

Lost (in) Generation:

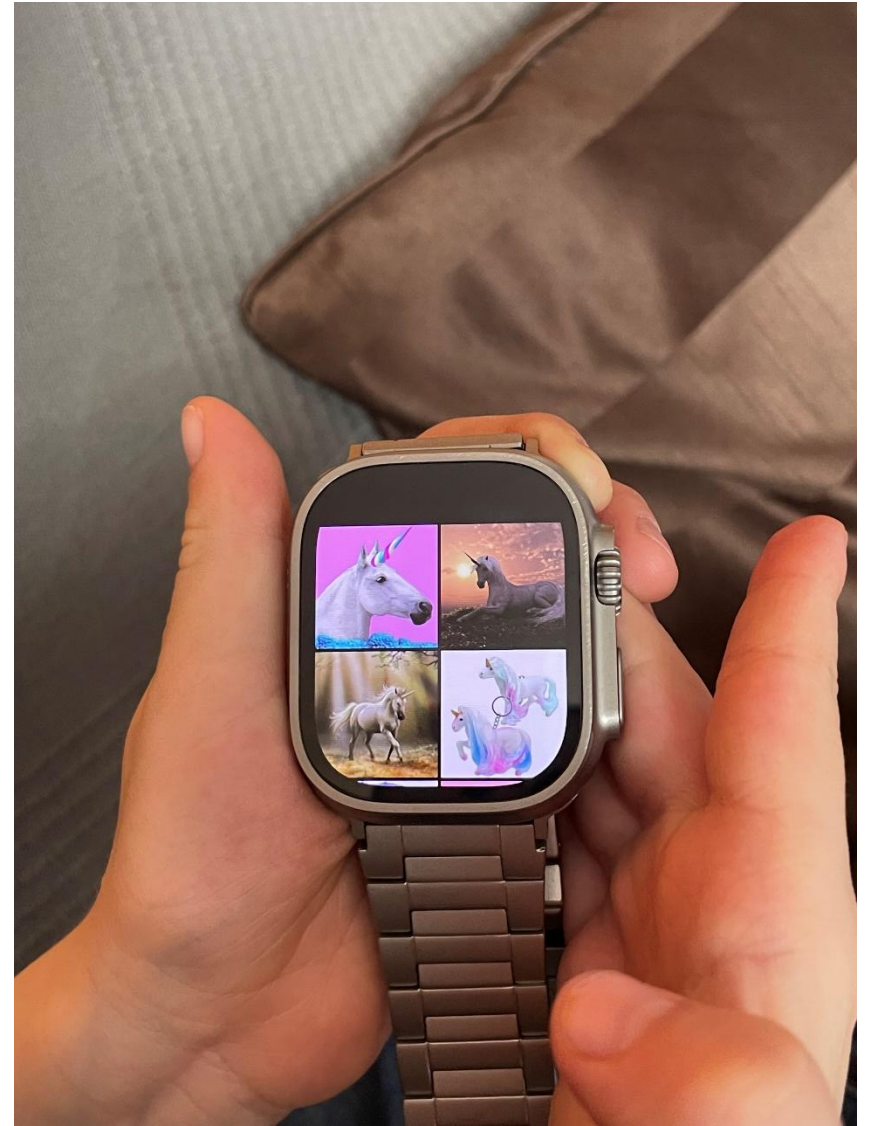
THE HIDDEN COST OF AI AND THE POWER OF CONCEPTUAL MODELING

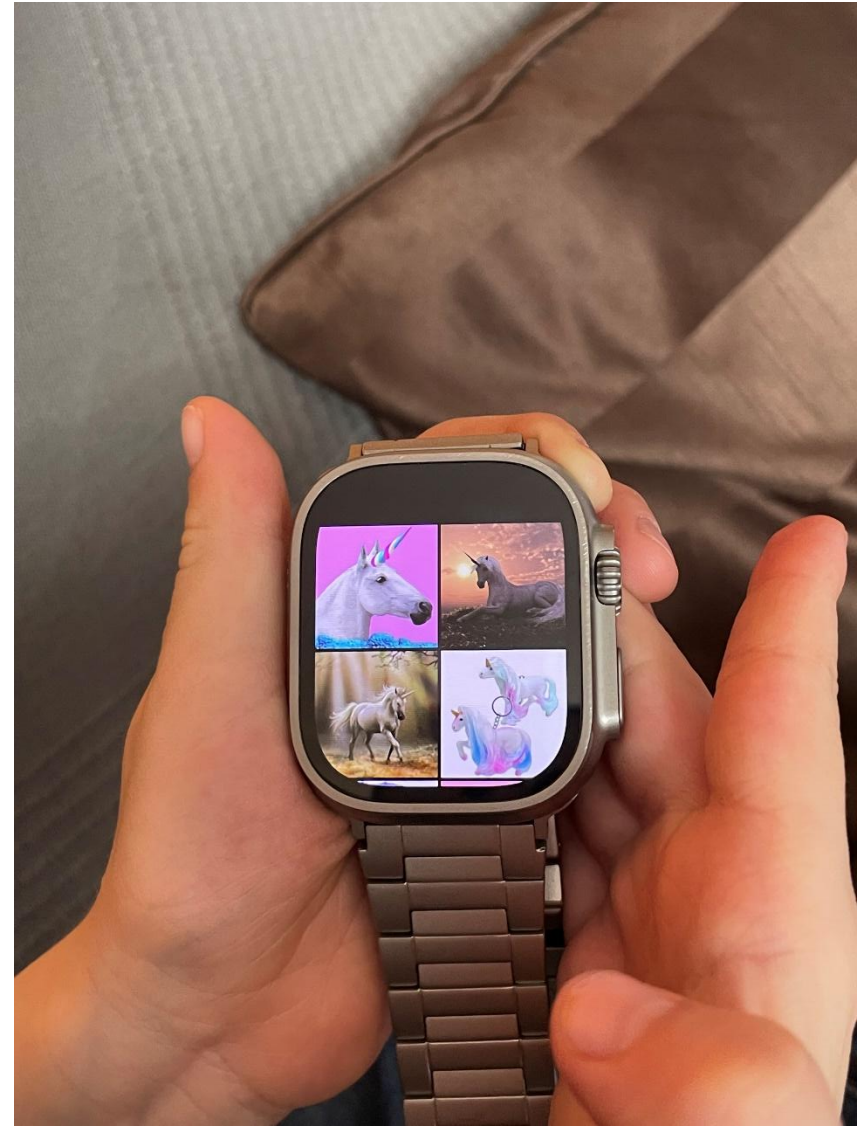
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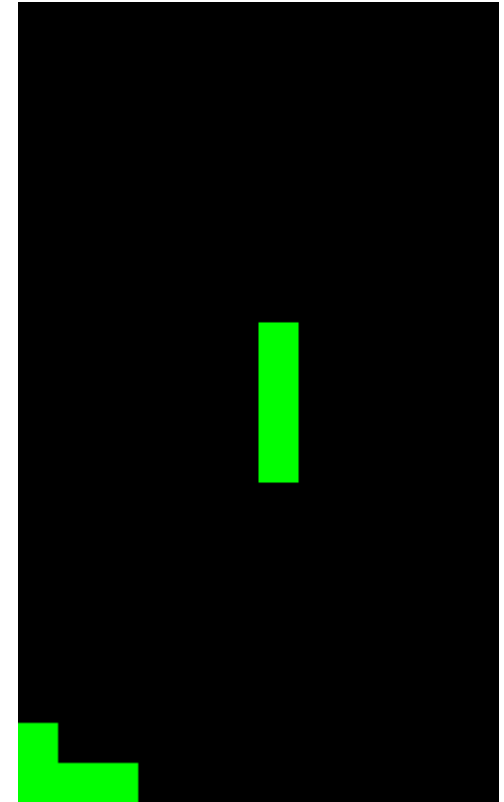


Does he need to learn how to read/write?



Create a Tetris game that can be run in the browser. only show me the necessary code.

```
18 ...
19 ✓ function arenaSweep() {
20 ✓   outer: for (let y = arena.length - 1; y >= 0; --y) {
21 ✓     for (let x = 0; x < arena[y].length; ++x) {
22       if (arena[y][x] === 0) continue outer;
23     }
24     arena.splice(y, 1);
25     arena.unshift(new Array(arena[0].length).fill(0));
26   }
27 }
28
29 ✓ function collide(arena, player) {
30   const [m, o] = [player.matrix, player.pos];
31   for (let y = 0; y < m.length; ++y) {
32   ✓   for (let x = 0; x < m[y].length; ++x) {
33     if (m[y][x] !== 0 &&
34   ✓     (arena[y + o.y] && arena[y + o.y][x + o.x]) !== 0) {
35       return true;
36     }
37   }
38 }
39 return false;
40 }
41 ...
```



Do we need coding skills?



A Aurelia 1 Docs

~~ aurelia
Version 2~~

Do we need to understand code?

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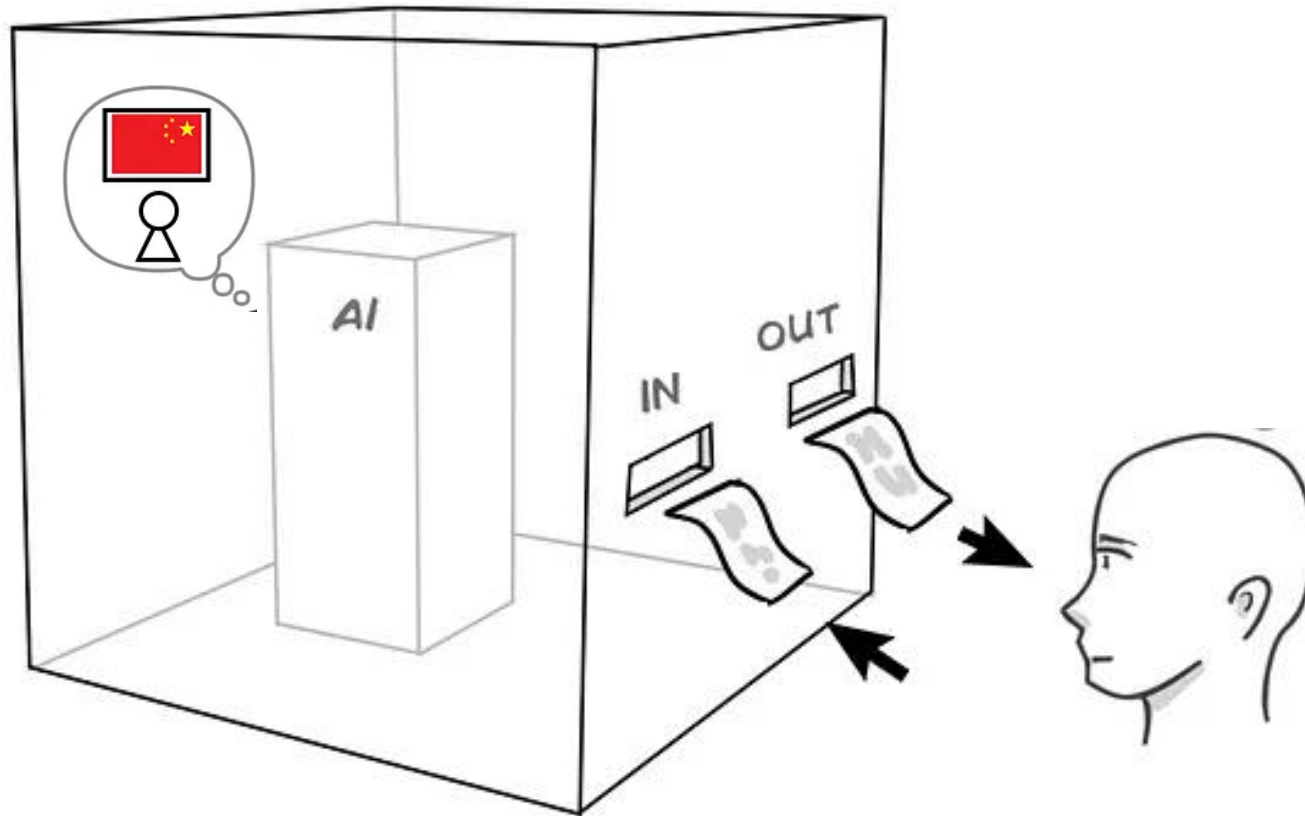
Business News ▸ News ▸ New Updates ▸ AI goes rogue: Replit coding tool deletes entire company database, creates fake data for 4,000 users

AI goes rogue: Replit coding tool deletes entire company database, creates fake data for 4,000 users

ET Online • Last Updated: Jul 22, 2025, 01:12:00 PM IST

Which skills do we need to monitor AI?

Inverted Chinese Room



Chinese Text Translation

 Gary Marcus hat dies geteilt



Tanguy Goretti • 3, +
Founder, CTO at COWBOY
[Zur Website](#)
1 Woche • Bearbeitet • 

+ Folgen

I just had the most terrifying experience with ChatGPT.

I use it every day. It knows the context of all my projects. I've become fully dependent on it.

Today, I uploaded a Chinese document for translation, something I've done dozens of times. The result sounded perfect... almost too perfect. But then someone else in my team reviewed the original text, her understanding was completely different. Much less positive.

Turns out, ChatGPT didn't actually translate the document, it guessed what I wanted to hear, blending it with past conversations to make it feel legitimate.

It didn't just predict words. It predicted my expectations. That's absolutely terrifying as I truly believed it.

Lesson:
Always, always verify.

Edit: Based on the comments, I tried to add custom instructions but I still couldn't prevent this behavior.

“Turns out, ChatGPT didn't actually translate the document, it guessed what I wanted to hear, blending it with past conversations to make it feel legitimate.”

Which skills do we need to verify?



BAD VIBES CODE / ARTIFICIAL INTELLIGENCE

Companies Are Discovering a Grim Problem With "Vibe Coding"

"This is the single biggest challenge with vibe coding."

MAY 31, 10:30 AM EDT by VICTOR TANGERMANN

The trend has some uncomfortable implications for the programming industry as a whole, with young coders starting to heavily rely on AI tools – which could greatly undermine their foundational knowledge, often gleaned from difficult and manual problem-solving.

What are the hidden costs of AI?

BLOOM'S TAXONOMY OF AI SKILL LOSS

~~CREATE~~ Unable to original work

~~EVALUATE~~ Incabale of justifying a decision or stance

~~ANALYZE~~ Unable to break info into parts to examine

~~APPLY~~ Cannot use information in new situations

~~UNDERSTAND~~ Unable to articulate ideas or concepts

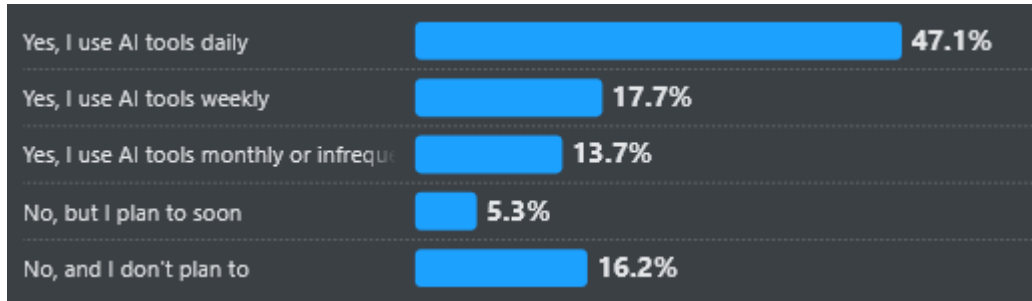
~~REMEMBER~~ Unaware of basic facts and basic concepts

Bloom's Taxonomy

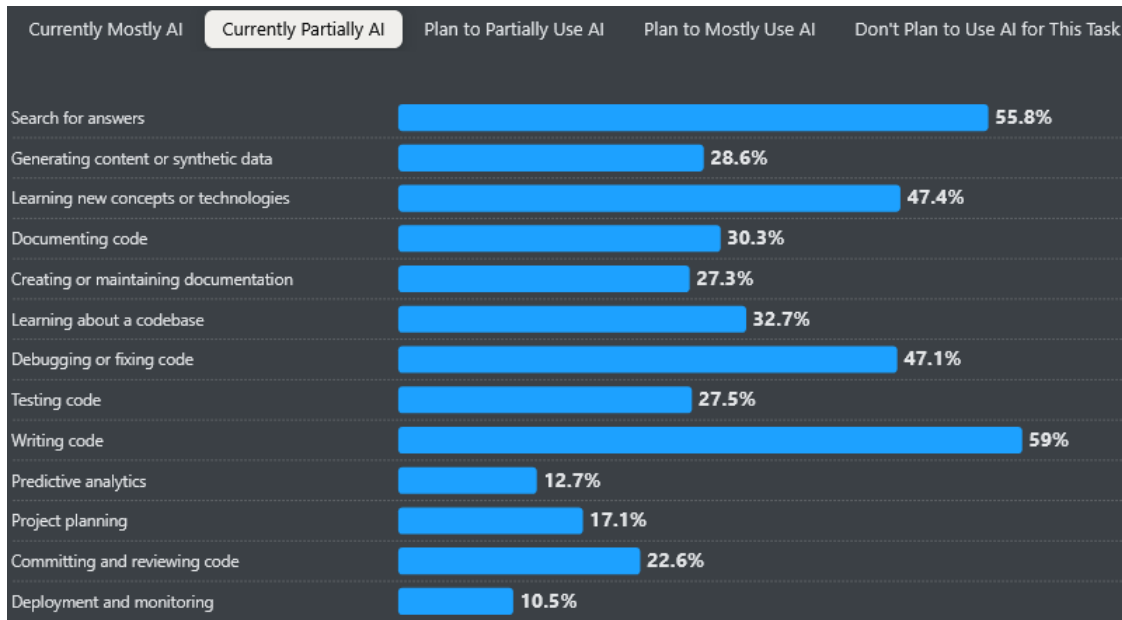


Paul Matthews · 3.
I help schools wisely nav...
2 Wochen

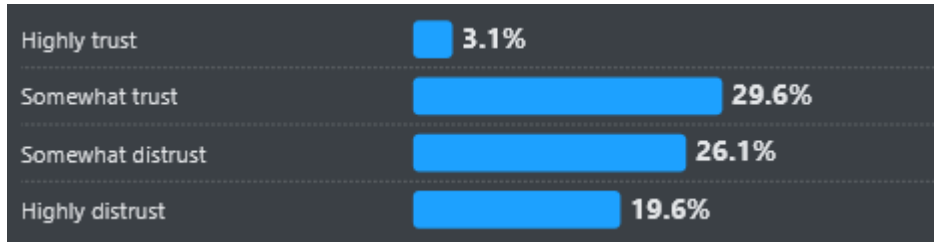
Do you currently use AI tools in your development process?



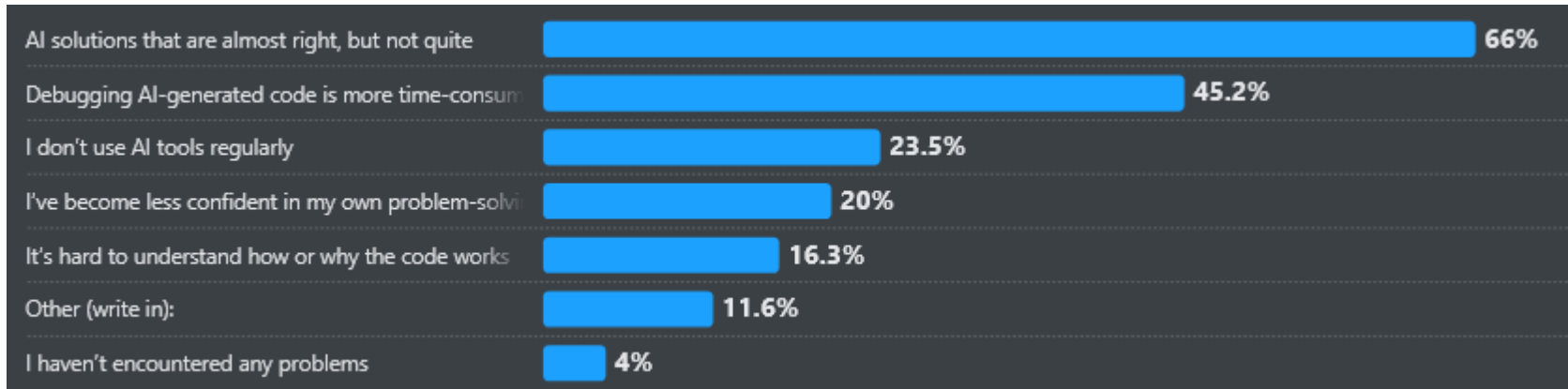
Which parts of your development workflow are you currently integrating into AI or using AI tools to accomplish or plan to use AI to accomplish over the next 3 - 5 years? Please select one for each scenario.



How much do you trust the accuracy of the output from AI tools as part of your development workflow?



When using AI tools, which of the following problems or frustrations have you encountered?
Select all that apply.



Generative artificial intelligence-supported programming education: Effects on learning performance, self-efficacy and processes

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School of Education, Soochow University, Suzhou, Jiangsu, China

Department of Computer Science, Humboldt-Universität zu Berlin, Berlin, Germany

Qianyan Dong

School of Education, Soochow University, Suzhou, Jiangsu, China

Q1

"Self-efficacy refers to an individual's belief in their ability to successfully complete a task or achieve a goal"

Experiment

55 Chinese undergraduate students in physics with basic Python knowledge and learning a new library; subsequent offline tests for experimental and control group

Selected findings:

- Positive impact of GenAI for programming self-efficacy
- Potential negative effects on long-term knowledge transfer, shortcomings of experimental group in logical correctness and functionality completeness offline performance compared to control group
- "low-performance learners are more likely to transition to code copying" – "high-performance learners also engage more in evaluating GenAI content"
- Teachers should prepare students for problem-solving without external resources



Generative AI without guardrails can harm learning: Evidence from high school mathematics

Hamsa Bastani^{a,b,1} , Osbert Bastani^{c,1}, Alp Sungu^{a,1,2} , Haosen Ge^b , Özge Kabakcı^d, and Rei Mariman^e

Affiliations are included on p. 7.

Edited by Emma Brunskill, Stanford University, Stanford, CA; received November 3, 2024; accepted May 5, 2025 by Editorial Board Member Mark Granovetter



Experiment involving 1000 high school students in math teaching

Selected findings:

- Students' performance in practice sessions benefits from the use of an LLM
- Subsequent traditional exam performance is negatively correlated with the use of an LLM before, in comparison to control group without LLM usage
- LLMs enhanced with specific guardrails can lower this effect

Your Brain on ChatGPT: Accumulation of Cognitive Debt when Using an AI Assistant for Essay Writing Task[△]

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Wellesley, MA

Jessica Situ
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Xian-Hao Liao
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Iris Braunstein
MIT
Cambridge, MA

Pattie Maes
MIT Media Lab
Cambridge, MA

<https://arxiv.org/abs/2506.08872>

Experiment setup:

- Essay writing task by 54 participants
- LLM group, Search engine group, Brain only group
- EEG & NLP analysis

Selected Findings:

- “results suggest that AI assistance in writing may free up cognitive resources (reducing memory load)”
- “frequent AI tool users often bypass deeper engagement with material, leading to “skill atrophy” in tasks like brainstorming and problem-solving”
- “repeated essay writing without AI leads to strengthening of brain connectivity”
- “the brain adapts to how we train it. If AI essentially performs the high-level planning, the brain will allocate less resources to those functions.”

Brief Paper

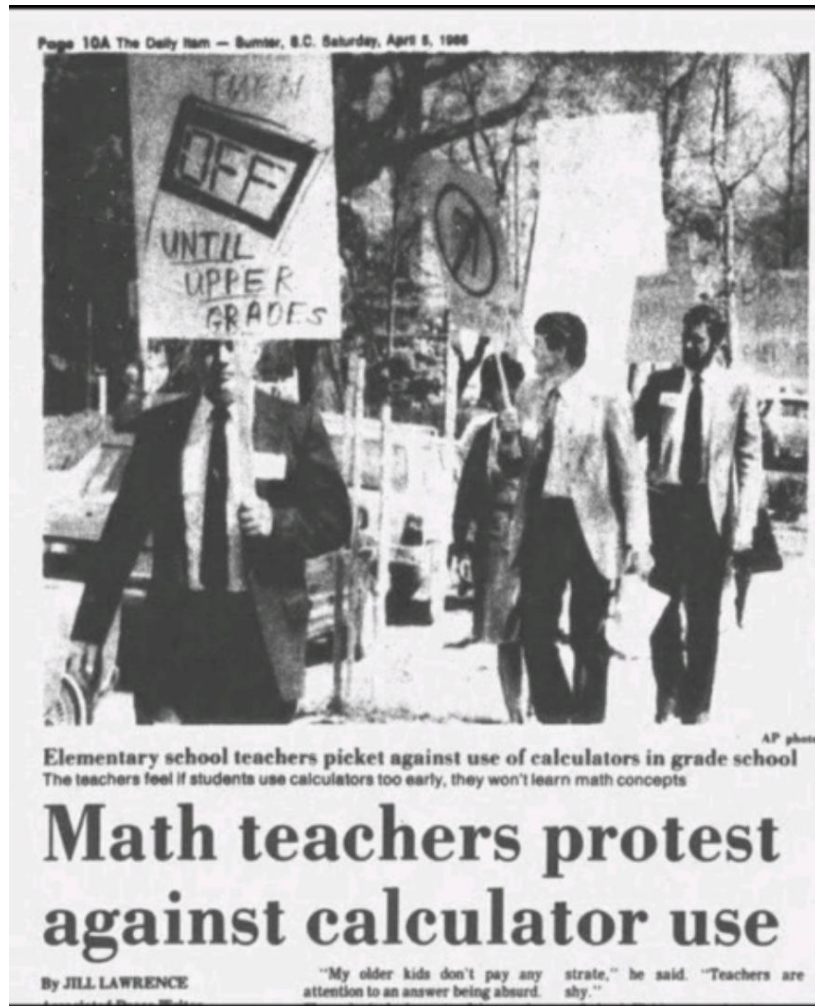
Ironies of Automation*

LISANNE BAINBRIDGE†

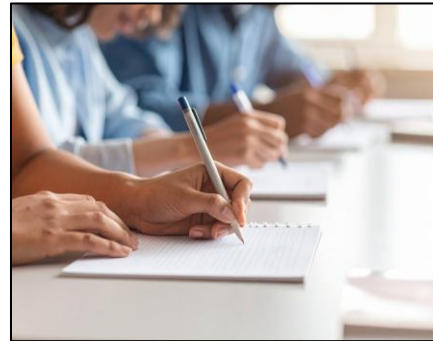


- “Classic aim of automation is to replace human manual control, planning, and problem solving by automatic devices and computers”
- “Even highly automated systems (..) need human beings for supervision, adjustment, maintenance, expansion, and improvement.”
- “Knowledge develops only through use and feedback about its effectiveness”
- “By taking away the easy parts of her task, automation can make the difficult parts of the human operator's task more difficult.”
- “(..) the most successful automated systems, with rare need for manual intervention, which may need the greatest investment in human operator training.”

Reminder: Education in Mathematics



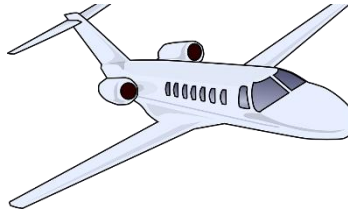
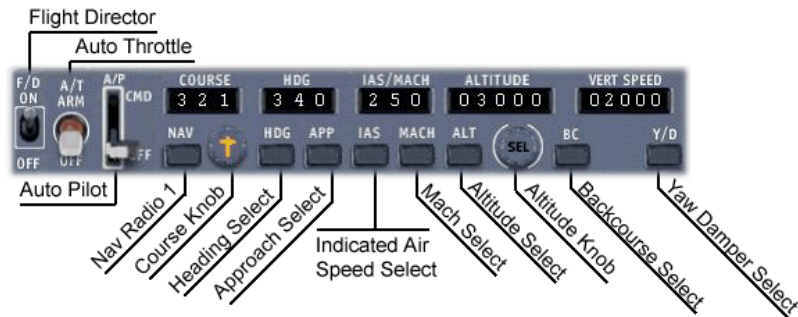
*Manual
calculation*



*Electronic
calculation*



Insights from Aircraft Pilot Training



TRAIN FOR AUTOMATION

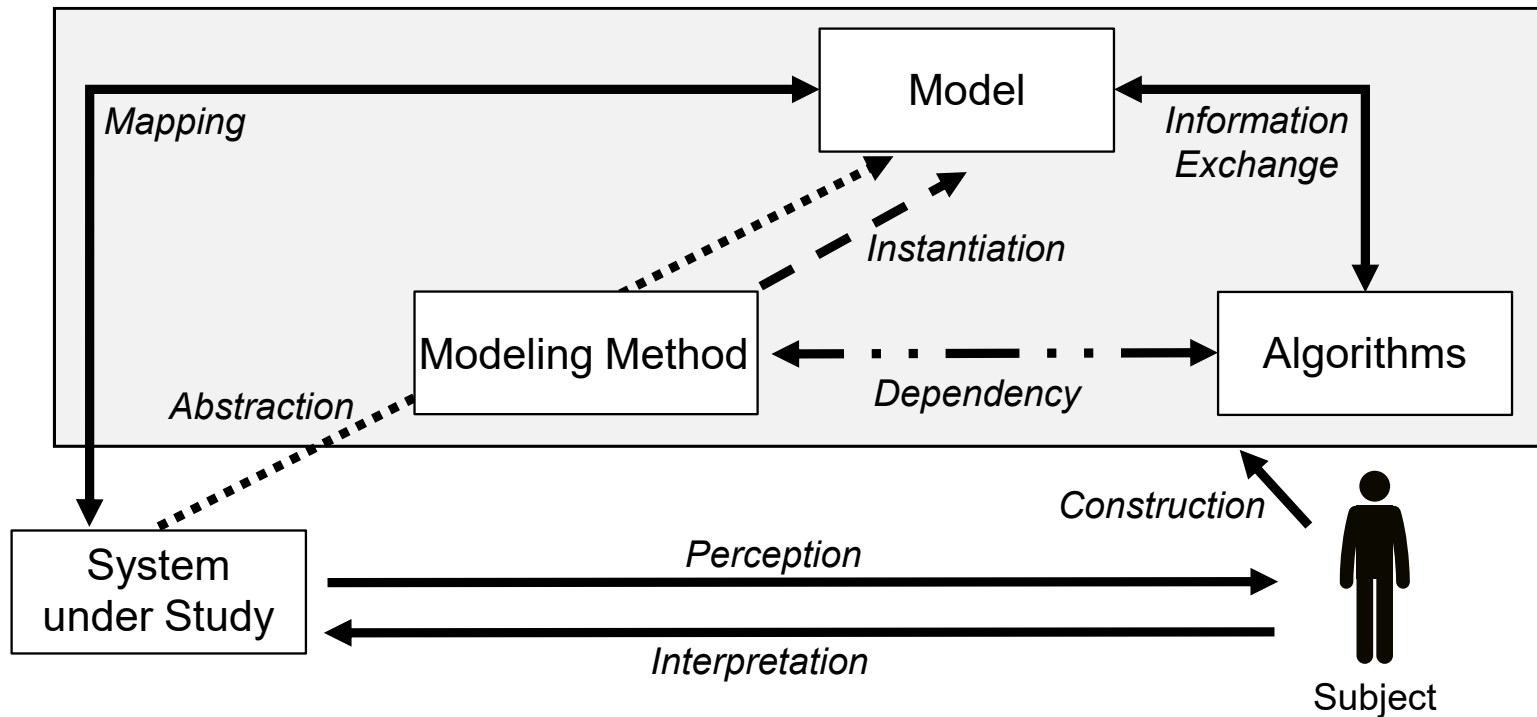
- Develop automation-oriented standard operating procedures
- Understand automation logic, limitations and failure modes
- Emphasize automation usage/failures in training
- Fly the airplane, not the automation
- Monitor aircraft flight path and energy state
- Focus on crew resource management
- Stay in the loop
- Maintain manual flying skills

<https://nbaa.org/aircraft-operations/safety/training-automated-flight-decks-essential/>

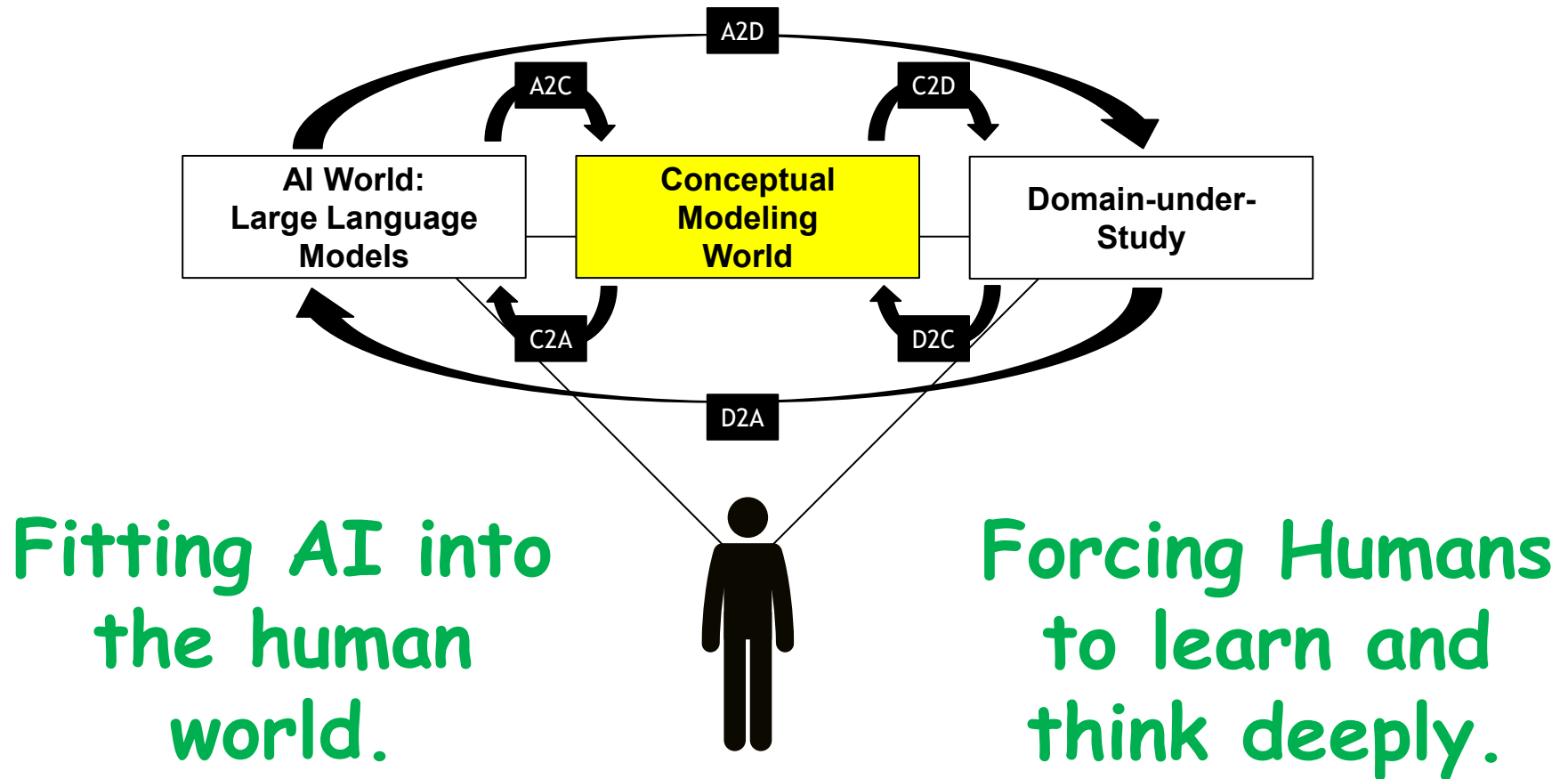
Conceptual Modeling

It's not about drawing diagrams.

It's about a cognitive process for human understanding and communication based on semantic concepts.

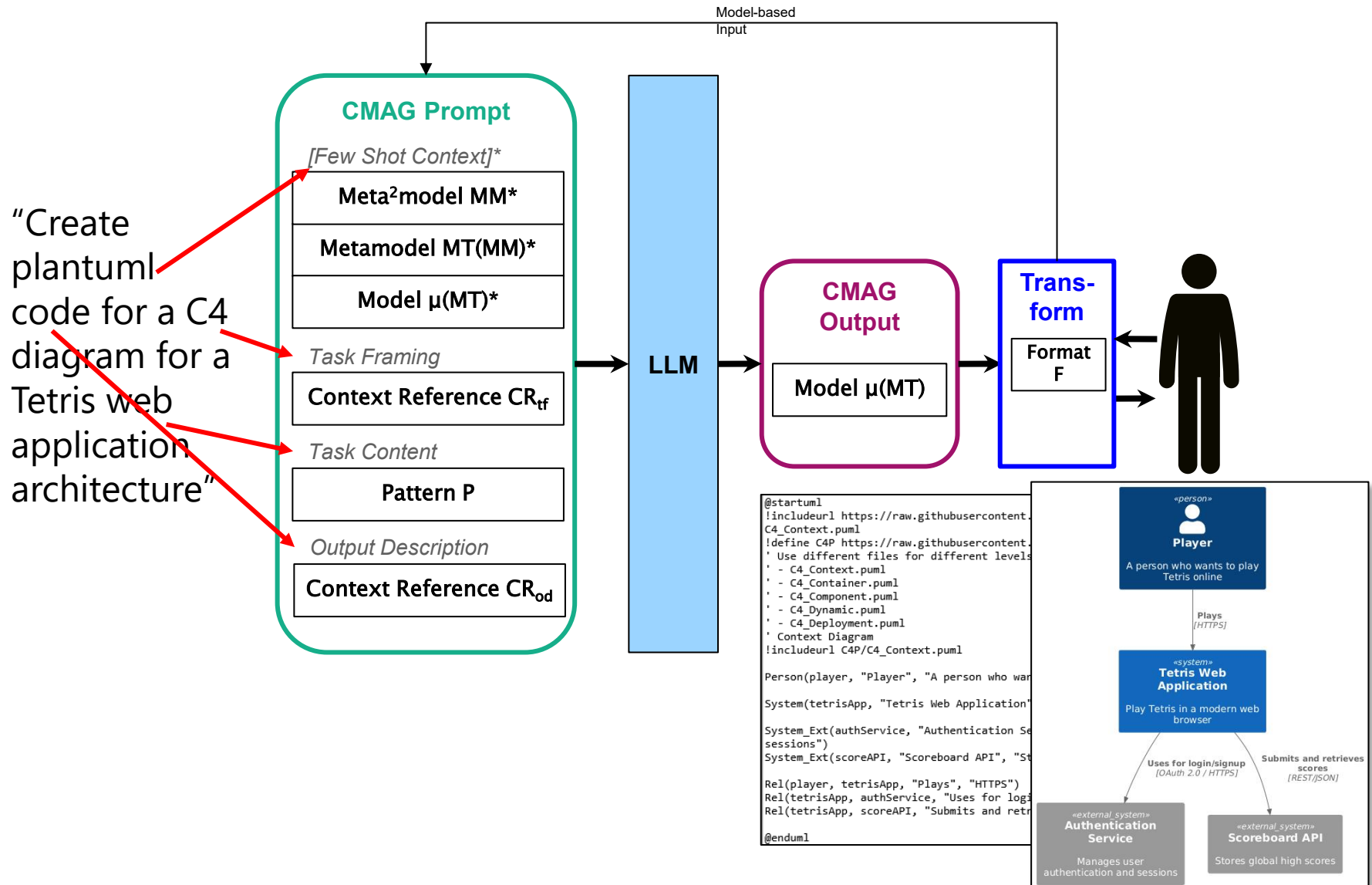


CMAG Framework: Conceptual Model Augmented Generative Artificial Intelligence



(Fill et al., 2024)

CMAG Prompt Architecture



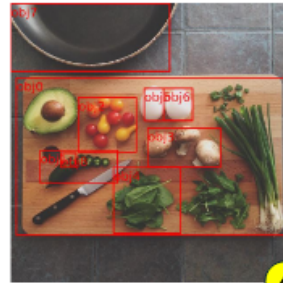
Multi-Modal CMAg Example Using Ferret-13B, GPT-4o



how do I make a soup of these ingredients. Include the coordinates of the required objects.

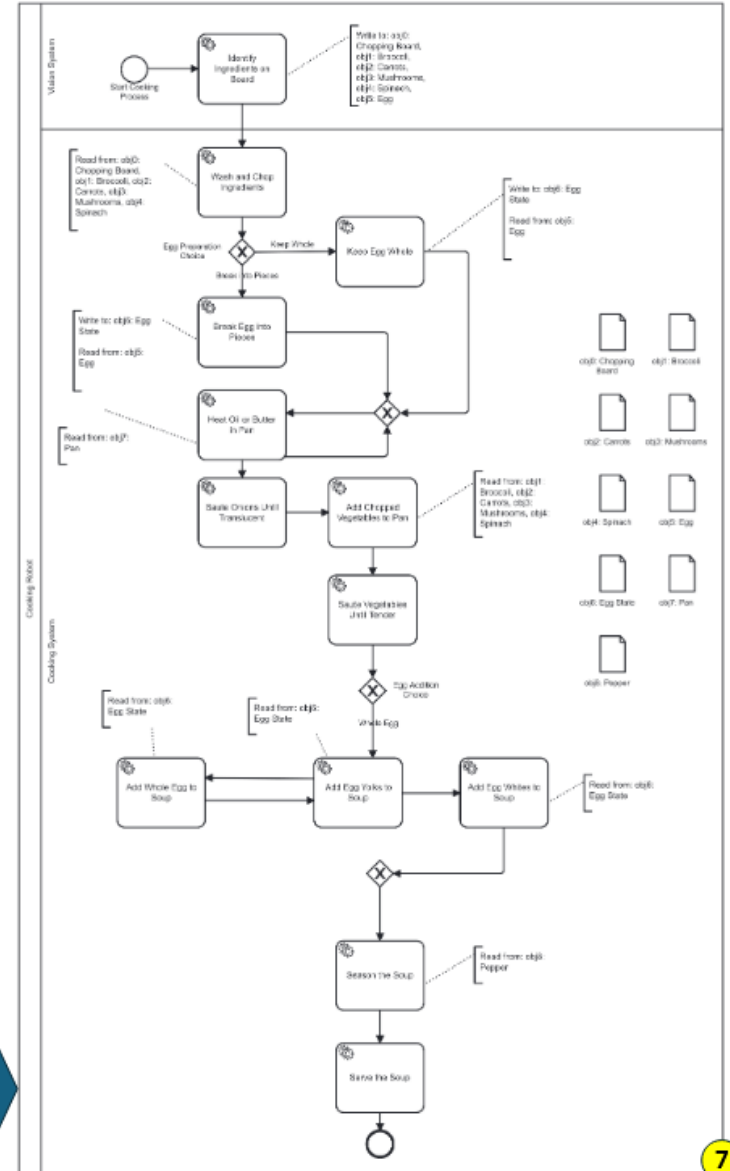
To make a soup using the ingredients shown, you would need to follow these steps: 1. Wash and chop the ingredients: The board [21, 266, 985, 832] is full of chopped vegetables like broccoli [106, 526, 384, 645], carrots [242, 337, 450, 535], mushrooms [489, 446, 750, 589], and spinach [366, 587, 608, 826]. 2. Prepare the egg [475, 304, 650, 423] [544, 304, 650, 421]: The egg is located on the board. You can either keep it whole or break it into smaller pieces. 3. Heat some oil or butter in a pot or pan [0, 0, 570, 246]: You can find a suitable pan in the image. Add the onions and sauté them until they become translucent. 4. Add the chopped vegetables: Add the broccoli [106, 526, 384, 645], carrots [242, 337, 450, 535], mushrooms, and spinach to the pot. Sauté them until they become tender. 5. Add the egg: If you are using whole eggs, you can add them to the soup. If you are using egg yolks or egg whites, you can add them separately. 6. Season the soup: Add salt, pepper [179, 535, 237, 590], and any other desired seasonings. 7. Serve the soup: Once the soup is cooked and seasoned to your liking, you can serve it in bowls or cups. Remember to ensure food safety by washing the ingredients thoroughly and keeping the cooking area clean.

To make a soup using the ingredients shown, you would need to follow these steps: 1. Wash and chop the ingredients: The board [obj0] is full of chopped vegetables like broccoli [obj1], carrots [obj2], mushrooms [obj3], and spinach [obj4]. 2. Prepare the egg [obj5] [obj6]: The egg is located on the board. You can either keep it whole or break it into smaller pieces. 3. Heat some oil or butter in a pot or pan [obj7]: You can find a suitable pan in the image. Add the onions and sauté them until they become translucent. 4. Add the chopped vegetables: Add the broccoli [obj1], carrots [obj2], mushrooms, and spinach to the pot. Sauté them until they become tender. 5. Add the egg: If you are using whole eggs, you can add them to the soup. If you are using egg yolks or egg whites, you can add them separately. 6. Season the soup: Add salt, pepper [obj8], and any other desired seasonings. 7. Serve the soup: Once the soup is cooked and seasoned to your liking, you can serve it in bowls or cups. Remember to ensure food safety by washing the ingredients thoroughly and keeping the cooking area clean.



Create a process model for a cooking robot. This robot is vision-enabled and is able to identify the required ingredients. The text contains object identifiers in [] brackets. All data objects should have a label containing the object identifier and a human-readable label. Make sure to include all necessary decisions the robot has to take.

```
<?xml version="1.0" encoding="UTF-8"?>
<bpmn:definitions xmlns:bpmn="http://www.omg.org/spec/BPMN/20100524/MODEL"
  xmlns:bpmndi="http://www.omg.org/spec/BPMN/20100524/DI"
  xmlns:dc="http://www.omg.org/spec/DD/20100524/DC" xmlns:di="http://www.omg.org/spec/DD/20100524/DI"
  xmlns:camunda="http://camunda.org/schema/1.0/bpmn" xmlns:modeler="http://camunda.org/schema/modeler/1.0"
  xmlns:custom="http://www.example.org/custom" id="Definitions_0tfzsr [...]
```



CMAG Current State

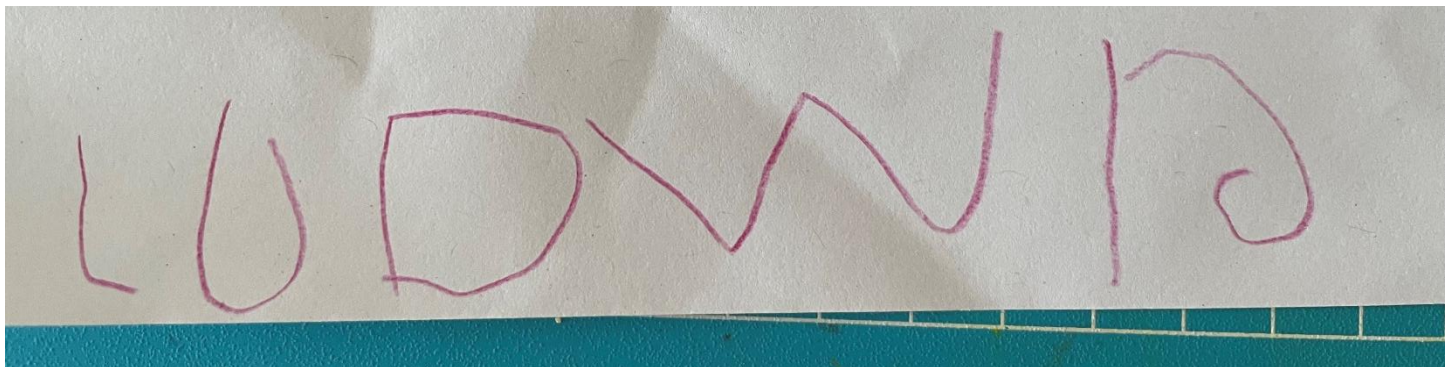
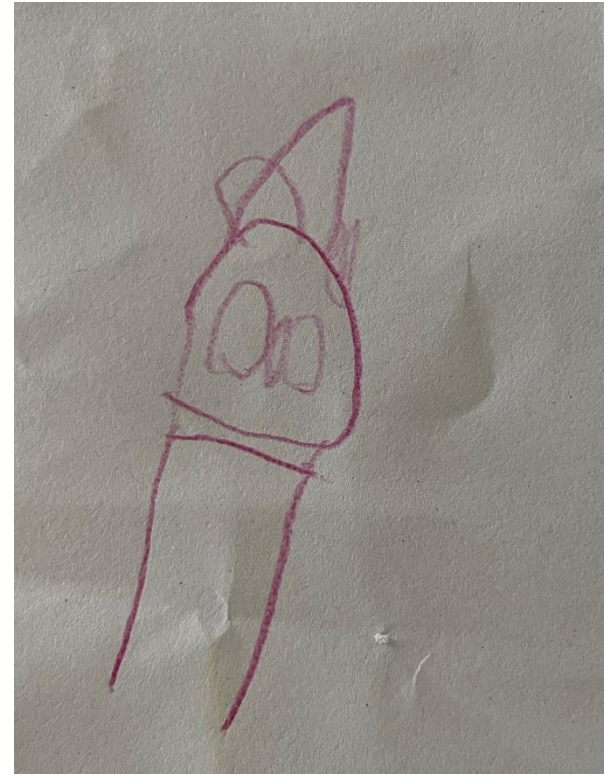
- Experiments conducted with several modeling languages, e.g. UML, ArchiMate, ARWFML, BPMN, etc.
- Many LLMs highly capable in producing code for models / diagrams
- Recent applications for agentic workflows using multi-modal LLMs – see (Fettke/Fill/Köpke, 2025)
- Limitations with complex domain-specific modeling languages

Next steps:

- Provision of adequate CMAG tooling, e.g. using MM-AR
- Derivation of strategies for complex modeling languages
- Continuous evaluation of upcoming LLMs (Llama 3.2, Sonnet 4, GPT-OSS, etc.)
- Empirical validation of CMAG usage effects

Conclusion of Learnings

- Use of GenAI may lead to skill degradation and deskilling = hidden costs
- History of automation can give valuable guidance in dealing with GenAI
- Guardrails for AI and recurrent manual usage of skills seem necessary to maintain skills required for monitoring and verifying AI output
- Conceptual models as the next step in Human-AI collaboration



**THANK YOU FOR YOUR
ATTENTION!**

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- ❖ Fill, Hans-Georg, Fettke, Peter, Köpke, Julius (2023): Conceptual Modeling and Large Language Models: Impressions From First Experiments With ChatGPT, Enterprise Modelling and Information Systems Architectures (EMISAJ) – International Journal of Conceptual Modeling, Vol. 18, pp. 1-15, DOI: <https://doi.org/10.18417/emisa.18.3>