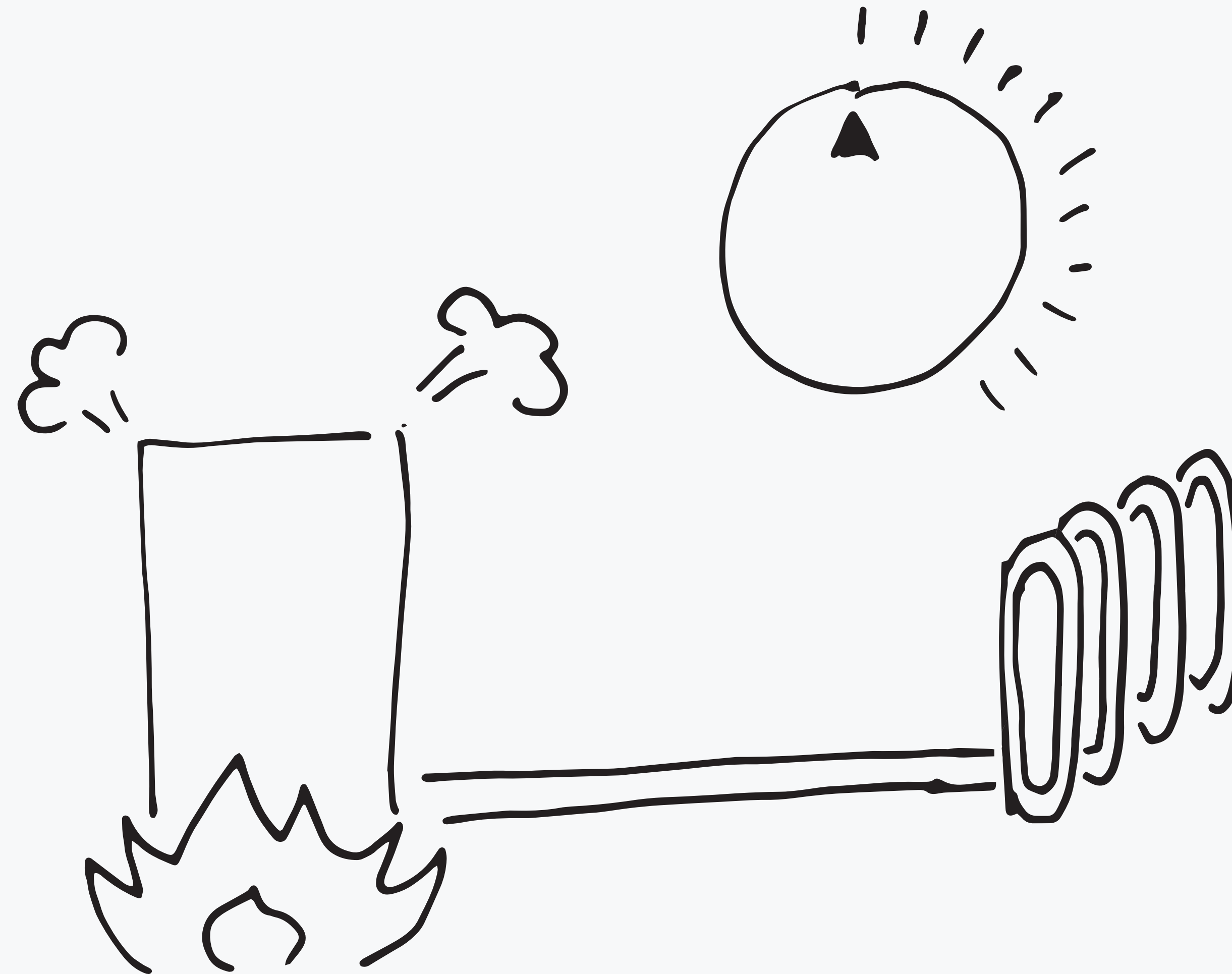
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Sources and further  
readings in  
footnotes and  
skipped slides

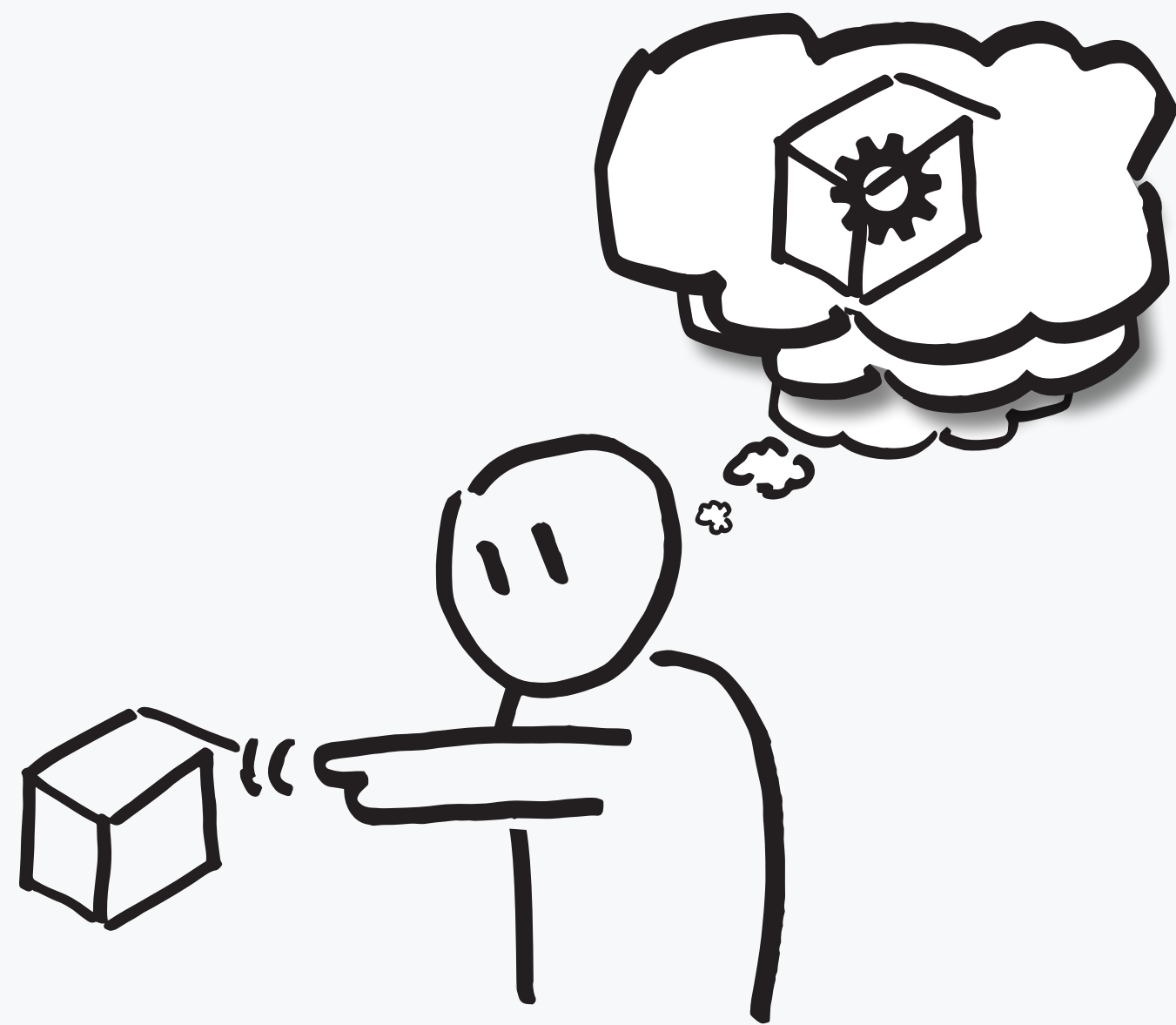
Link to the slides at  
the end of the talk



# Misleading mental models → counterproductive decisions



# Mental models



User's understanding of the product developed by interaction with the product and by extrapolation from previous, similar systems

User's mental model determines

1. **Expectations** of normal appearance and behavior
2. **How to use** the system
3. **How to repair** when things go wrong

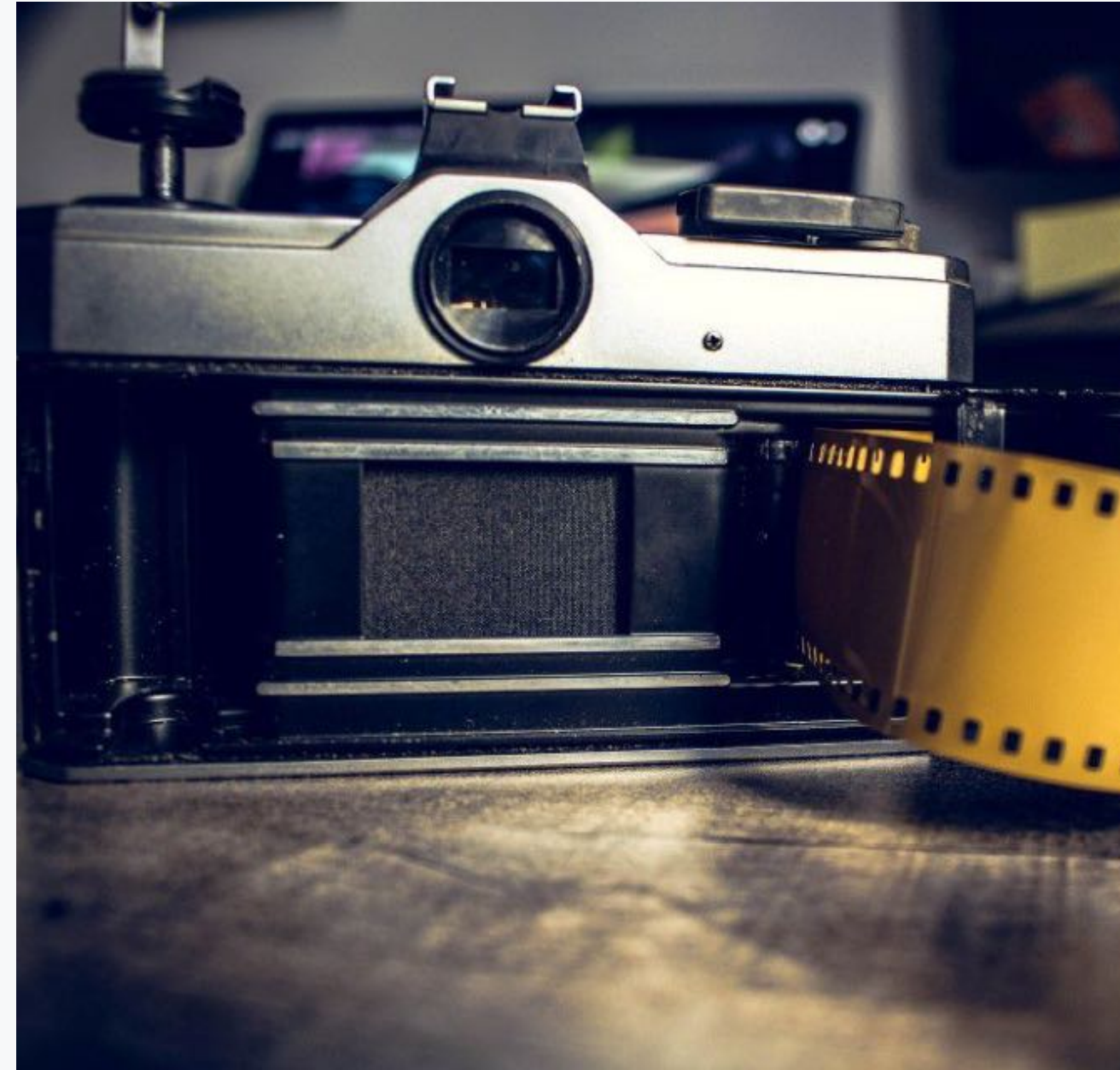
### *Some characteristics of user's mental model*

- Mental models are **incomplete** and **technically inaccurate**
- People **forget** the details, especially when those details have not been used for some period.
- People **confuse similar devices and operations** with one another.
- People **maintain "superstitious"** behavior patterns even when they know they are unneeded because they cost little in physical effort and save mental effort.
- People are willing to **trade-off extra physical action for reduced mental complexity**, especially where the extra actions allow one simplified rule to apply to a variety of devices





# Mental models in the transition period

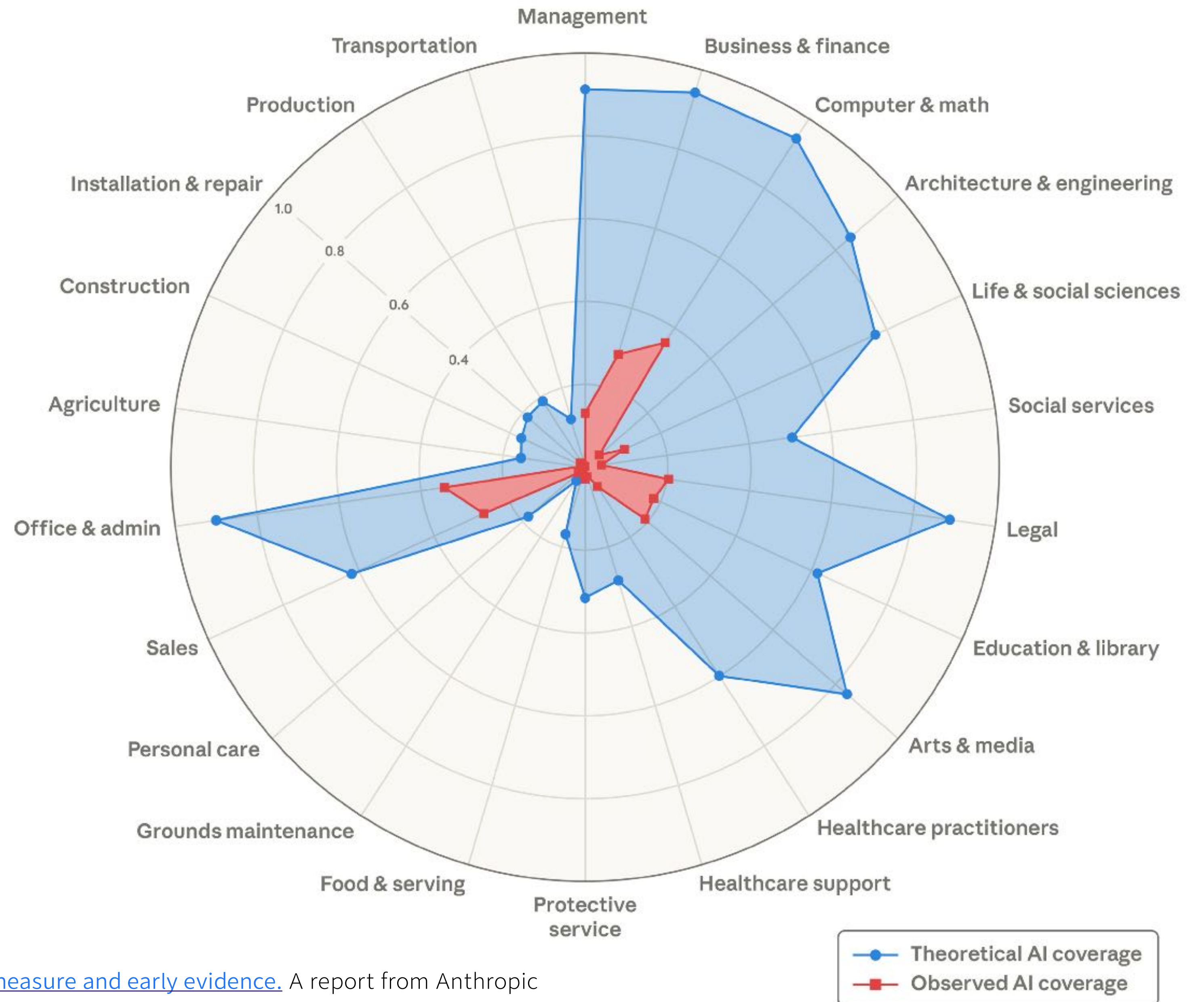


- **Future:** We should need to understand the working of AI in the same level that we currently understand how to take a photo
- **Now:** Knowing more about AI gives us an edge

# Occupational exposure to AI

A report from Anthropic in March 2026:

- AI potential is not yet at the level that is theoretically possible
- Theoretical level means using LLM can decrease time at least 50%





The Automaton of a Swiss inventor Henri Maillardet (ca. 1810 )  
currently at theFranklin Institute science museum in Philadelphia

# “AI as a person” → Not useful



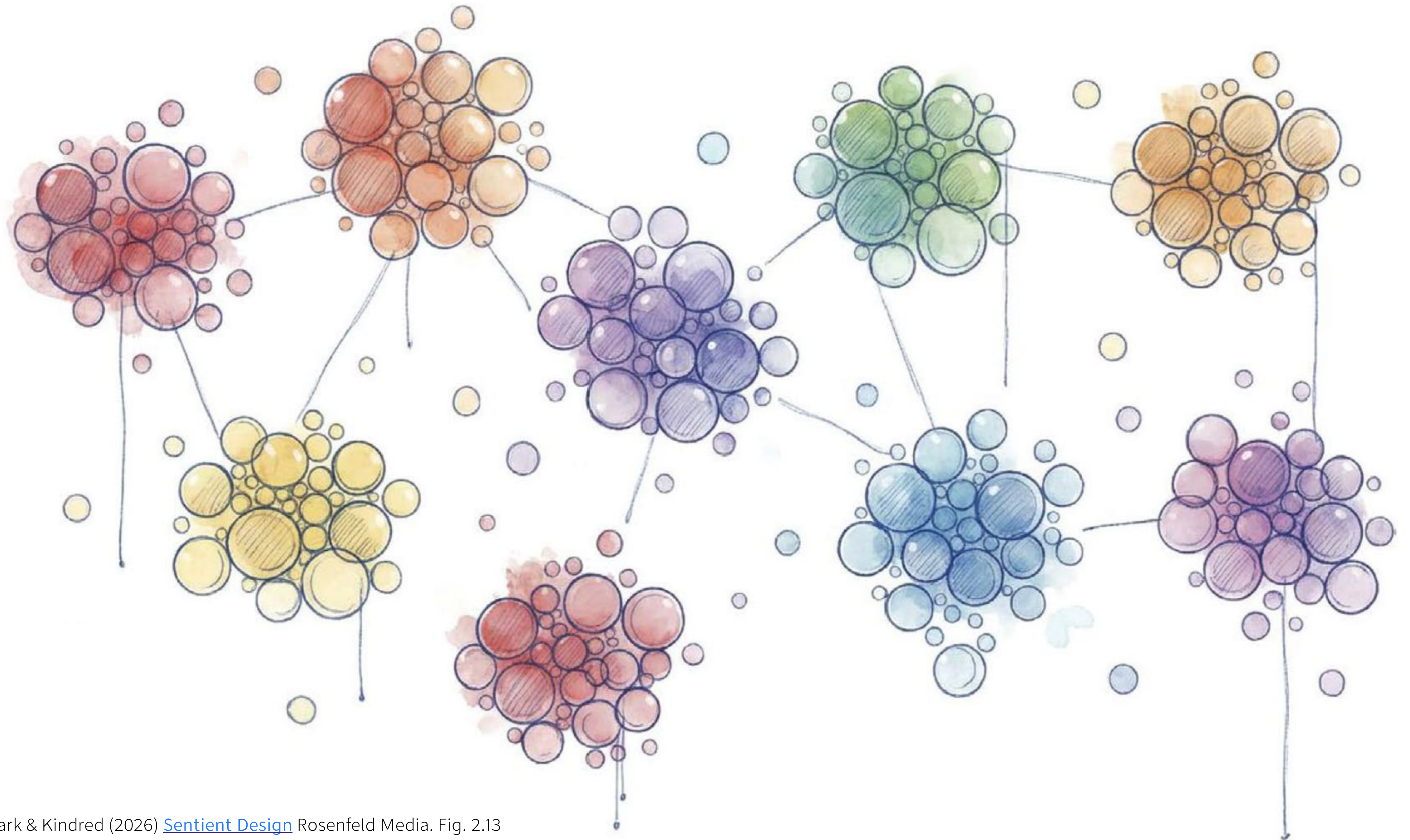
Humans tend to attribute human characteristics, behaviors, or emotions to non-human entities

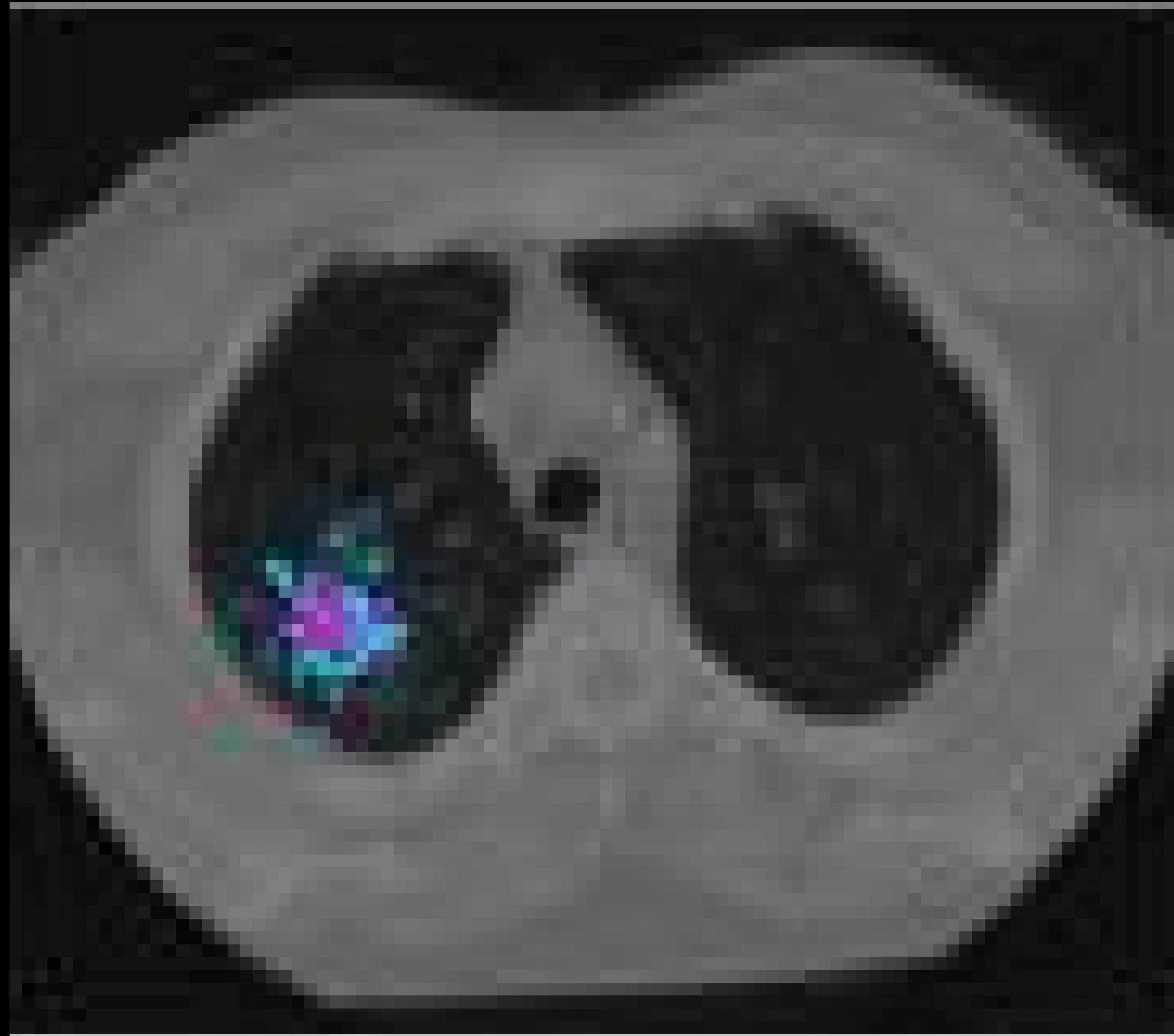
- We respond to them socially
- Based on behaviors we observe, we construct stories around them
- When these stories are detached from actual mechanisms and capabilities, we make wrong conclusions and bad decisions

The Automaton of a Swiss inventor Henri Maillardet (ca. 1810 )  
currently at the Franklin Institute science museum in Philadelphia

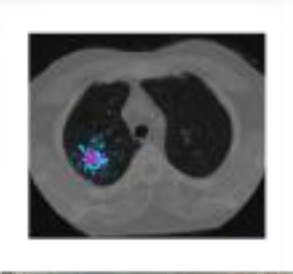
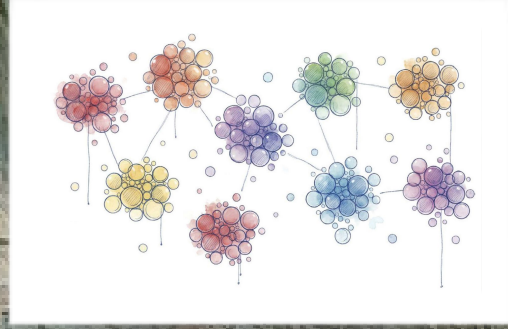
Socially: based on works of Clifford Nass and Byron Reeve under the term “The Media Equation”  
Stories: See arguments from Yuval Harari, e.g., in this news piece in [Forbes](#)  
Wrong conclusion: Cal Newport argument, e.g., in his podcast [Ep. 380 ChatGPT is not alive](#)













Large language models

Image generation models

# Artificial Intelligence (AI)

## Computer systems

- AI
  - Rules-based
    - ...
  - Machine learning (from data)
    - Classifier
    - ...
  - Generative AI
    - Image generating models
    - **Large Language Models (LLM)**
    - ...

Human:

Can you explain the history of transistors and how they're relevant to computers? What is a transistor, and how exactly is it used to perform computations?

AI assistant:

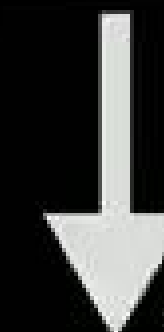
A

Human:

Can you explain the history of transistors and how they're relevant to computers? What is a transistor, and how exactly is it used to perform computations?

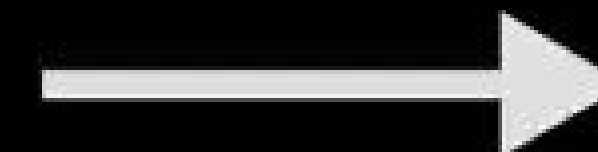
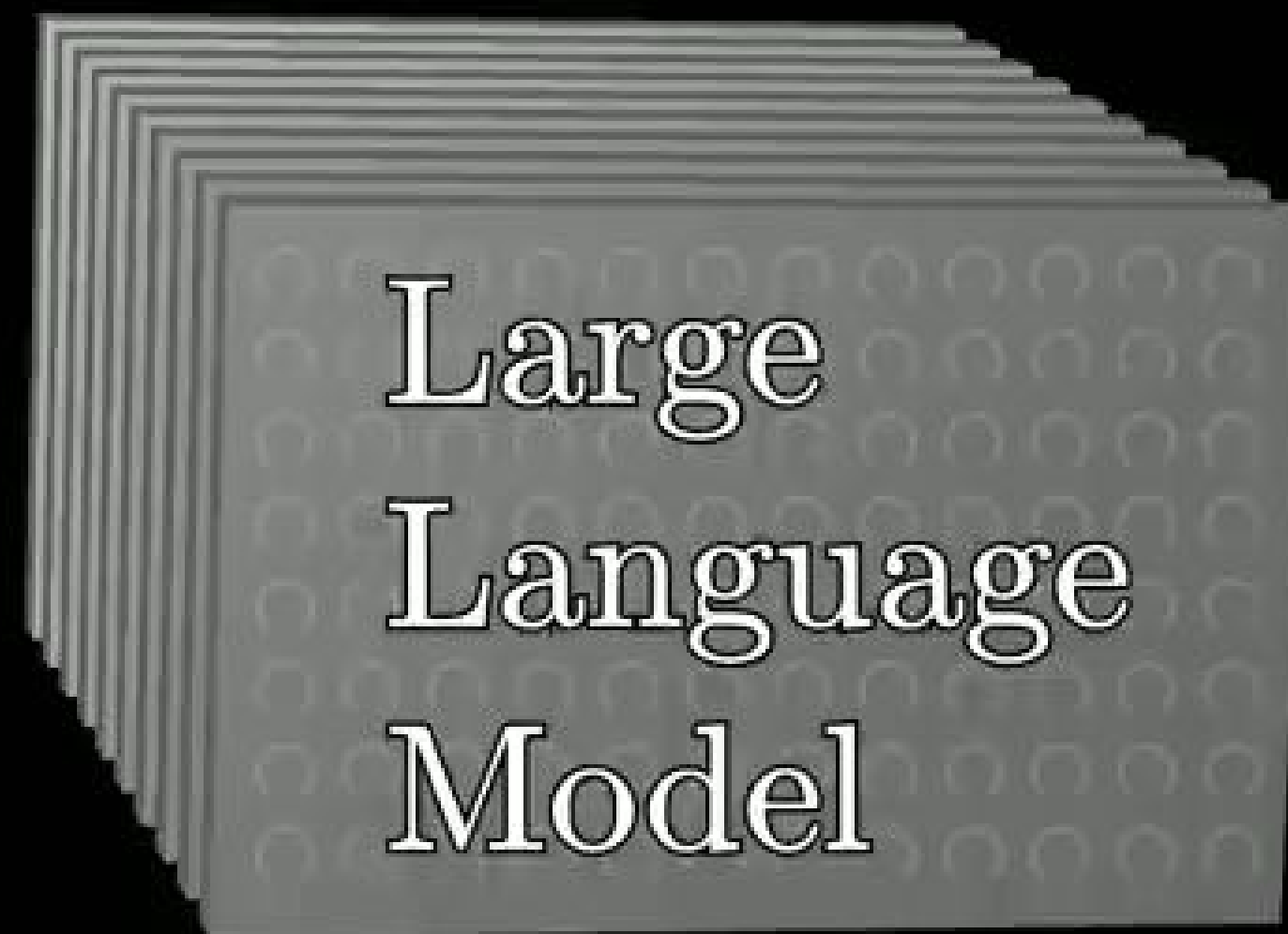
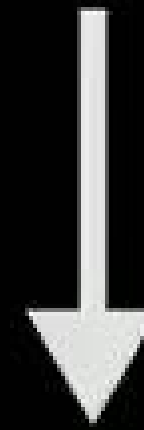
AI assistant:

A



transistor

Paris is a city in \_\_\_\_\_



|              |             |     |
|--------------|-------------|-----|
| France       | <div></div> | 17% |
| and          | <div></div> | 15% |
| the          | <div></div> | 9%  |
| Logan        | <div></div> | 7%  |
| which        | <div></div> | 4%  |
| Henry        | <div></div> | 3%  |
| northern     | <div></div> | 3%  |
| central      | <div></div> | 2%  |
| northeastern | <div></div> | 2%  |
| Paris        | <div></div> | 1%  |
| Texas        | <div></div> | 1%  |
| ⋮            |             |     |

# LLM guesses the next word based on what came

to be or not to be , that is the  ;

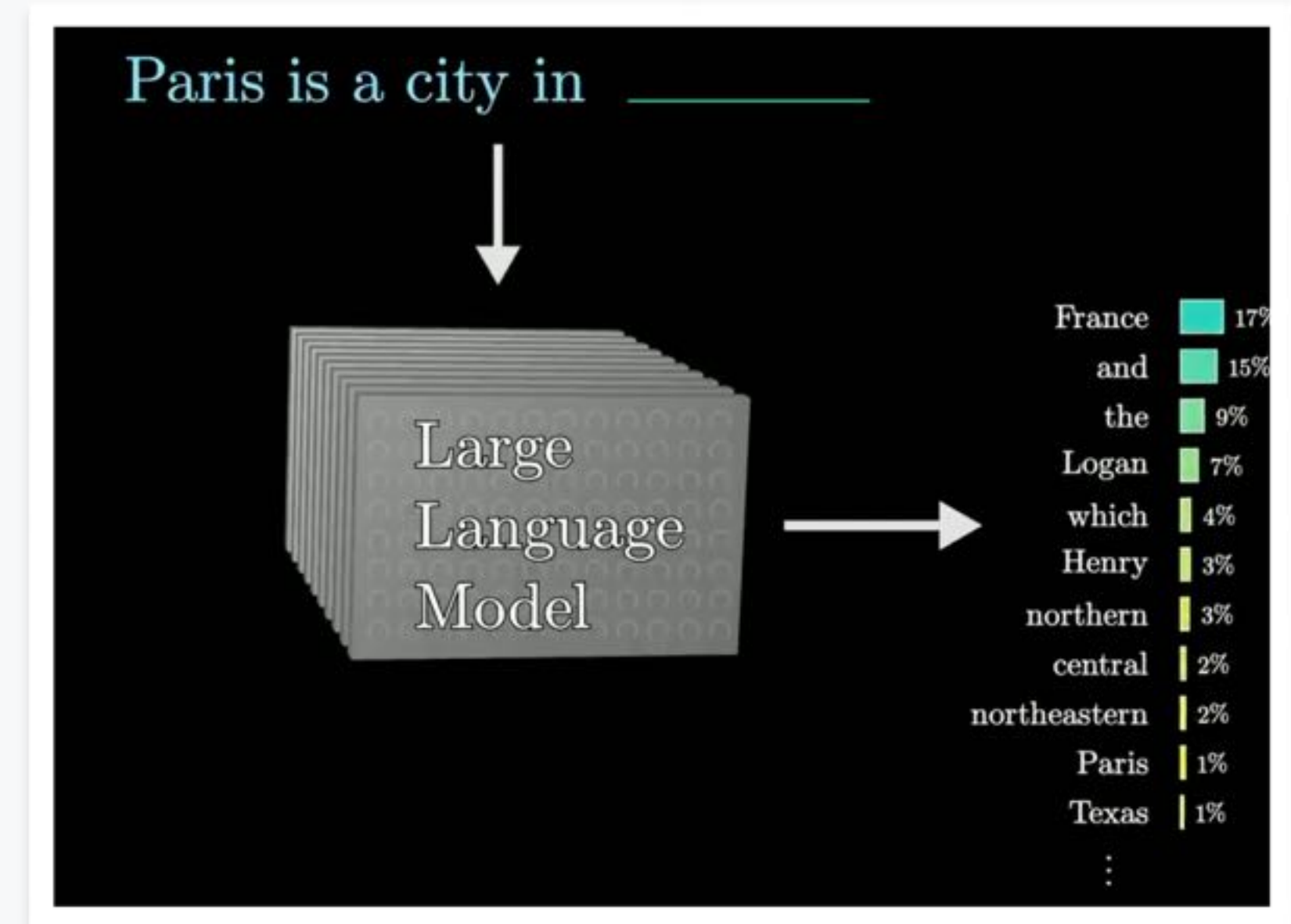
|                   |                   |                  |
|-------------------|-------------------|------------------|
| 56.987% question  | 3.610% difference | 3.004% answer    |
| 2.691% problem    | 2.623% key        | 0.954% challenge |
| 0.899% truth      | 0.743% game       | 0.719% point     |
| 0.678% definition | 0.618% riddle     | 0.584% idea      |
| 0.576% dilemma    | 0.568% message    | 0.555% phrase    |

BERT's predictions for what should fill in the hidden word

- It does not “think” like human does (no memory, no learning), it predicts next words
- Features such as “reasoning” or “memory” are built on top of this word-guessing
- Its response is based on its training data—which could include biases

# Large language models

- Guess the next word probabilistically
- Learn from data (mostly from the internet)



## Quiz

- Do LLMs have an idea about “university”?
- Can LLMs tell you about “university”?
- Do LLMs remember?



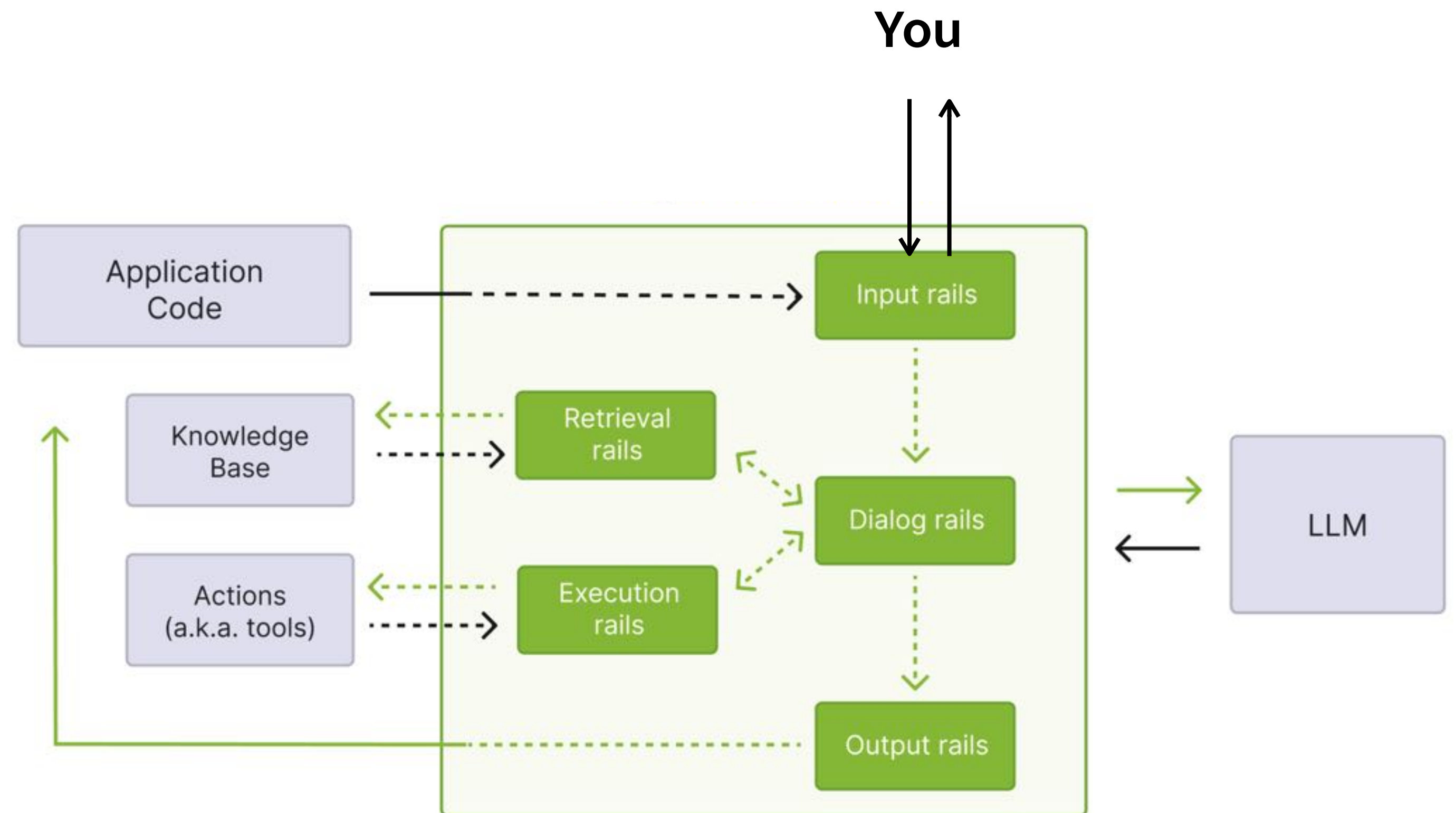
**slido.com**  
#3510 604

*I shall drop on you*



# You interact with LLMs with harnesses and guardrails

- **Harness:** Software that manage LLM's execution, memory, verification
- **Guardrails:** rules and filters for input to and output from an LLM as a safety net



[NVIDIA NeMo Guardrails documentation](#)

Easy for you



Difficult for you

LLMs can do well



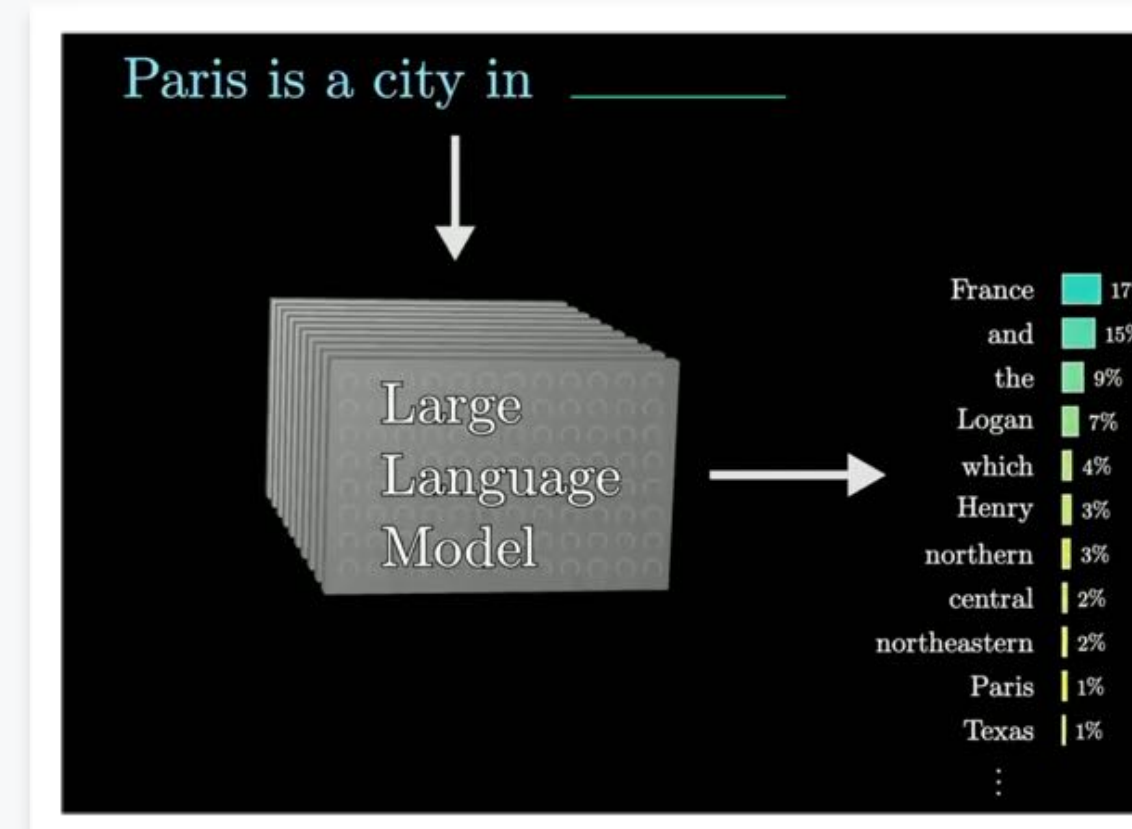
LLMs make mistakes







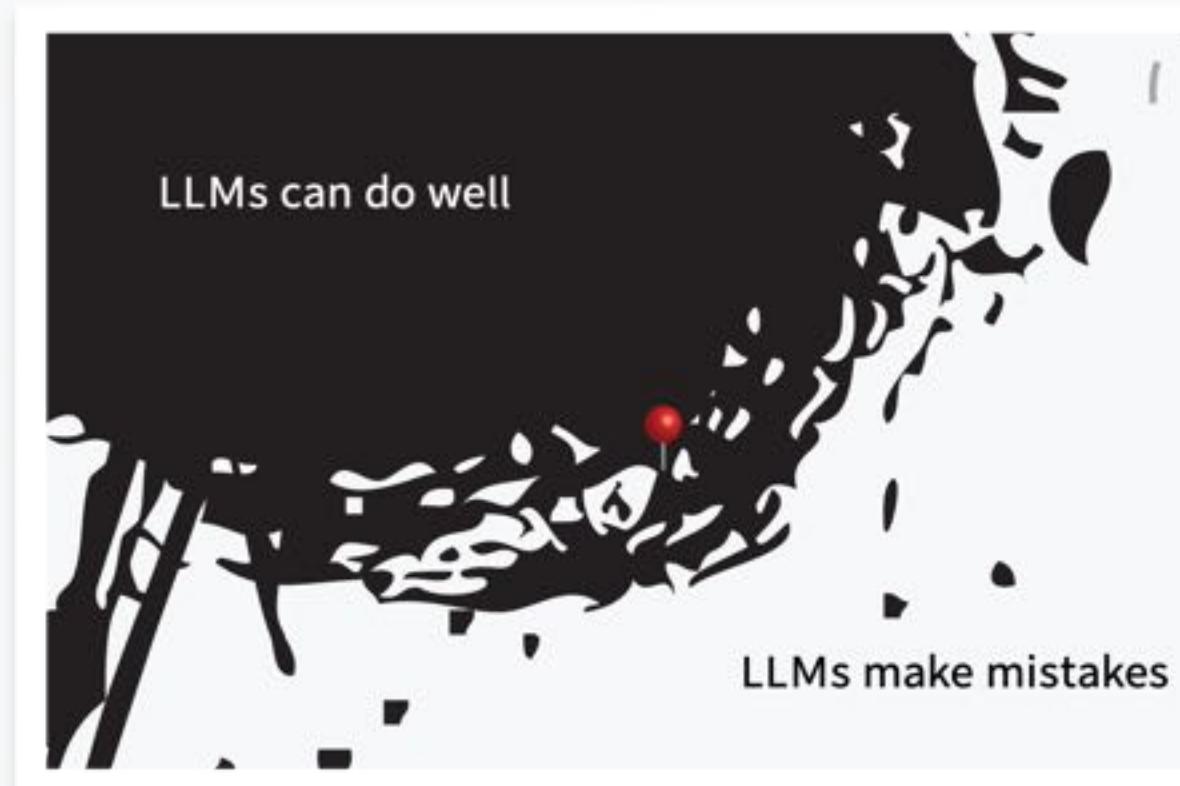
AI as a forest



LLM is a probabilistic word-guesser based on internet data



LLM with a harness



Jagged frontiers of LLM capabilities



LLM as a hammer for making tools

- ✅ Mental models for thinking about AI



- A way to answer the question “Do I need AI?”

- Task analysis
- Cost-benefit analysis

- Implications on how to work with AI

3 points

# Task analysis

Example: Chat's () treasurer role for a professional association

- Task and sub-tasks

Collect evidence of expenses

Reimburse

Organize info

Create reports

# Task analysis

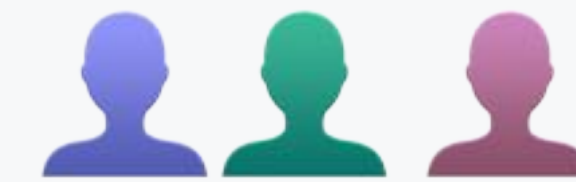
Example: Chat's (👤) treasurer role for a professional association

Collect evidence of expenses

Reimburse

Organize info

Create reports



Spenders



Treasurer



Bank



Executives

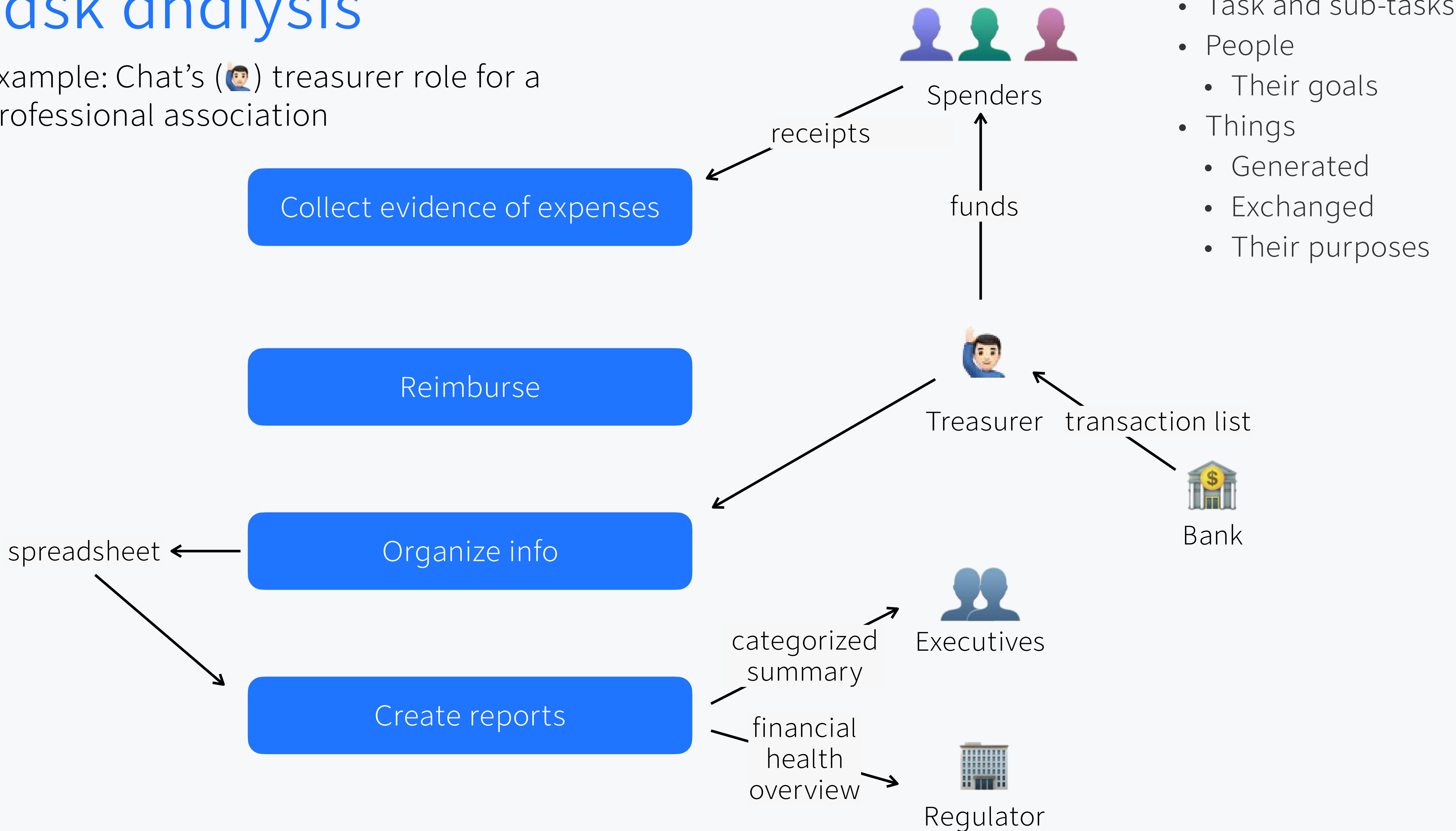


Regulator

- Task and sub-tasks
- People
  - Their goals

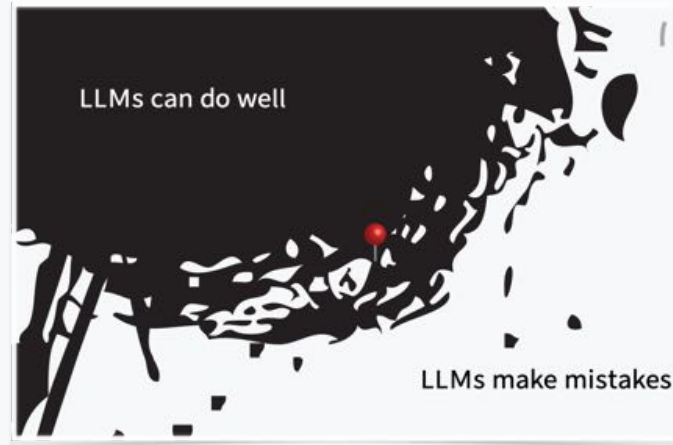
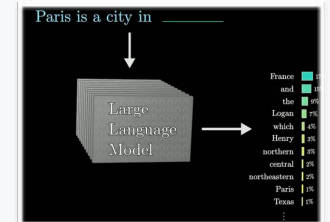
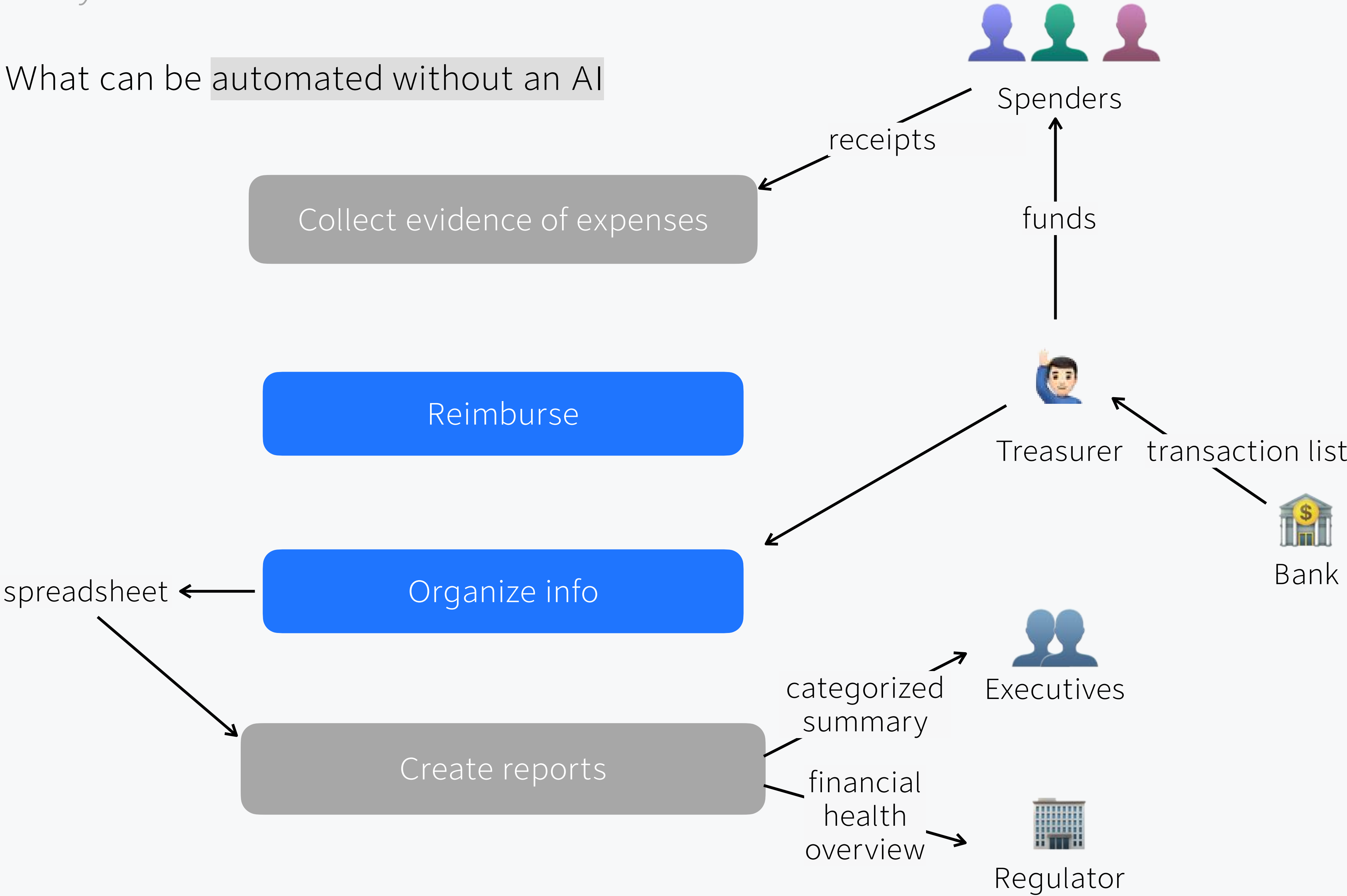
# Task analysis

Example: Chat's (👤) treasurer role for a professional association



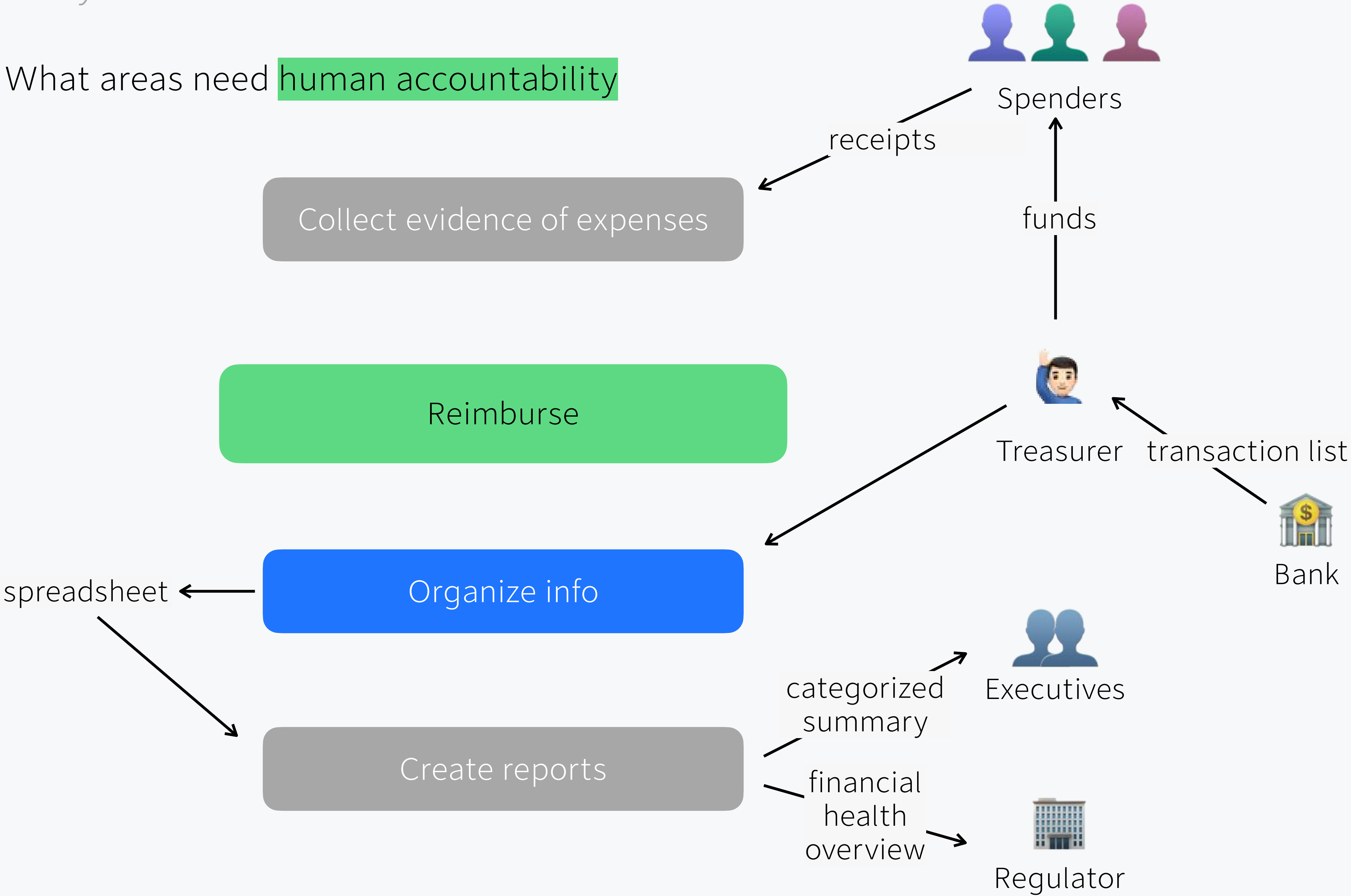
Task analysis

? What can be automated without an AI



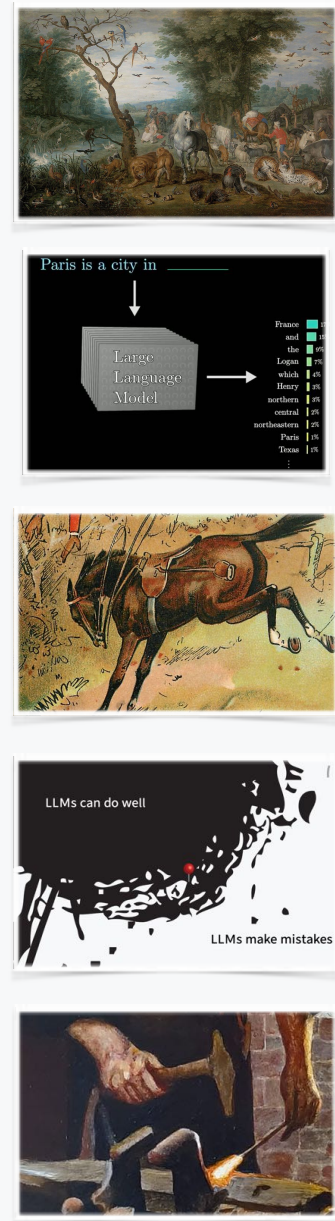
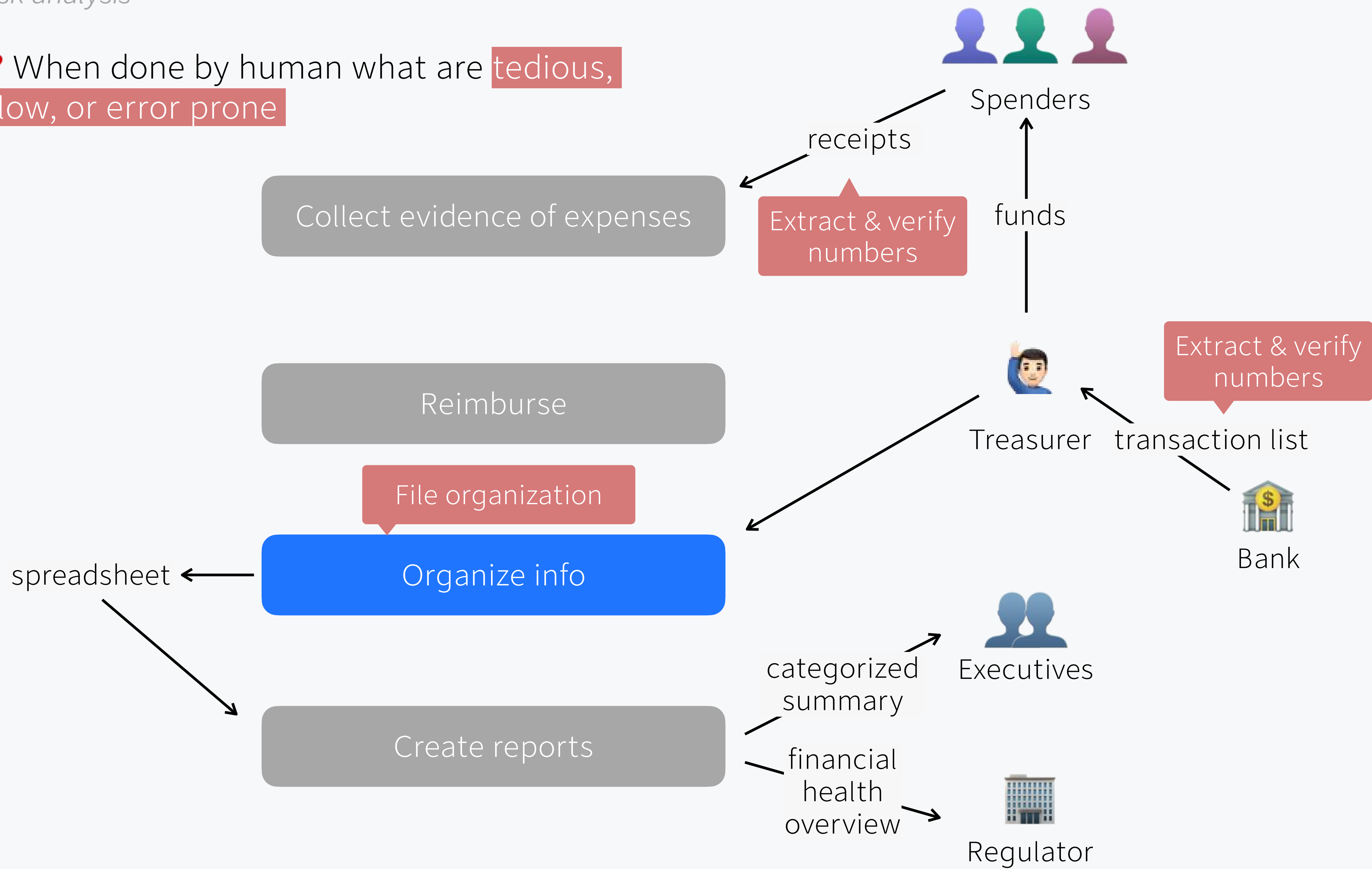
Task analysis

? What areas need human accountability



Task analysis

? When done by human what are tedious, slow, or error prone



-  Mental models for thinking about AI



- A way to answer the question “Do I need AI?”

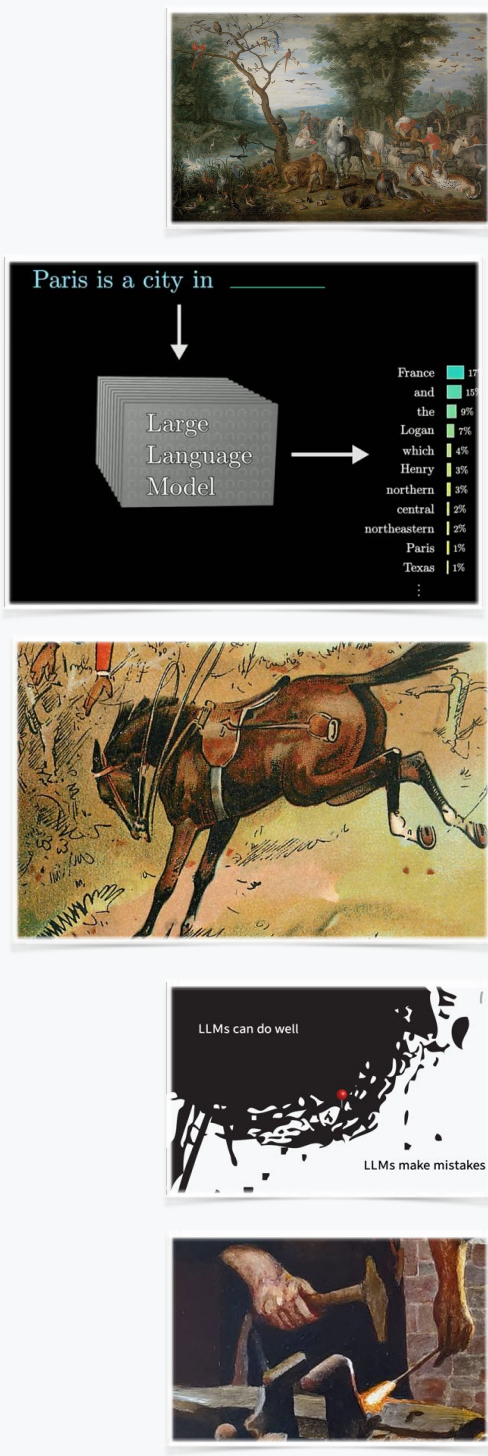
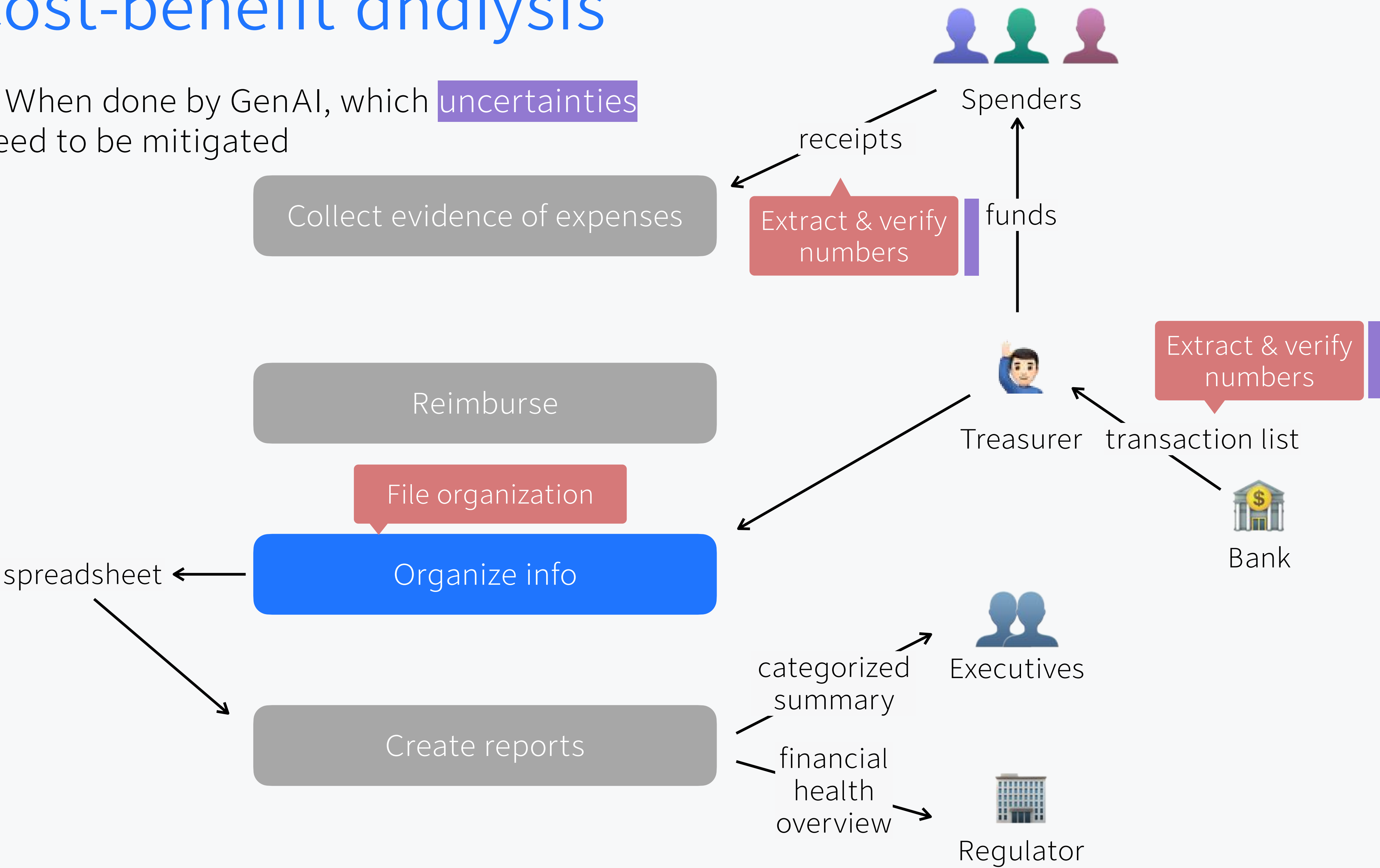
-  Task analysis
- Cost-benefit analysis

- Implications on how to work with AI

3 points

# Cost-benefit analysis

? When done by GenAI, which **uncertainties** need to be mitigated

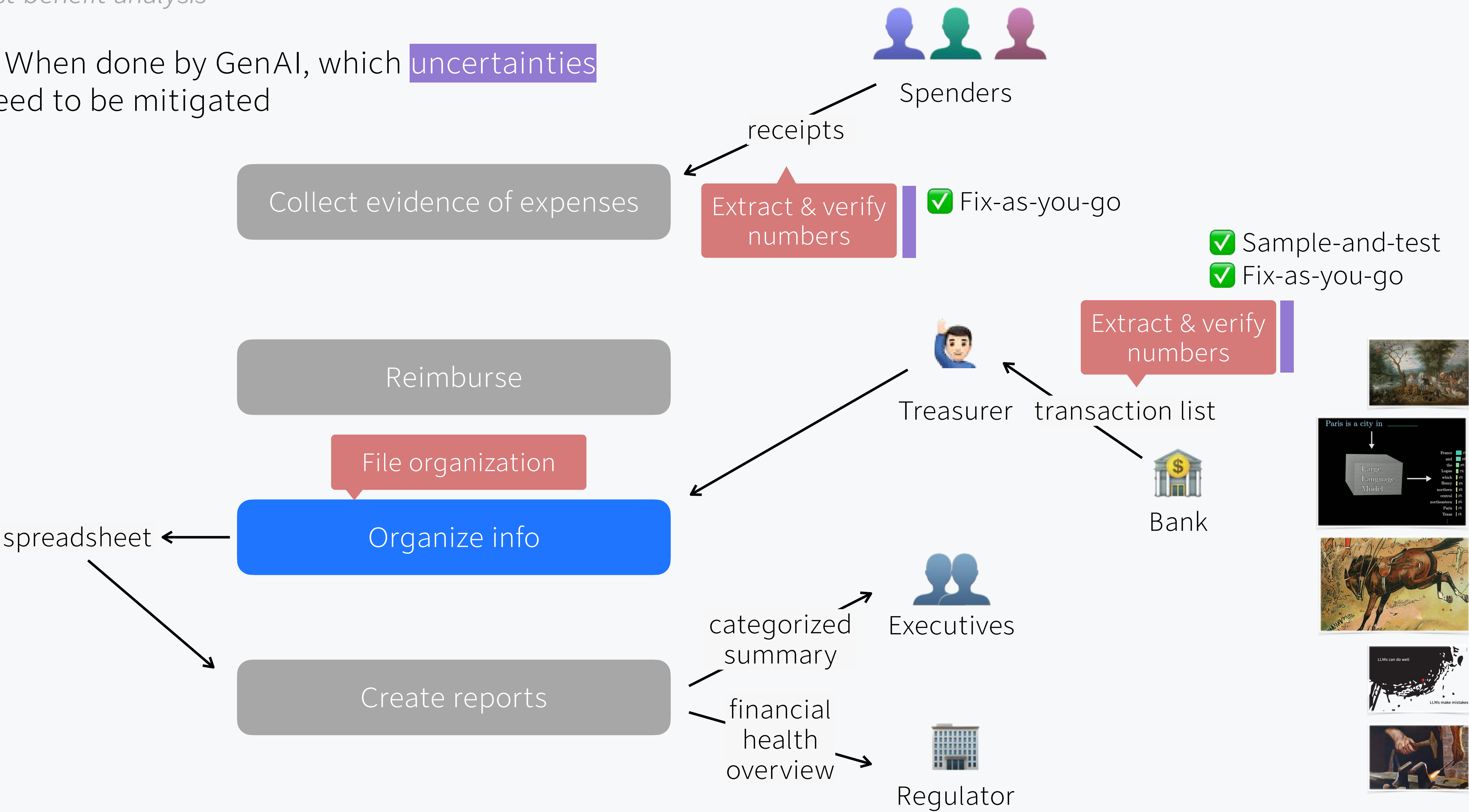


# Addressing uncertainty from AI work

- **Harness:** For when non-AI testing can be precisely stated
- **Fix-as-you-go:** For when you are the primary user and you will get feedback from subsequent work before you commit on a substantial outcome
- **Sample-and-test:** For repetitive tasks that the input has similar nature
- **Allow undo:** For low-stake tasks that can easily be reversed/compensated
- **LLM-check-LLM:** Have different models check each others' output. Not guarantee accuracy

Cost-benefit analysis

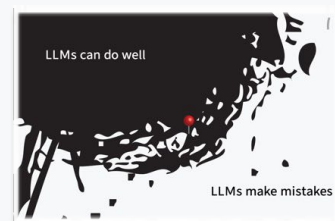
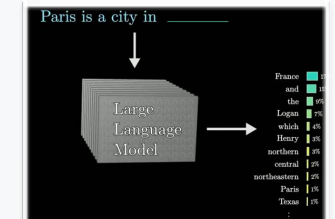
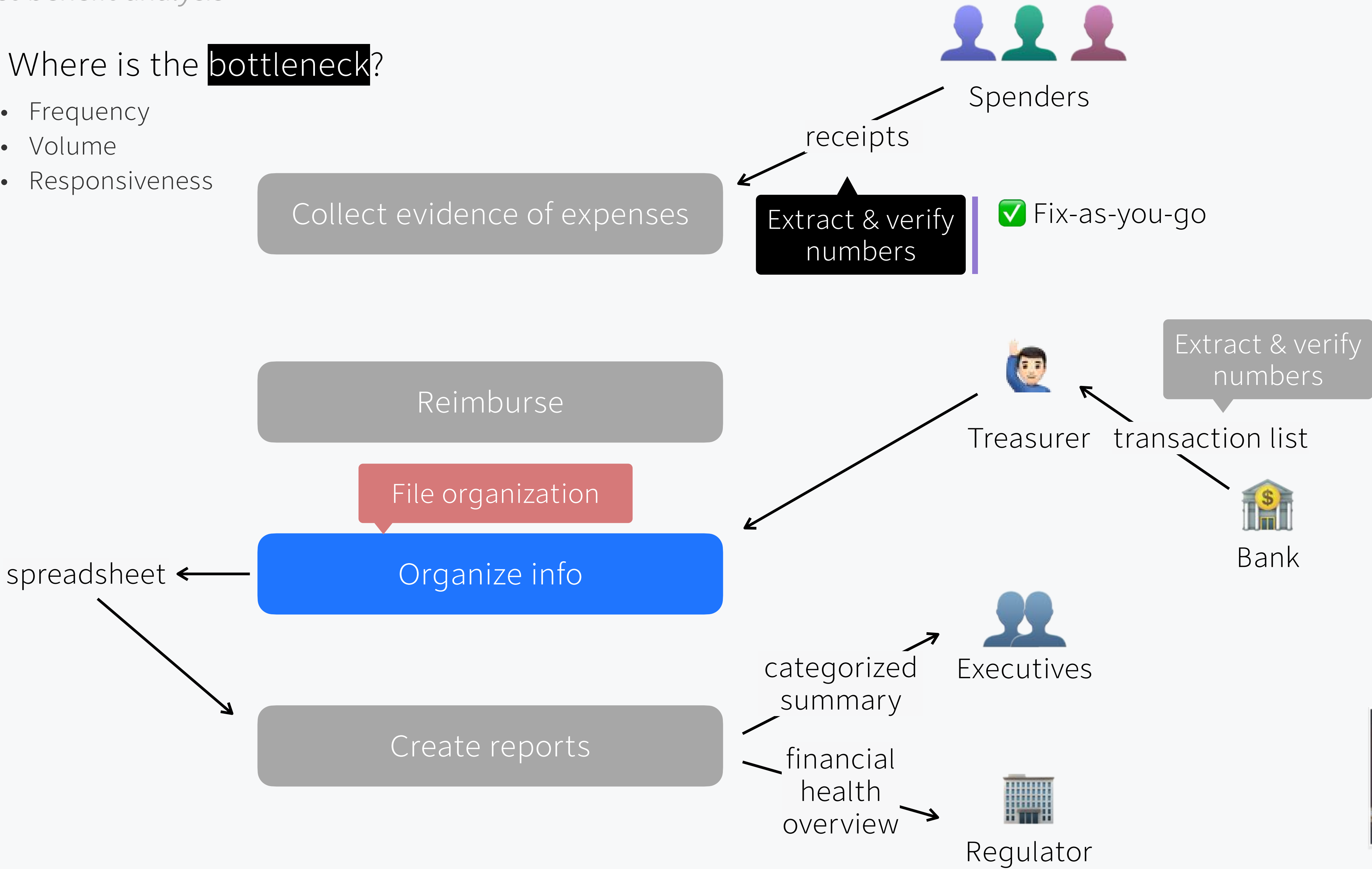
? When done by GenAI, which **uncertainties** need to be mitigated

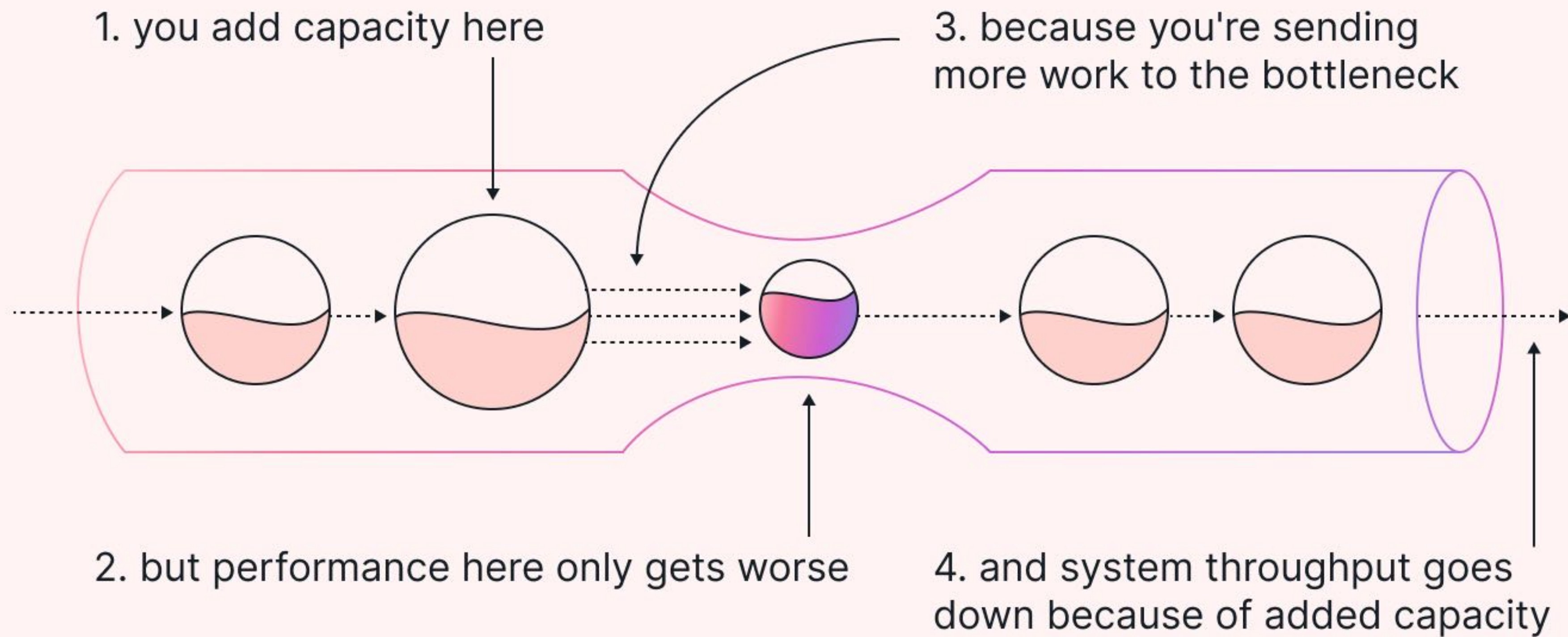


Cost-benefit analysis

? Where is the **bottleneck**?

- Frequency
- Volume
- Responsiveness

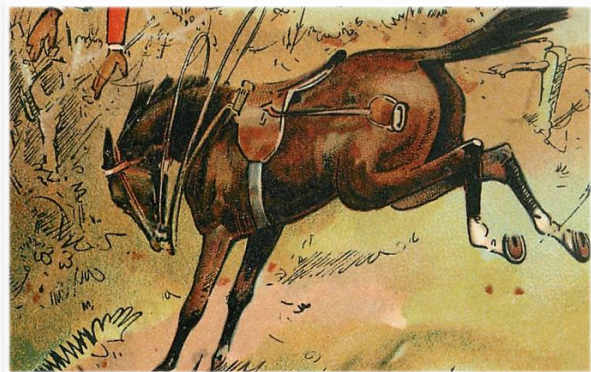
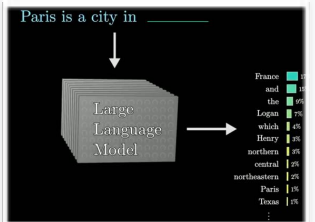
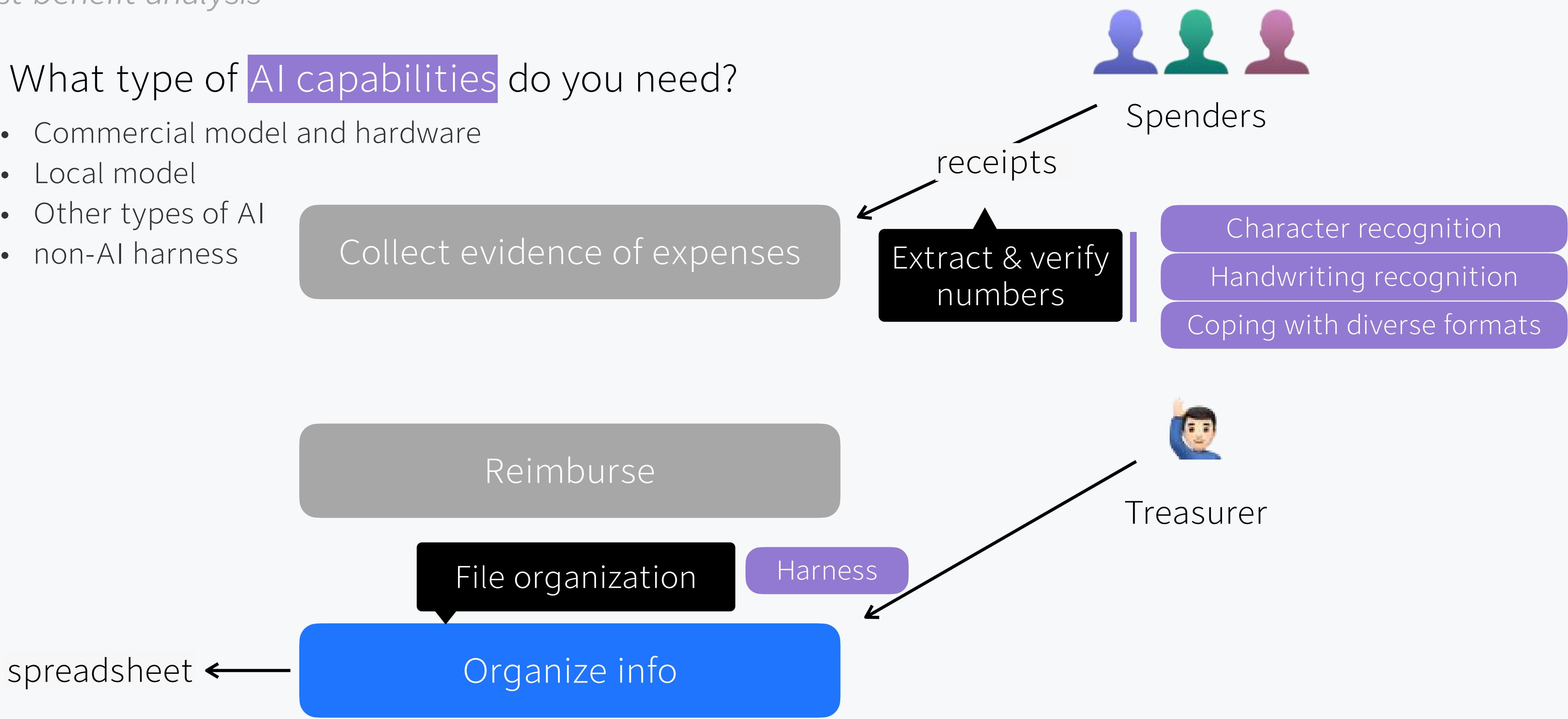




Cost-benefit analysis

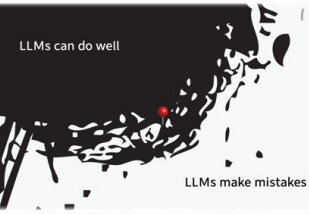
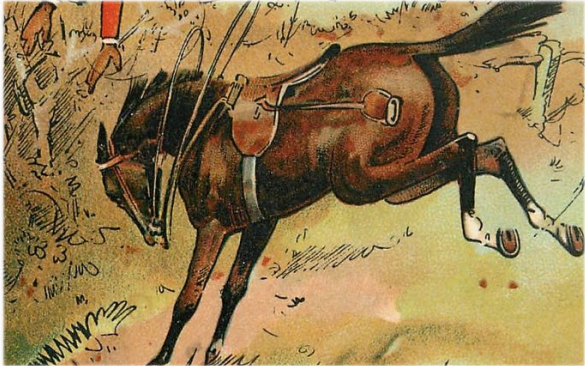
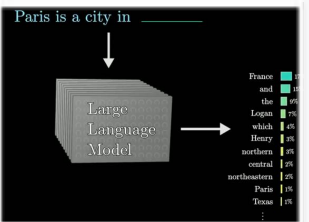
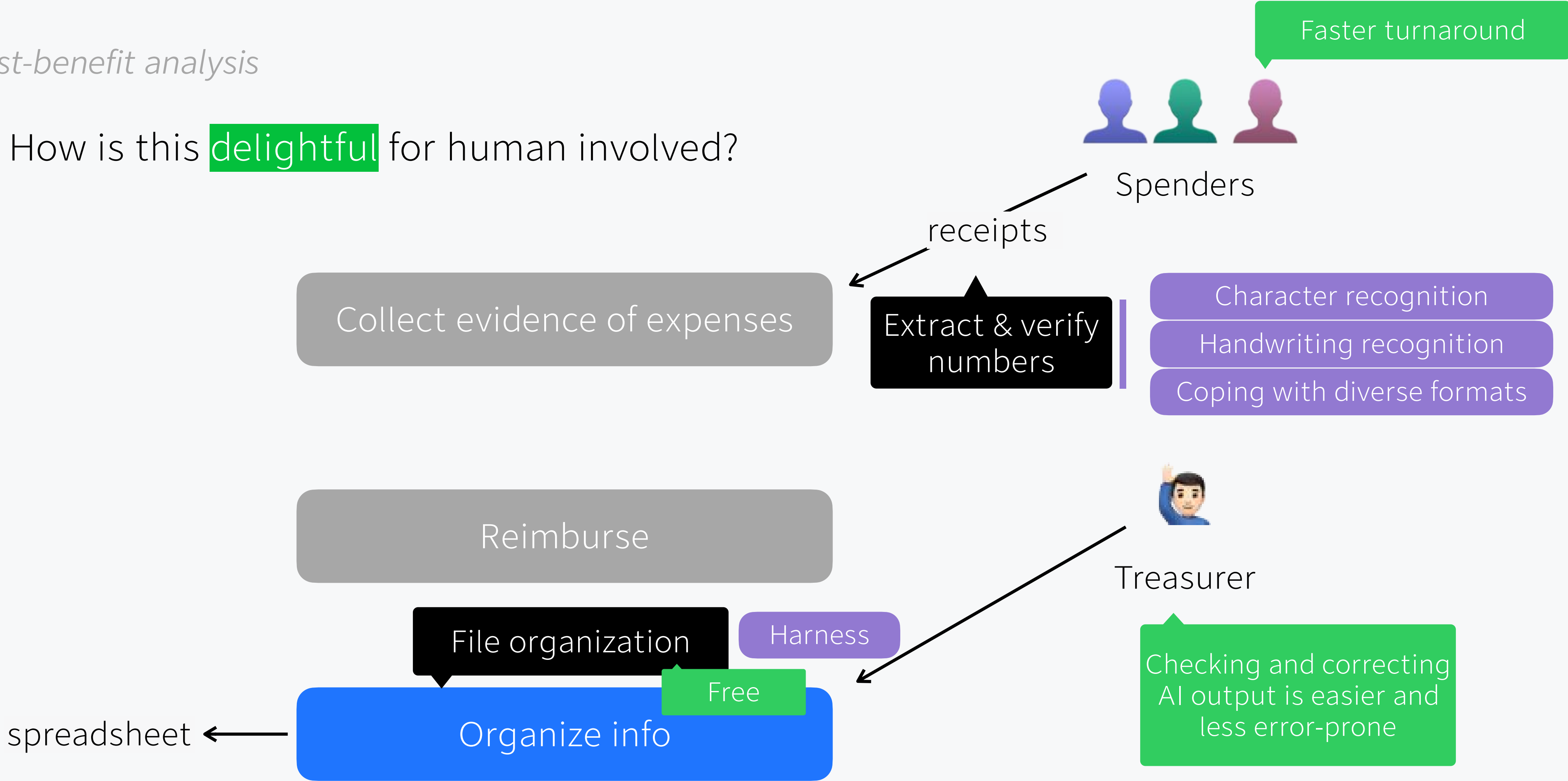
? What type of AI capabilities do you need?

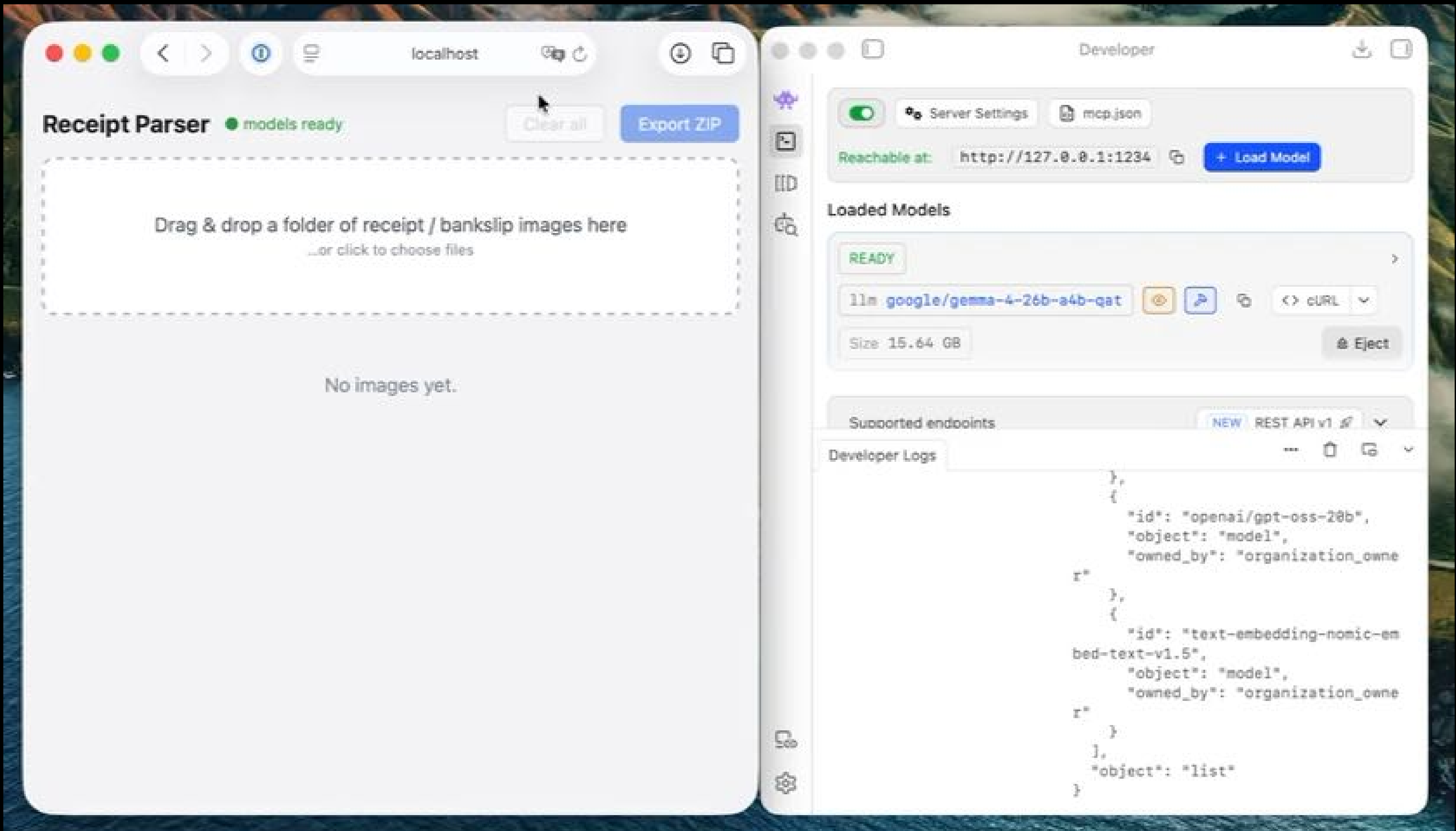
- Commercial model and hardware
- Local model
- Other types of AI
- non-AI harness



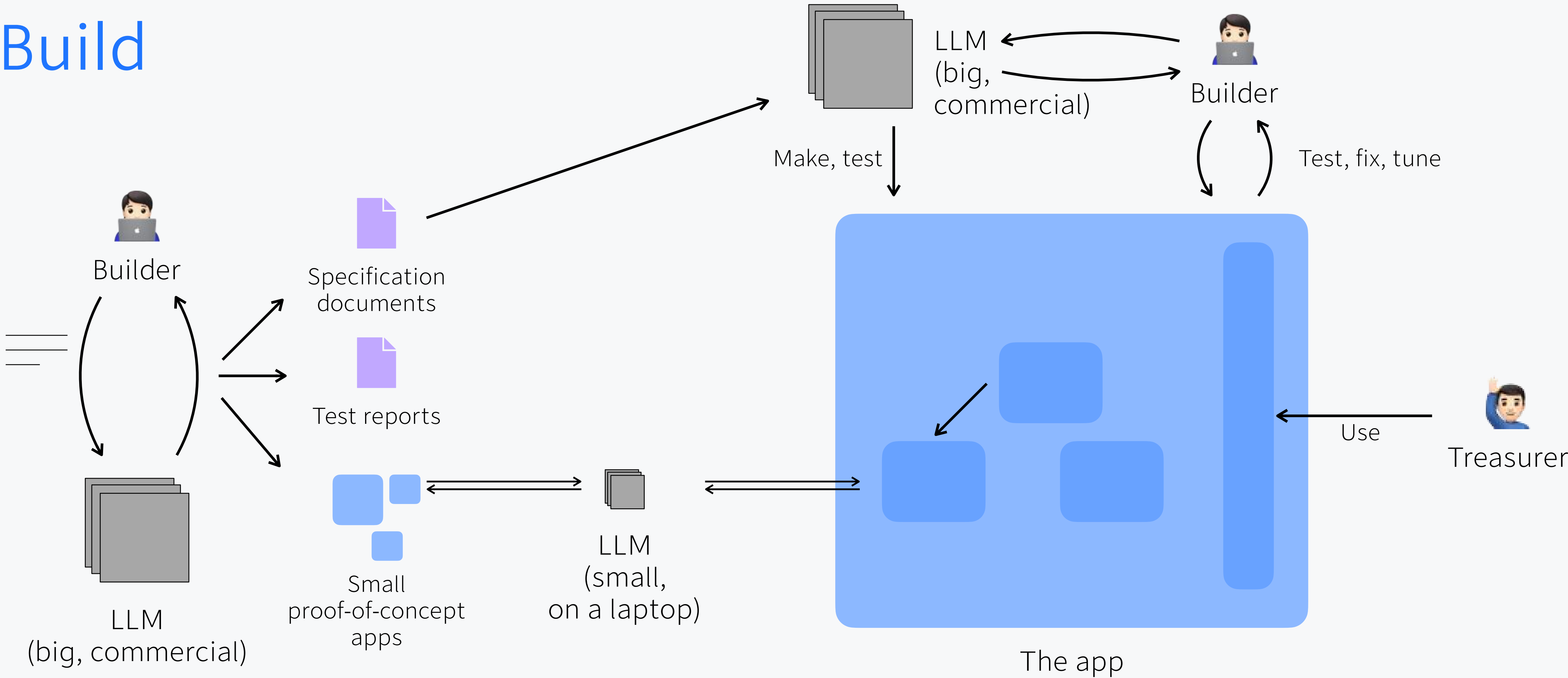
Cost-benefit analysis

? How is this delightful for human involved?

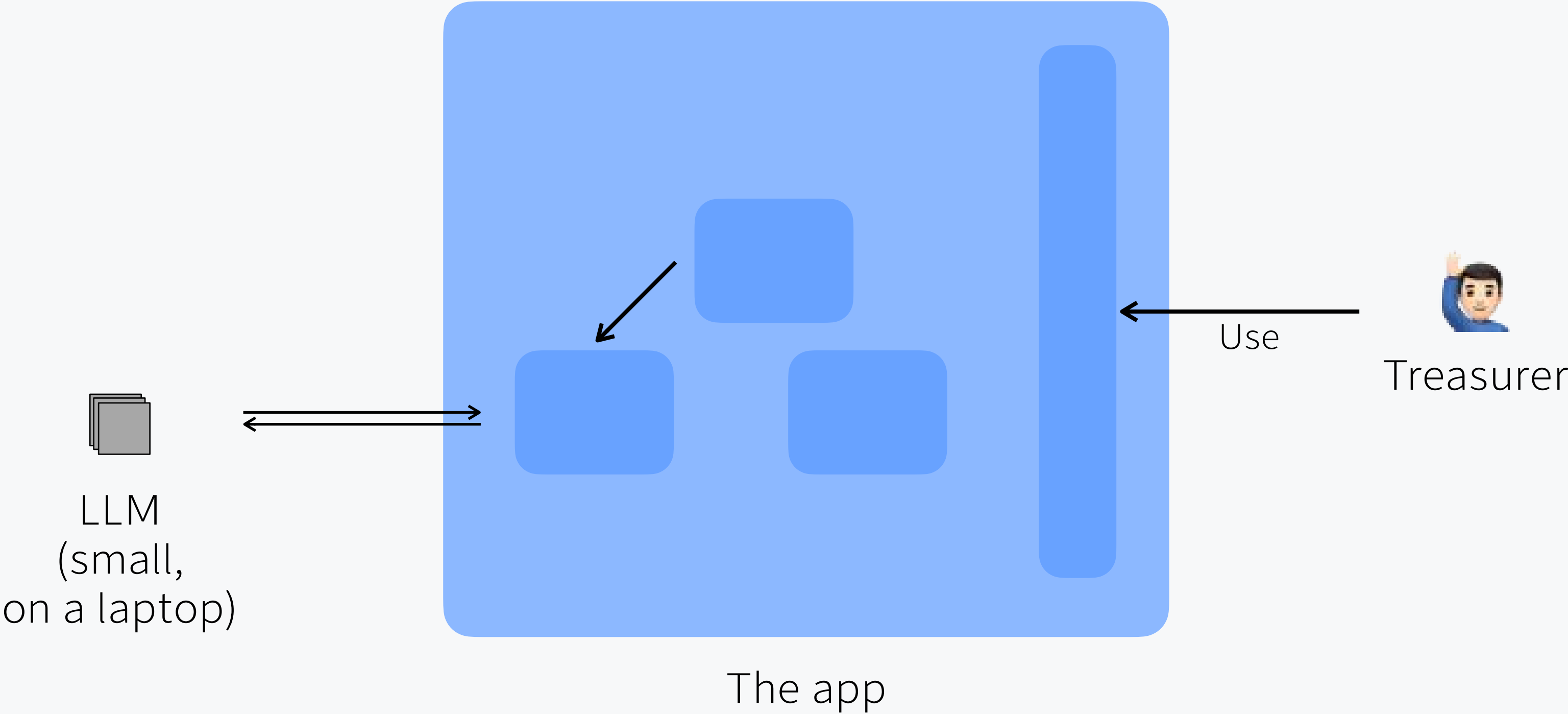




# Build



# Use



## Cost of introducing GenAI

Uncertainty

Money

Lack of understanding of context

Software maintenance

De-skilling human

Interpretation overhead

## Benefits of introducing GenAI

Speed

Accuracy

Free up human capacity

Opportunity to learning about GenAI

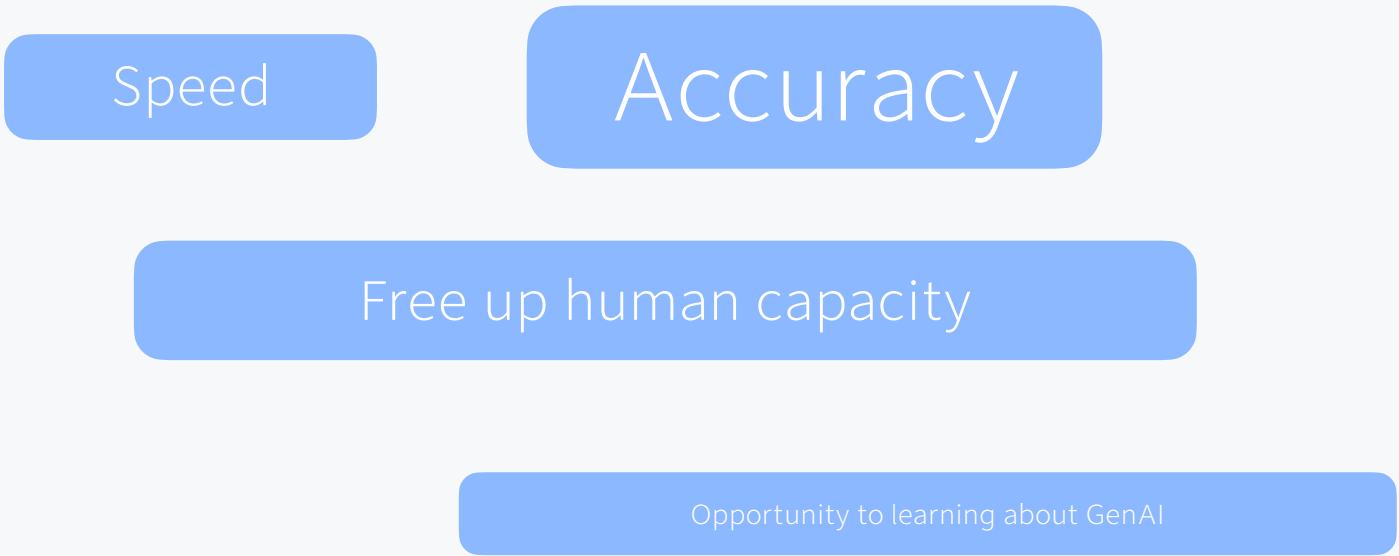


Image: Brian Carver via [carvingisfun.com](https://carvingisfun.com)

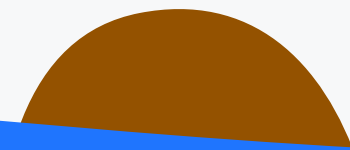
Cost of introducing GenAI



Benefits of introducing GenAI



Each sub-tasks have different configurations of cost and benefits

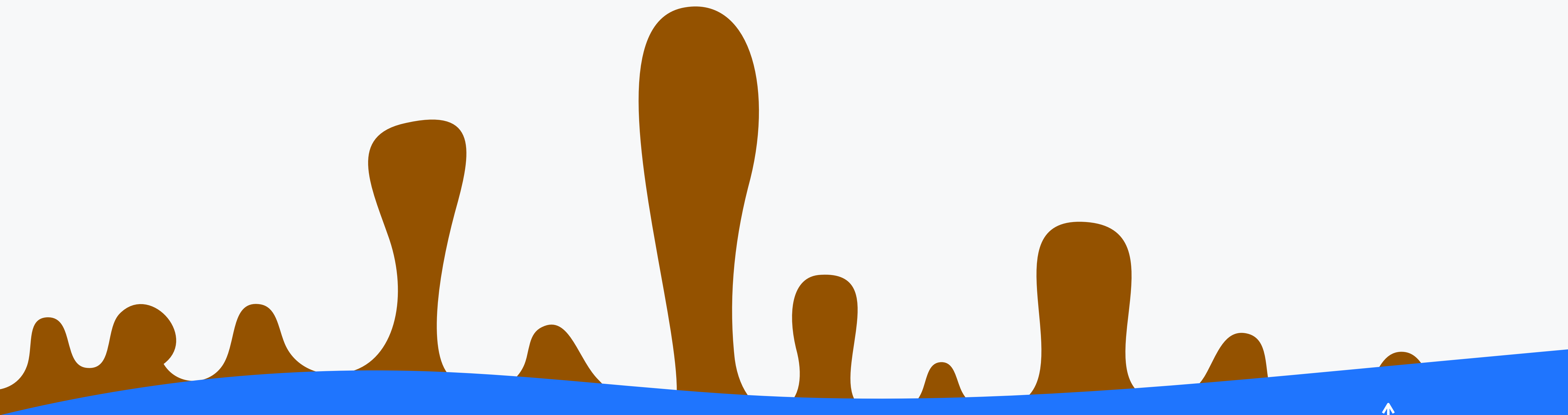


How difficult it is to make a solution

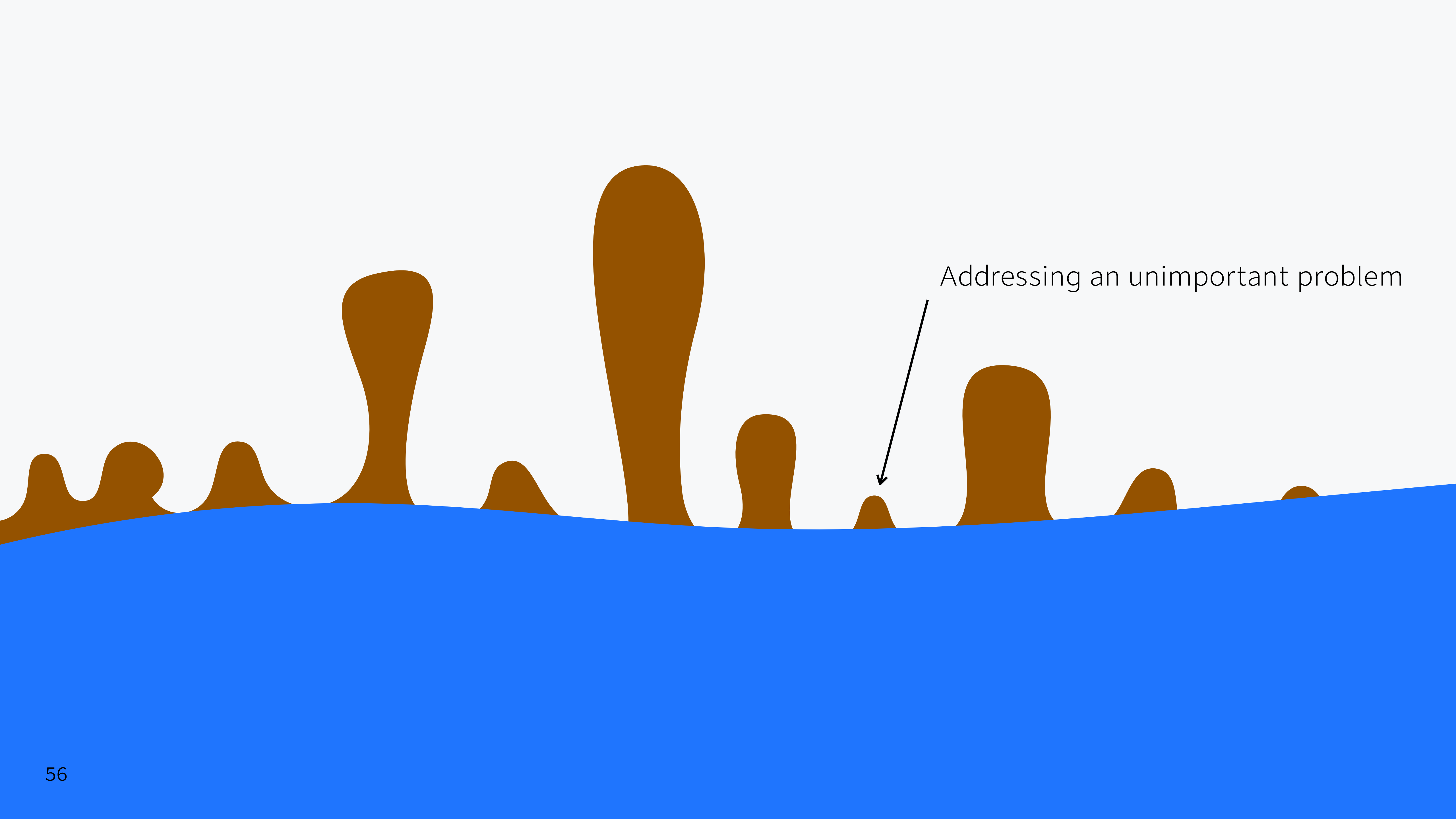




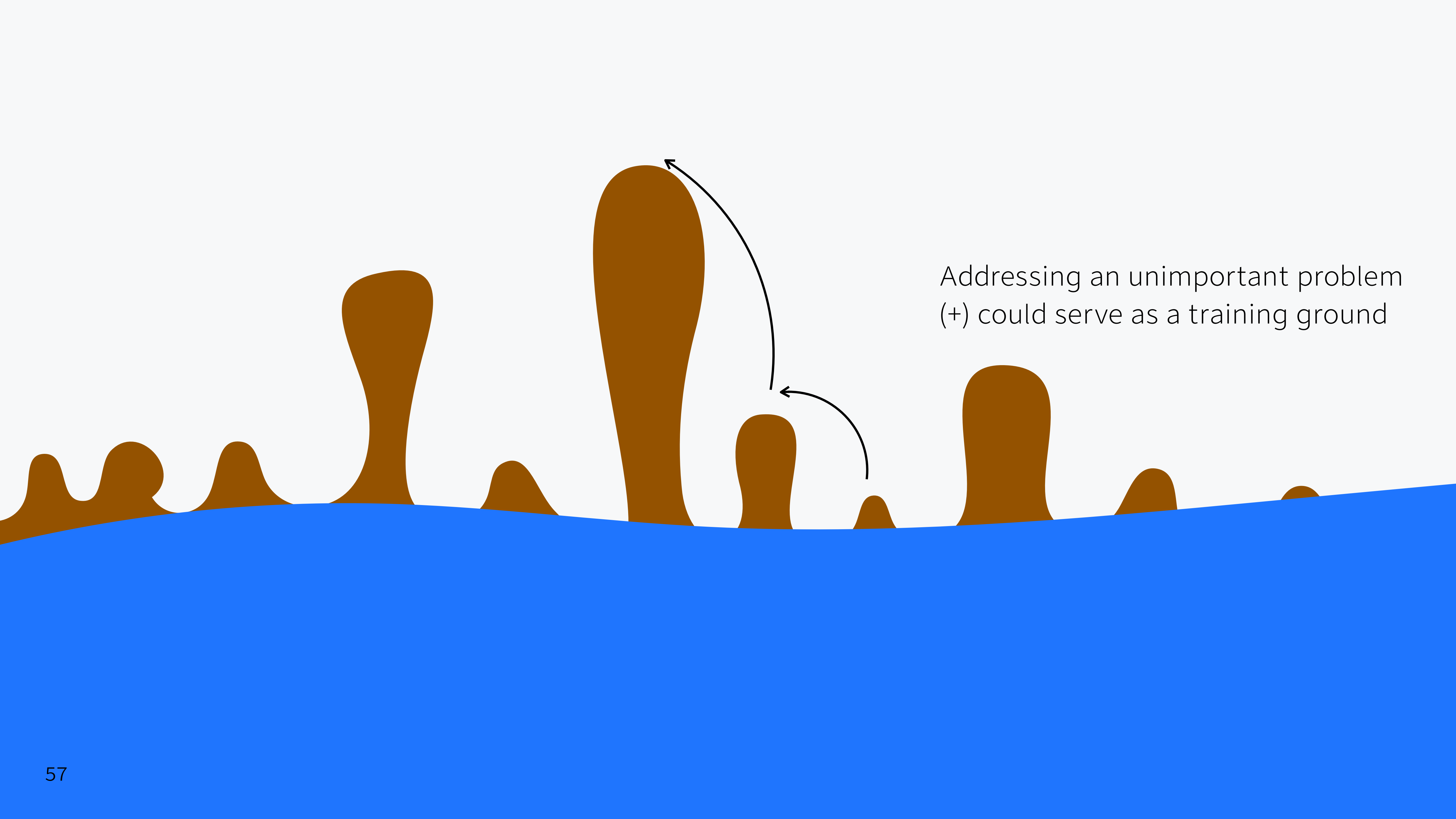
How difficult it is to make a solution



How difficult it is to make a solution

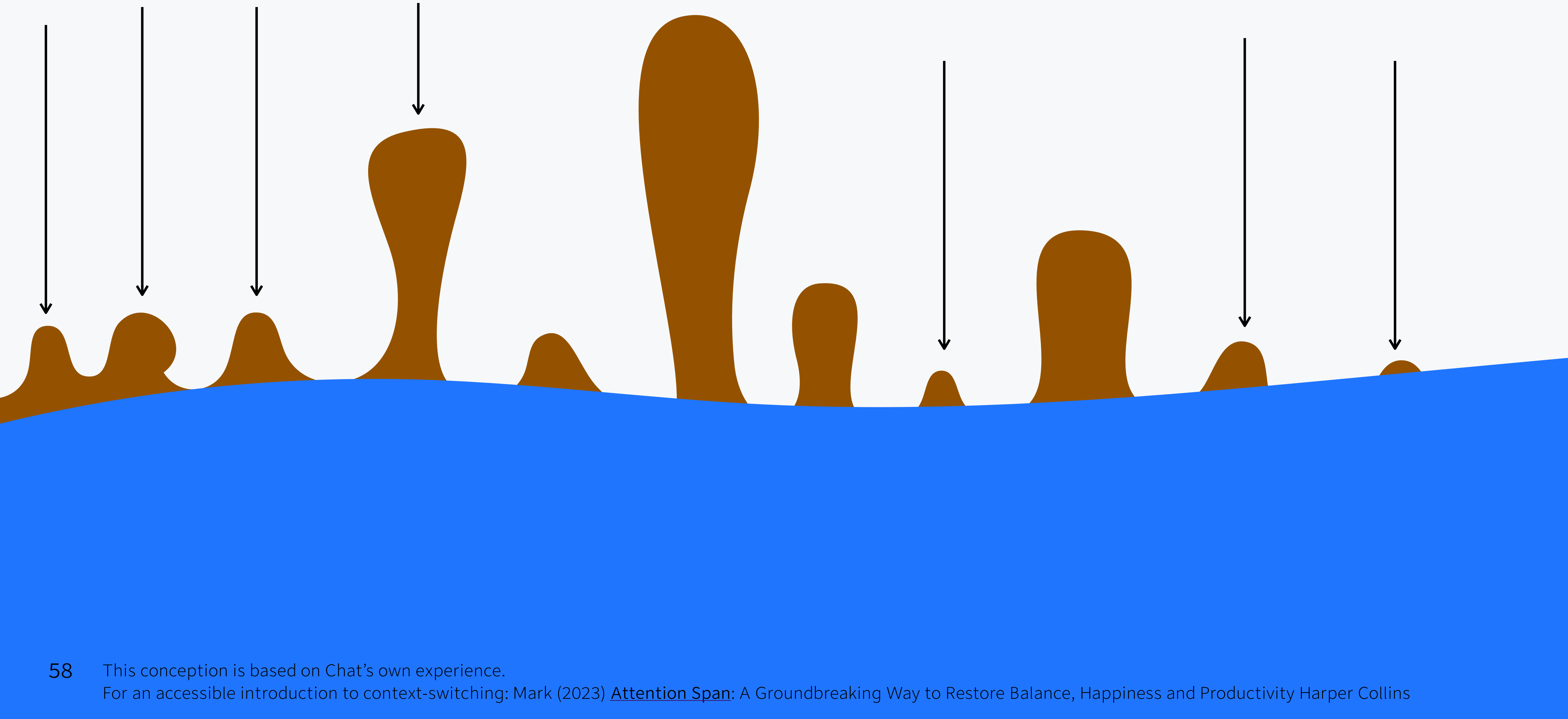


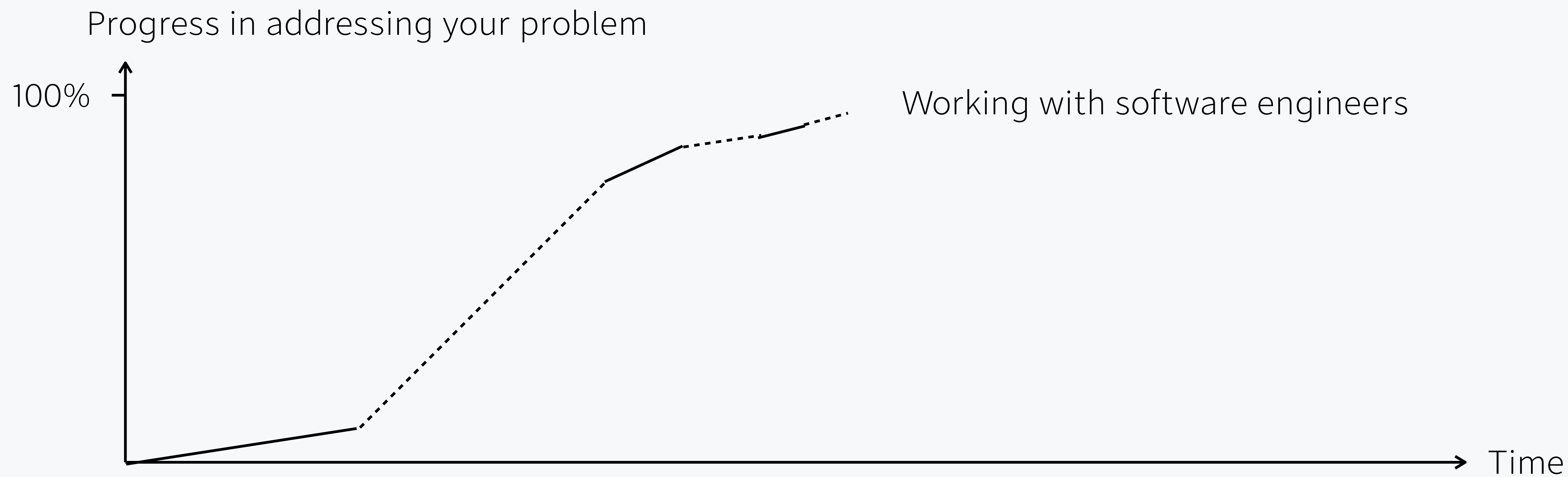
Addressing an unimportant problem



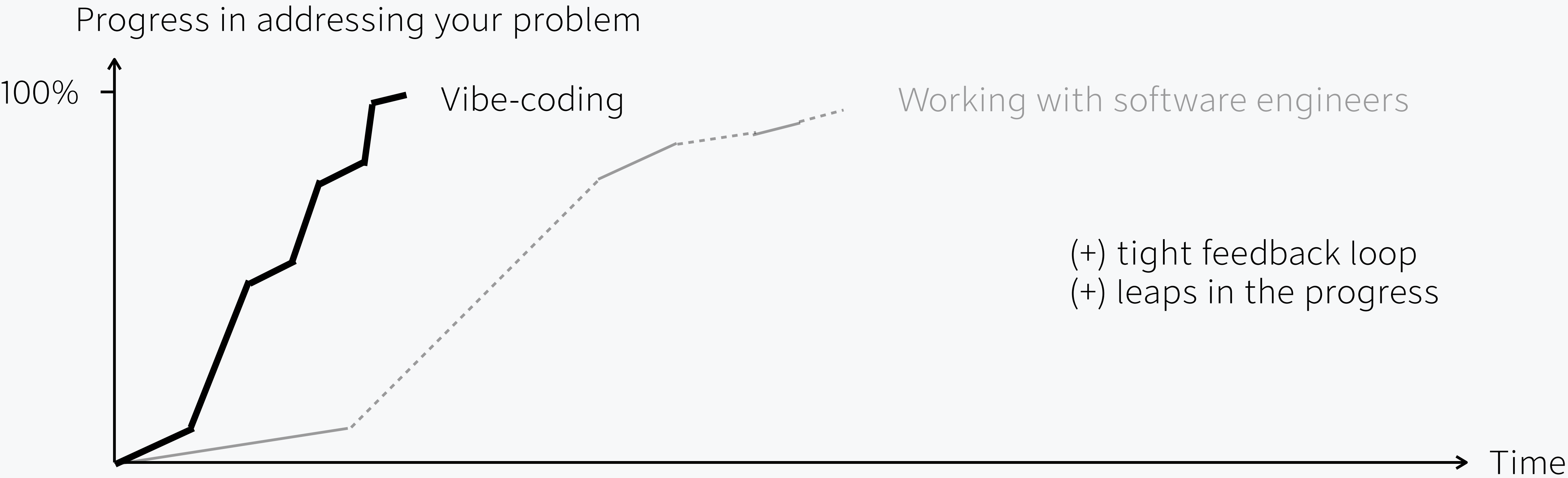
Addressing an unimportant problem  
(+) could serve as a training ground

! Addressing **too many** problems **simultaneously**  
**Cost of context-switching**

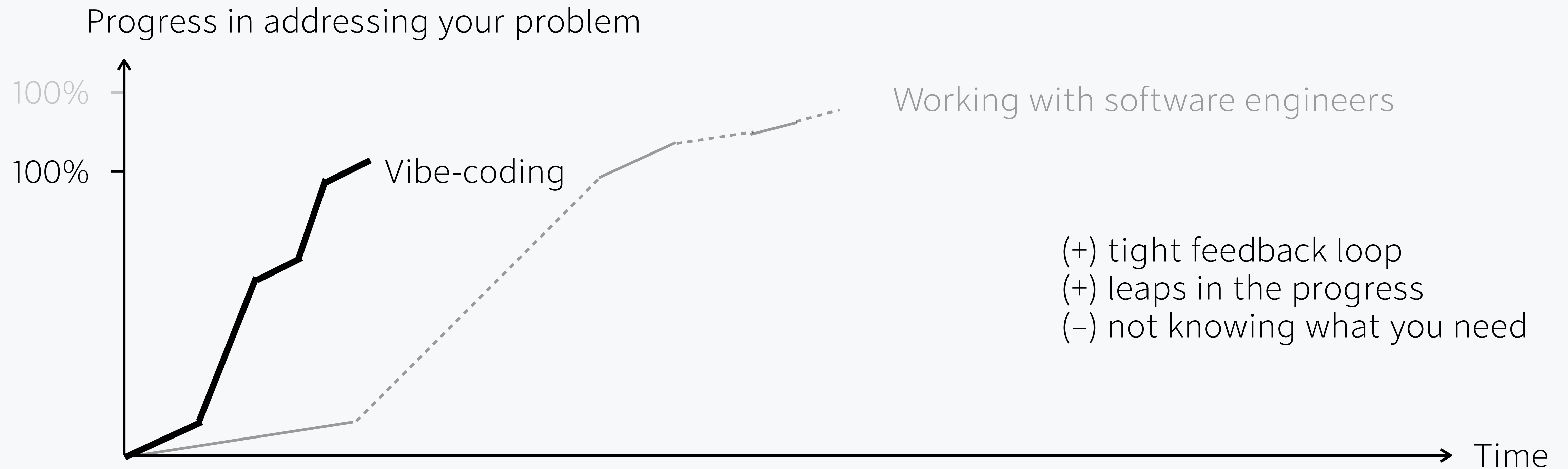




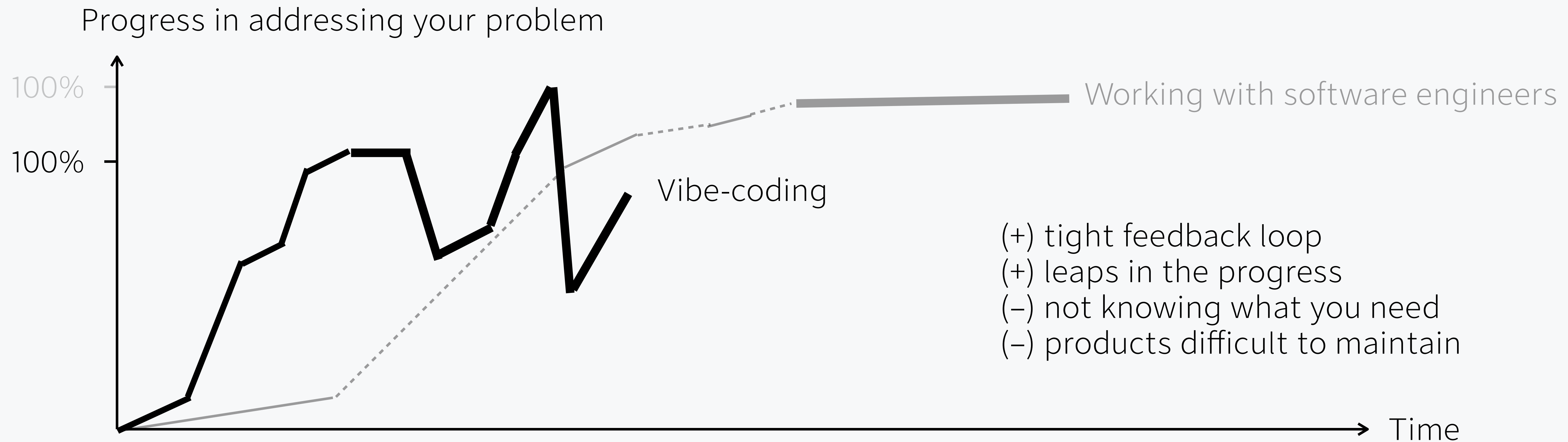
# Vibe coding hope



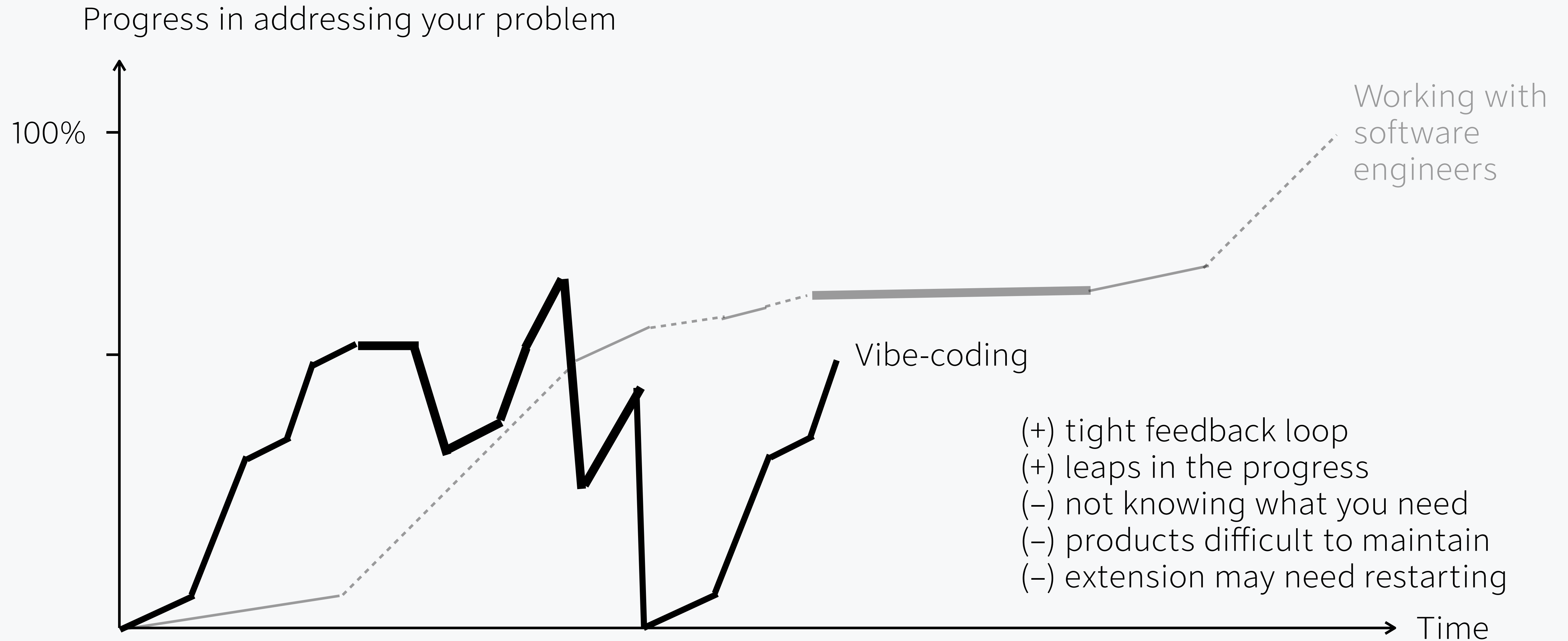
# Vibe coding reality



# Vibe coding reality



# Code may be cheap, but software engineering isn't



**Brian:** one of the things that I've learned with my projects is that, number one, I have a greater appreciation for what software engineers do in that sense where it isn't just like, well, here's an idea, one, two, three options go. It is you kind of have to scope it out and think it through. [...] you actually have to think it through more in terms of, okay, what does that mean to fetch an API and specific APIs and things like that? So it's almost like doing these sorts of things have trained me to think more in a software way.

**Allison:** Yeah, it makes me so appreciative of the apps I have on my phone that work really well. And it really, you know, I get that thing where I'm like, do I need to pay for another app or another subscription? And it has kind of turned that around where I'm like, oh, my God, there's so much work that is required, like, on an ongoing basis to make these things even functional. So, like, yeah.

**Brian:** Right. And you're only building for yourself. So imagine you're building something for other people where the users would come back to you and say, hey, this isn't working. Right.

**Allison:** Yeah. Horrifying.

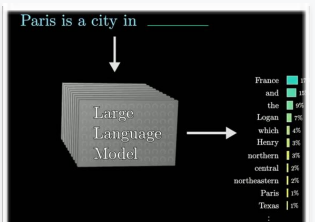
# Possible endpoints

Use GenAI to...

- do the work
- make tools
- make proof-of-concepts
- make artifacts to help you communicate your ideas
- explore solution possibilities
- explore the problem
- learn about capabilities of GenAI

# Do I need AI?

-  Task analysis
  - What are tasks, people, and things?
  - What can be automated without an AI?
  - What areas need human accountability?
  - When done by humans, what are tedious, slow, or error-prone?
-  Cost-benefit analysis
  - When done by GenAI, which uncertainty needs to be mitigated?
  - Where is the bottleneck?
  - What type of AI capabilities do you need?
  - How is this delightful for the human involved?
  - What endpoints should I aim for?



- ✓ Mental models for thinking about AI

- ✓ A way to answer the question “Do I need AI?”

- Implications on how to work with AI

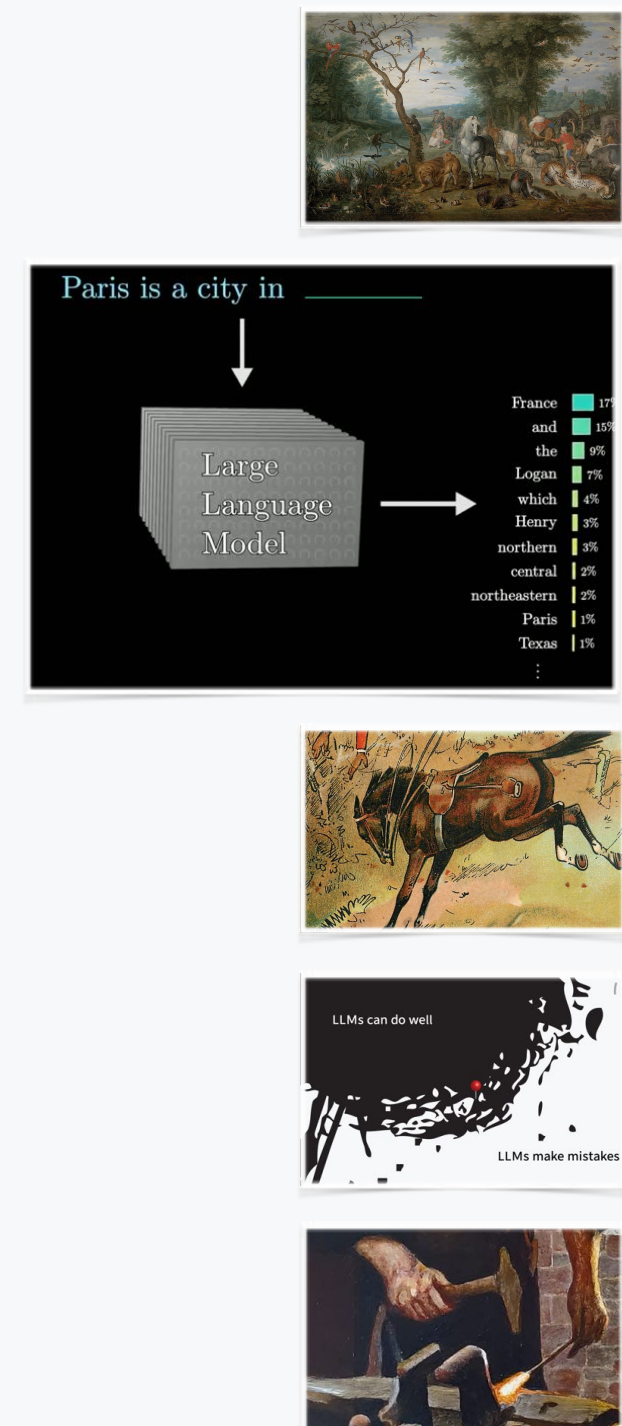


- Task analysis
- Cost-benefit analysis

3 points

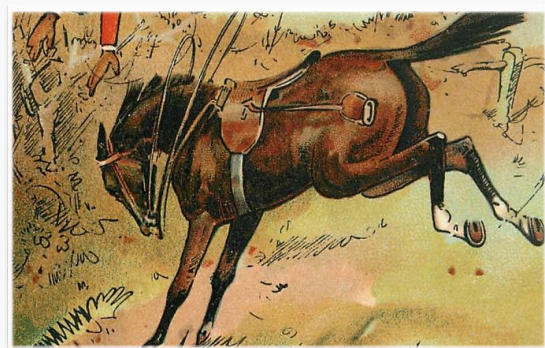
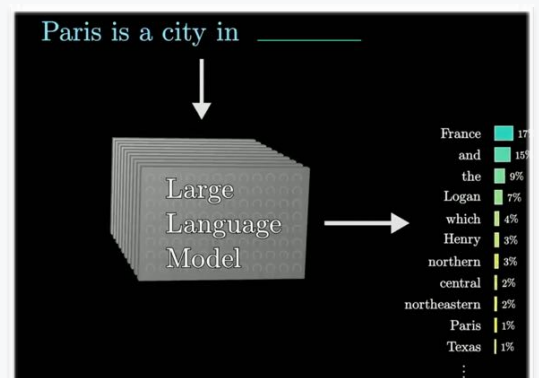
# Working with LLMs

- Make the LLM **write** text down and **read** from them
  - Some model generate “artifacts” and “files” in the chat
  - “Coding” mode (Claude Code or ChatGPT Codex) allows LLM to work on a folder
  - AGENTS.md or CLAUDE.md



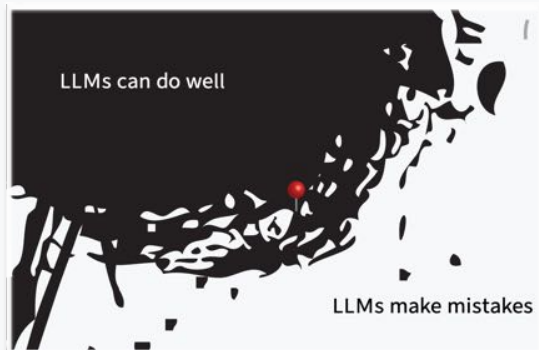
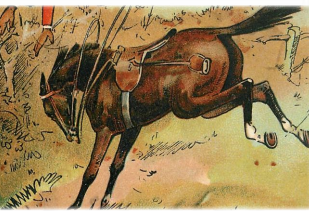
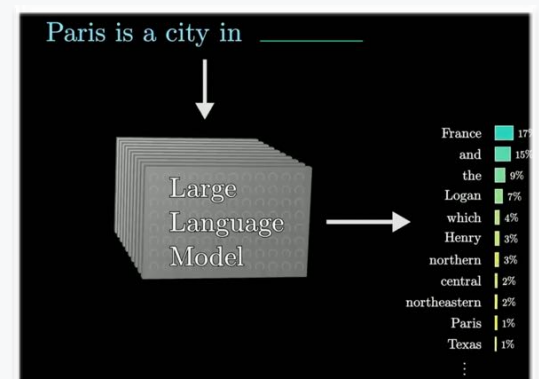
# Working with LLMs

- Make the LLM write text down and read from them
- Your input: **clear, specific, detailed**, with **examples**. No need to be polite



# Working with LLMs

- Make the LLM write text down and read from them
- Your input: clear, specific, detailed, with examples. No need to be polite
- Be vigilant about **what you know** and **what you don't know**

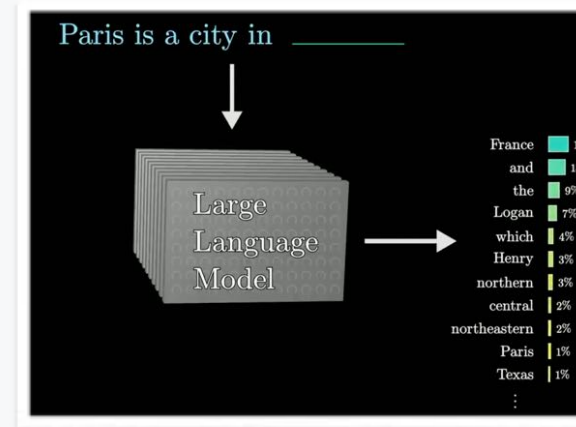


# Competences for working with Generative AI

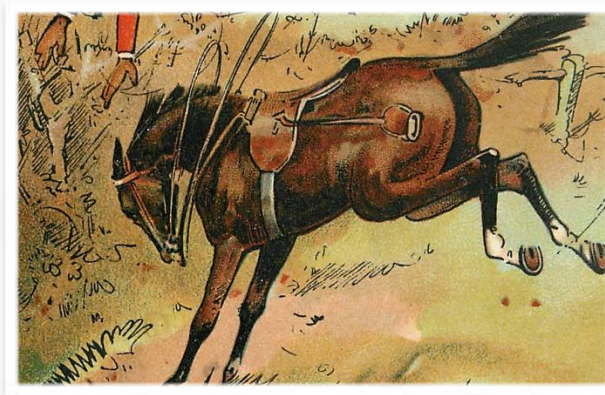
- Mental models about AI



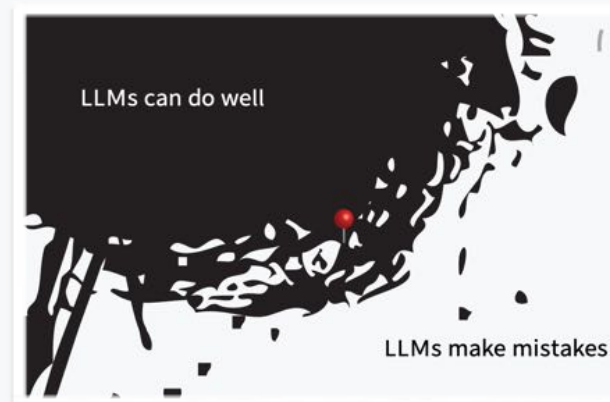
AI as a forest



LLM is a probabilistic word-guesser based on internet data



LLM with a harness



Jagged frontiers of LLM capabilities



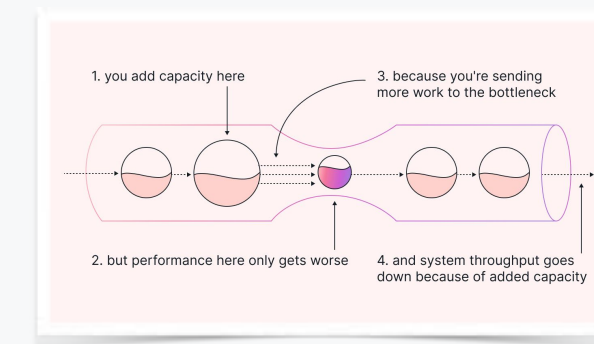
LLM as a hammer for making tools

Do I need AI?

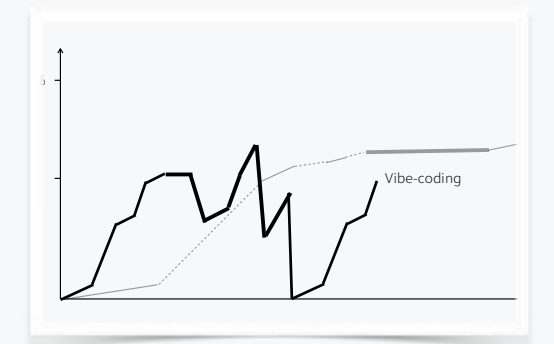
- Task analysis
- Cost-benefit analysis



falling tide and cost of context switching



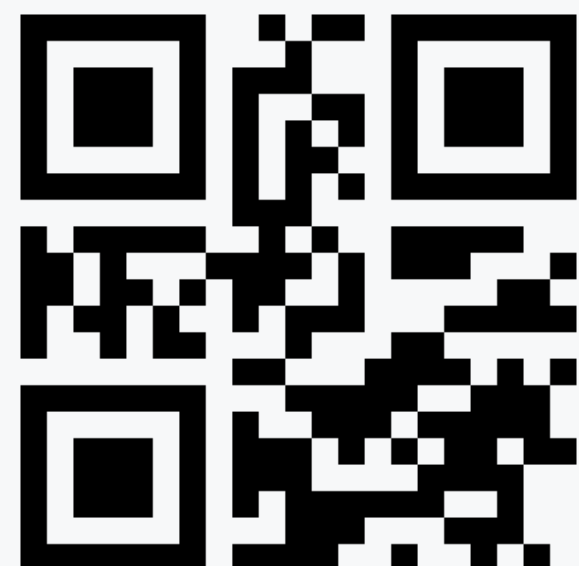
bottleneck



vibe coding hope vs. reality

## Working with LLMs

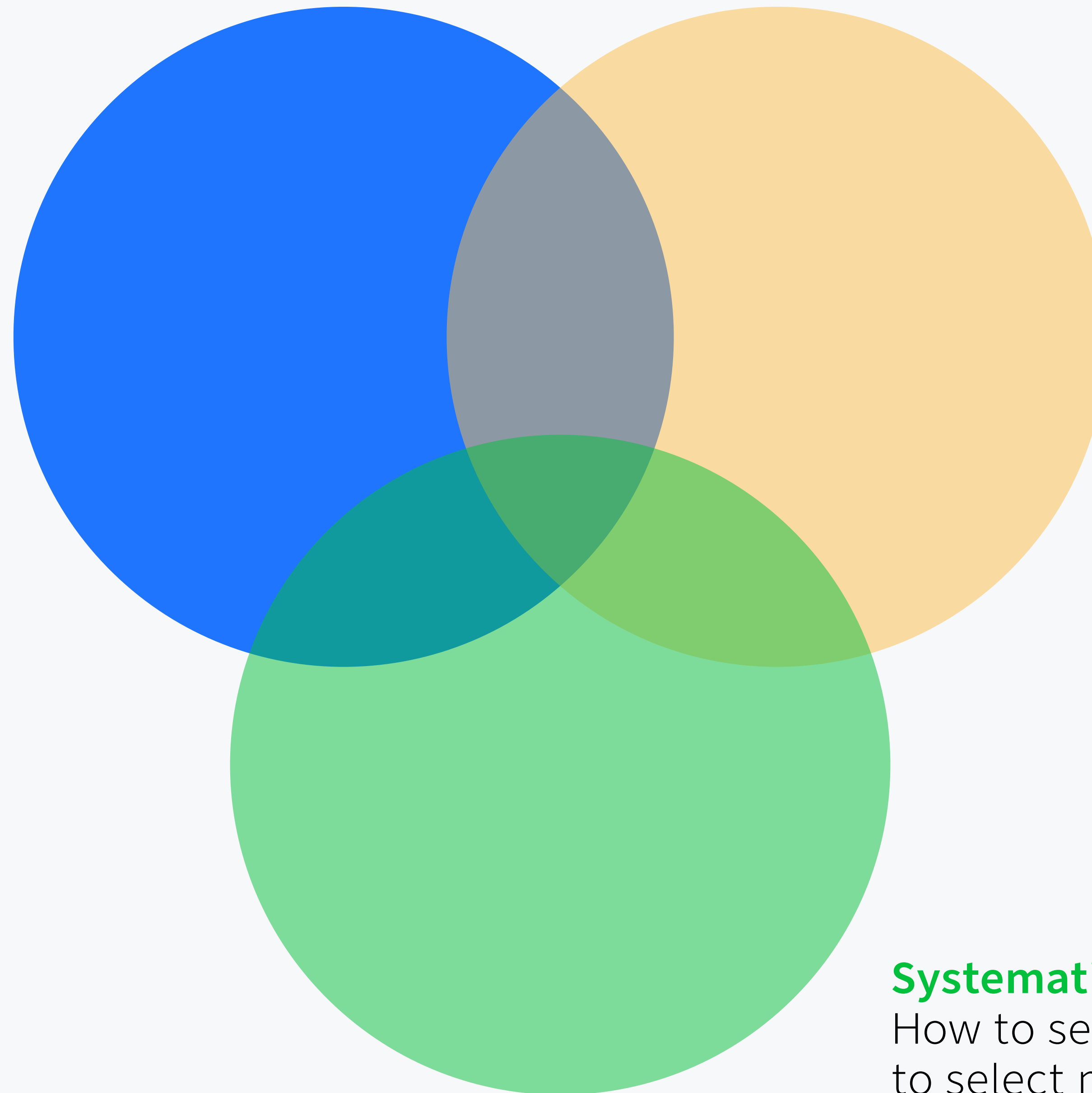
- Make it write and read
- Input: clear, specific, detailed, with examples
- Be vigilant of what you know/don't



Slides: [chatw.ch/c-ai](https://chatw.ch/c-ai)

## Domain expertise

Knowledge and skills specific to their profession



## Generative AI usage expertise

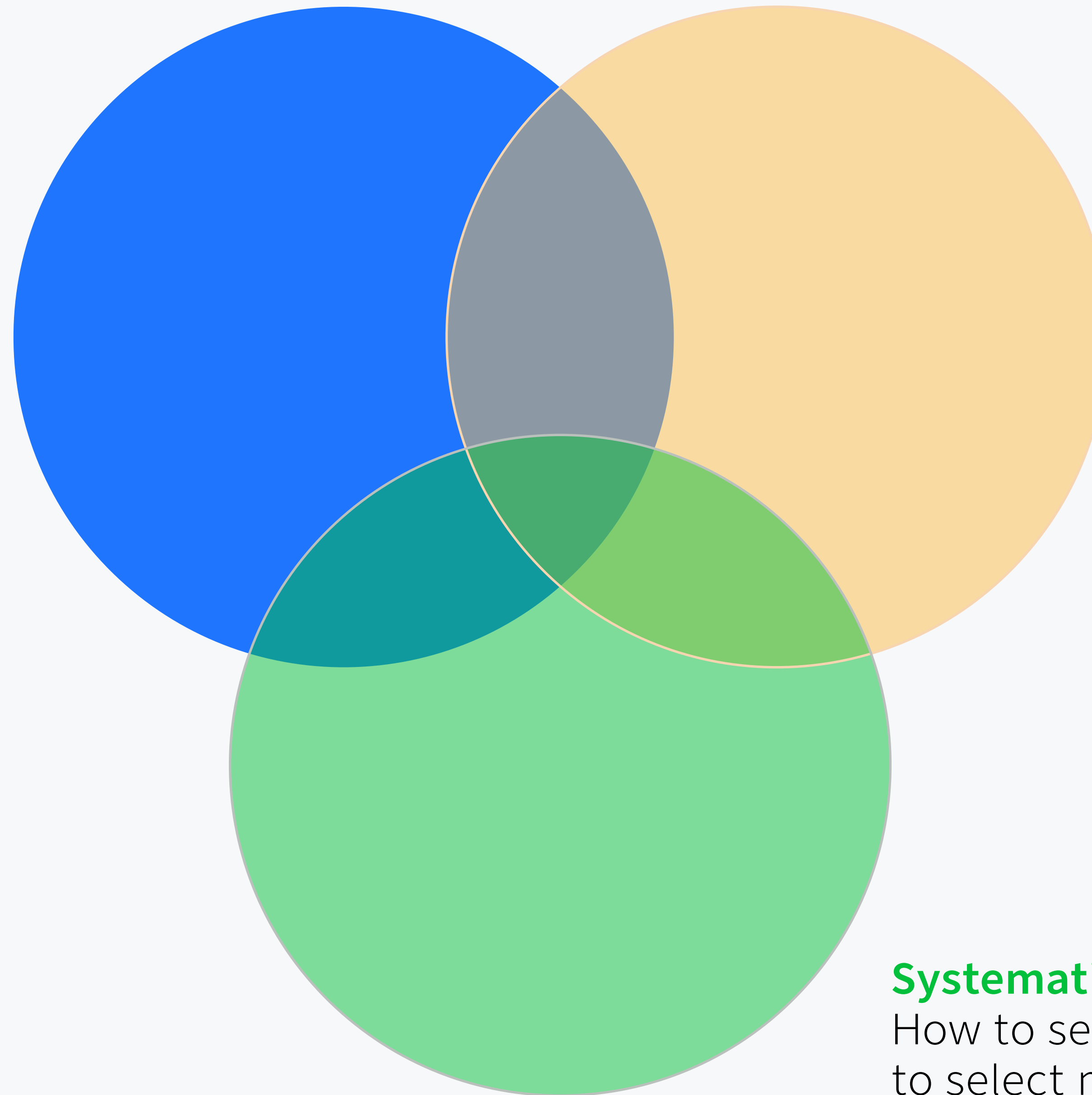
E.g., how to setup GenAI in the workflow, prompting techniques

## Systematic Evaluation expertise

How to setup an experiment, how to select measurements, how to evaluate the results

## Domain expertise

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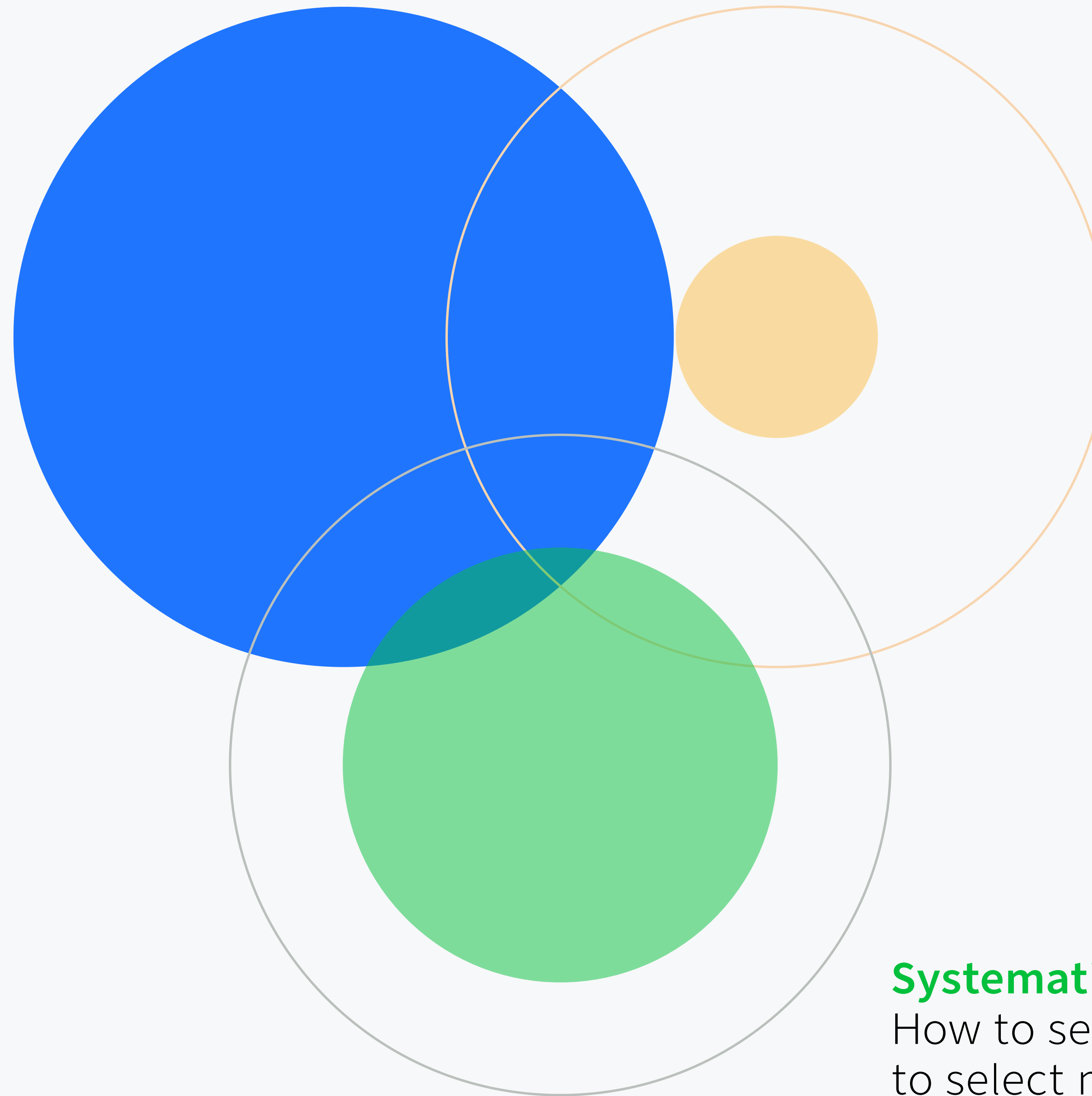
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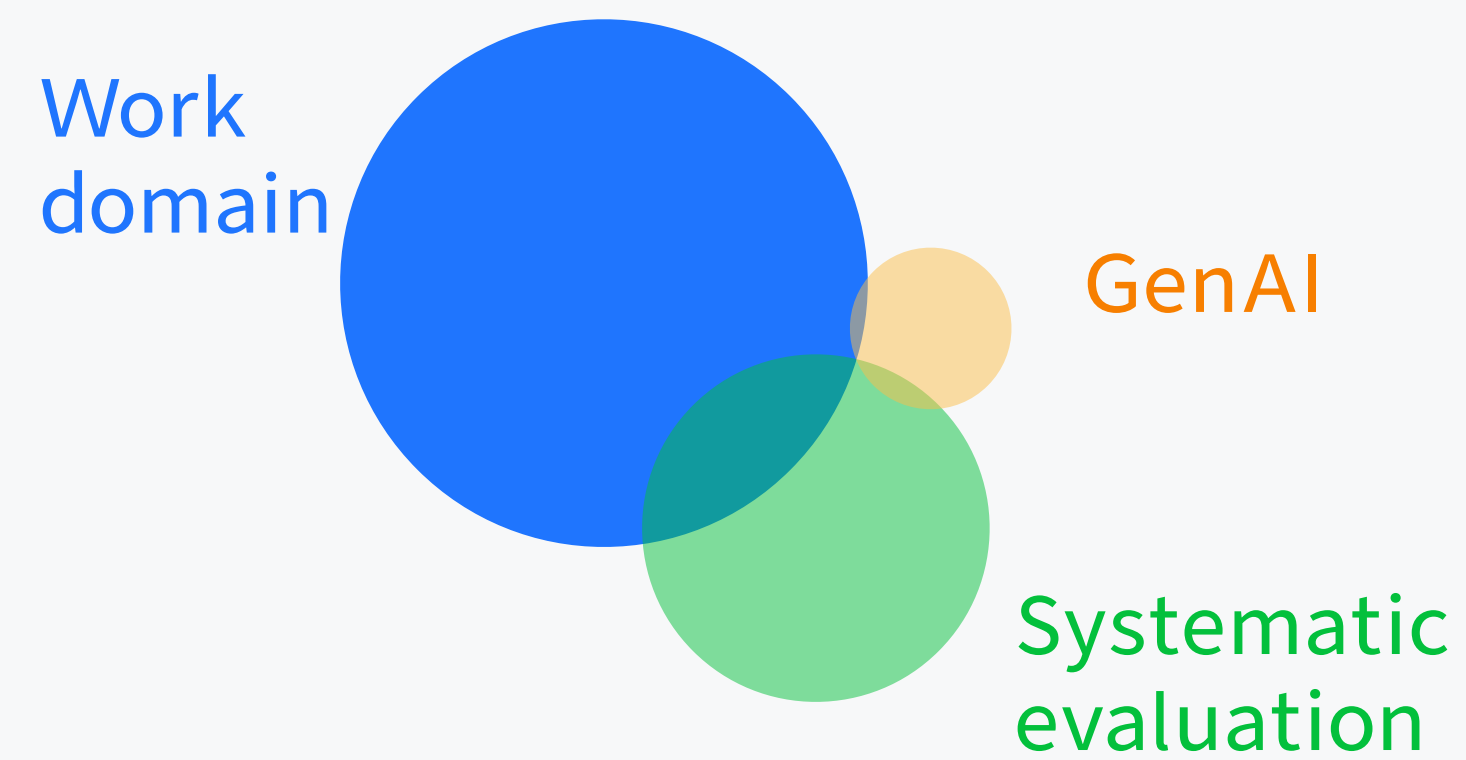
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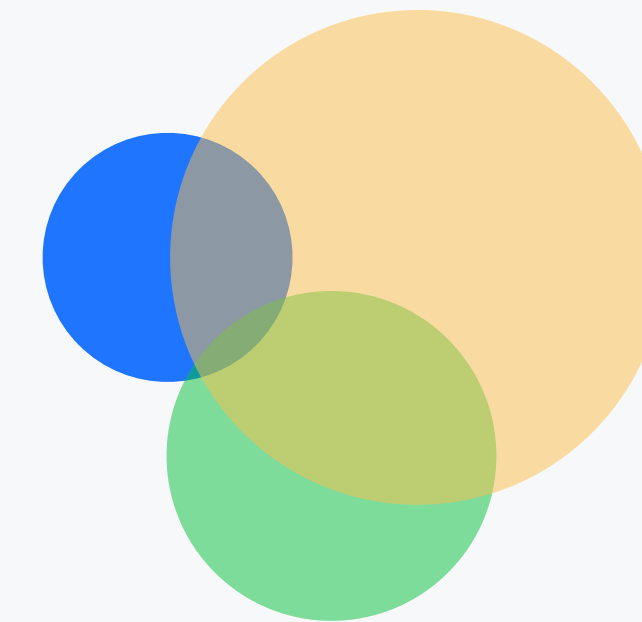


# Dynamics and opportunities in teams

A team member with high work experience



A junior team member with more GenAI curiosity



Supervising team member

