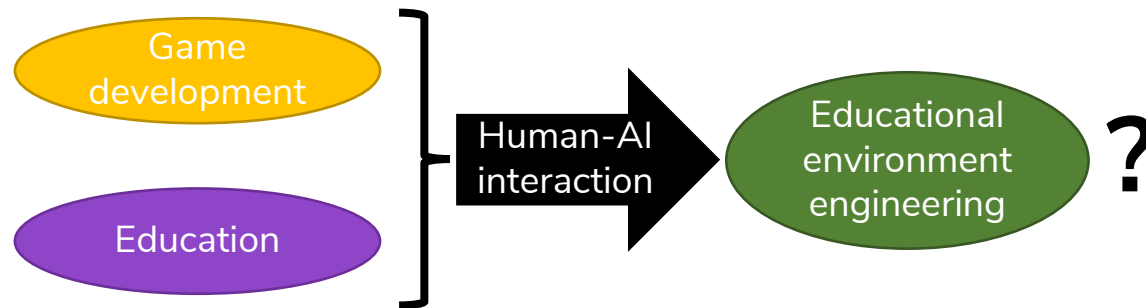


Will human-AI interaction promote new career paths in game development and education?



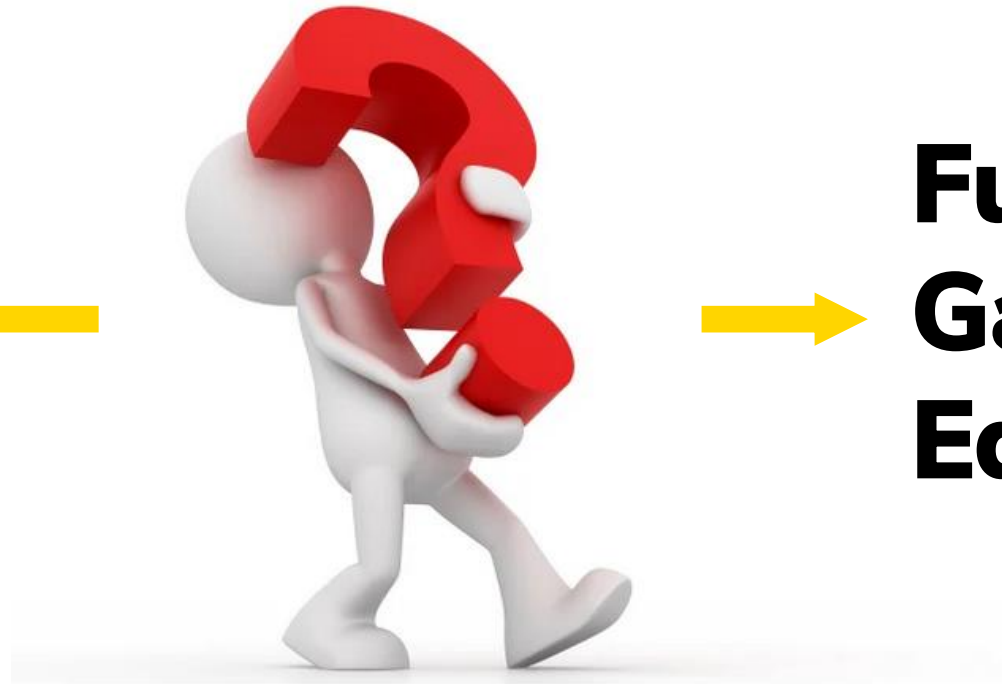
Stefan E. Huber

Digital Psychology Lab (Prof. Manuel Ninaus)

Institute of Psychology

University of Graz

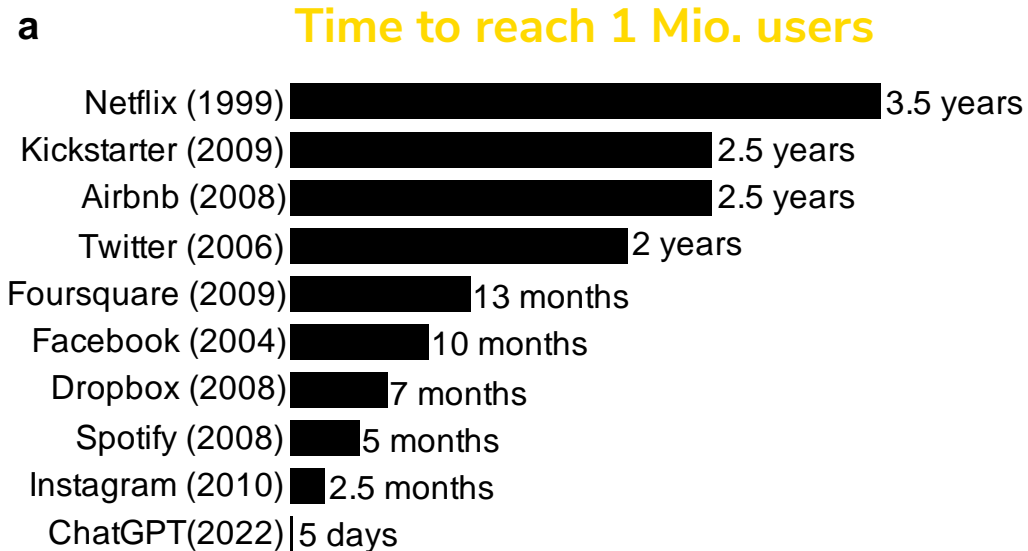
**Human-AI
Interaction**



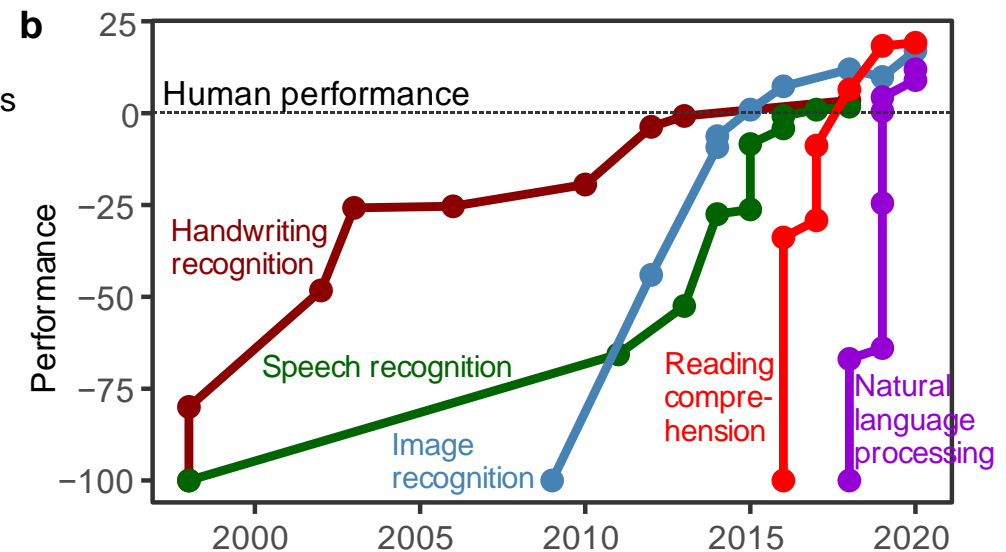
**Future of
Games &
Education**

Expertise & Education

ChatGPT et al.



<https://www.statista.com/chart/29174/time-to-one-million-users/>



<https://doi.org/10.48550/ARXIV.2104.14337>

Why?

○ Because it proved useful.

- Producing and polishing text
- Teaching & learning
- Generating computer code
- Generating first ideas
- Facilitating routine tasks

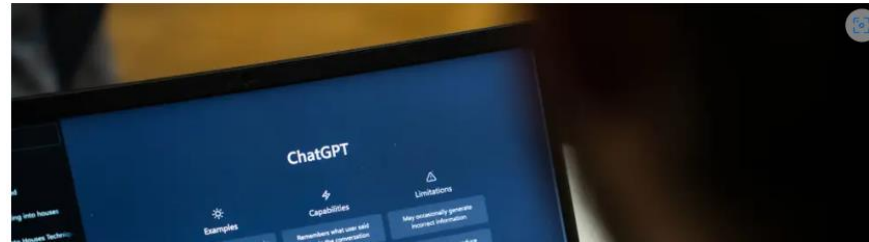
How *Nature* readers are using ChatGPT

Eighty per cent of respondents have used AI chatbots – and 57% say they use them for 'creative fun'.

<https://doi.org/10.1038/d41586-023-00500-8>

7 ways to use ChatGPT at work to make your job easier

Jacob Zinkula and Aaron Mok Updated Sep 3, 2023, 9:49 PM MESZ



<https://www.businessinsider.com/how-to-use-chatgpt-at-work-job-save-time-ai-2023-2>

This man used AI to write and illustrate a children's book in one weekend. He wasn't prepared for the backlash.

Beatrice Nolan Jan 15, 2023, 10:00 AM MEZ



<https://www.businessinsider.com/chatgpt-midjourney-ai-write-illustrate-childrens-book-one-weekend-alice-2023-1>

The 5 ChatGPT prompts including exact wording I use to save up to 8 hours a week of work

Ashley Couto Apr 15, 2023, 2:49 PM MESZ

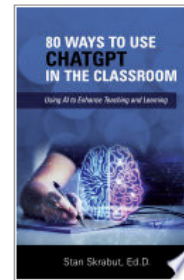


Ashley Couto is freelance writer and brand officer for a small business. Ashley Couto

- I've been in marketing for 18 years. ChatGPT has helped me make my workflow more efficient.
- The generative AI helps me write social-media posts, troubleshoot marketing problems, and more.
- Here are my five most valuable hacks, with example prompts I use daily to reduce my workload.

<https://www.businessinsider.com/chatgpt-hacks-reduce-workload-example-prompts-2023-4>

80 Ways to Use ChatGPT in the Classroom



Stan Skrabut

Stan Skrabut, 31.01.2023 - 135 Seiten

What is the impact of chatGPT on your classroom?
Should you be concerned? Should you use it or not?

In the book, "80 Ways to Use ChatGPT in the Classroom:

Mehr »

Suchen

[Voransicht des Buches »](#)

https://books.google.at/books/about/80_Ways_to_Use_ChatGPT_in_the_Classroom.html?id=ng-rEAAQBAJ&redir_esc=y



<https://www.bing.com/videos/riverview/relatedvideo?q=how%20to%20use%20chatgpt%20for%20brainstorming&mid=0E9A4121B297E3CBE7910E9A4121B297E3CBE791&ajaxhist=0>



<https://www.bing.com/videos/riverview/relatedvideo?q=how%20to%20use%20chatgpt%20for%20brainstorming&mid=0506F2B03AAB8AEC5FF60506F2B03AAB8AEC5FF6&ajaxhist=0>

Example

1

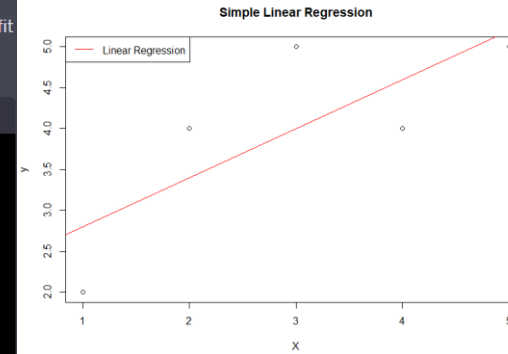
```
Certainly! Here's how you can perform simple linear regression in R using a similar dataset and the built-in lm() function for linear modeling. We'll create a linear regression model, fit it to the data, make predictions, and create a simple plot:
```

```
R                                                                    Copy code

# Sample dataset
X <- c(1, 2, 3, 4, 5) # Input features (independent variable)
y <- c(2, 4, 5, 4, 5) # Target variable (dependent variable)

# Create a linear regression model
model <- lm(y ~ X)

# Make predictions
```



Learning data analysis with R

- 1 “Can you give some short code snippet including an example for a simple regression in R?”
- 2 “How could the residuals be added to the plot?”
- 3 “I don’t see the residuals. What could be the reason?”

2

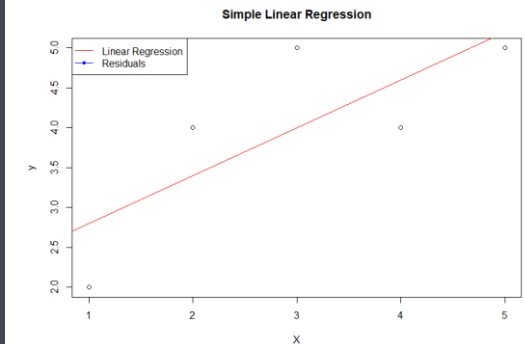
```
You can add the residuals to the plot in R to visualize the differences between the observed values and the predicted values. Here's how you can modify the code to include the residuals in the plot:
```

```
R                                                                    Copy code

# Sample dataset
X <- c(1, 2, 3, 4, 5) # Input features (independent variable)
y <- c(2, 4, 5, 4, 5) # Target variable (dependent variable)

# Create a linear regression model
model <- lm(y ~ X)

# Make predictions
```



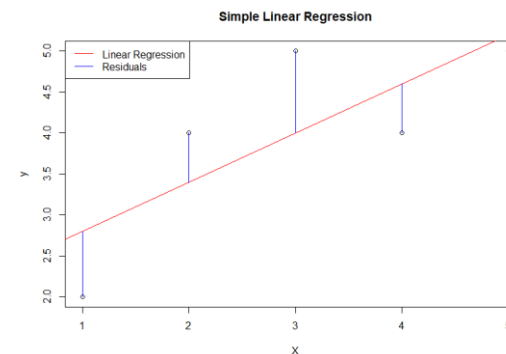
3

```
I apologize for the oversight. It appears there was a mistake in the code. The issue is with the way the residuals are being plotted. Instead of using points(), you should use segments() to plot the residuals as vertical lines from the observed values to the predicted values. Here's the corrected code:
```

```
R                                                                    Copy code

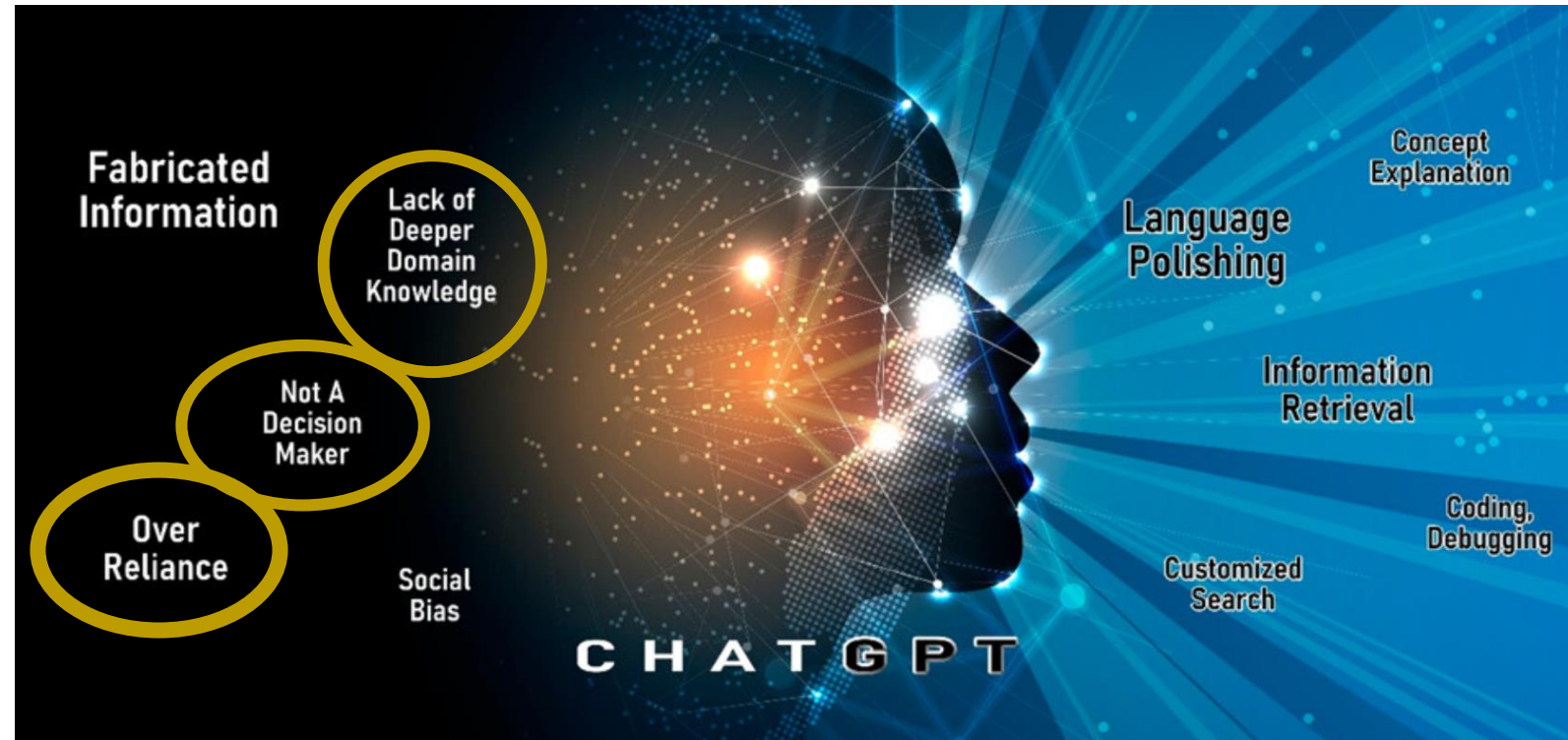
# Sample dataset
X <- c(1, 2, 3, 4, 5) # Input features (independent variable)
y <- c(2, 4, 5, 4, 5) # Target variable (dependent variable)

# Create a linear regression model
model <- lm(y ~ X)
```



Remaining issues

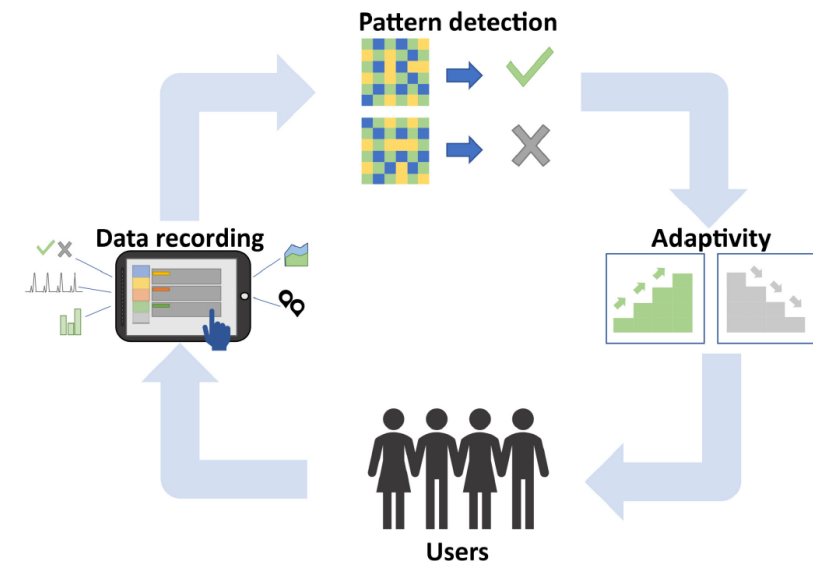
- **Innovation:** Could an algorithm like ChatGPT have discovered wave-particle duality?
- Fabrication, confabulation
- Social and cultural bias
- **Lack of recent, state-of-the-art domain knowledge**
- Lack of accountability: **Decision making** requires the human supervision
- **Over-reliance:** impeding learning? Deskilling? Loss of expertise?



<https://doi.org/10.1021/acs.est.3c01818>

Why bother about human expertise at all?

- **High quality decisions** of human-AI systems depend also on human expertise
- **Accountability**
- Promoting **whose understanding?**
- „The ultimate goal of the field of Artificial Intelligence in Education is not to promote artificial intelligence, but to promote education. (...) In the end, our goal is not to create intelligent tutoring systems or stupid tutoring systems, but to create intelligent and successful students.“ (<https://doi.org/10.1007/s40593-016-0105-0>)



<https://doi.org/10.3389/fpsyg.2022.956798>

How to become an expert?

○ 10 instructional principals:

1. Support students in their epistemological understanding
2. Provide students with opportunities to differentiate between and among concepts
3. Practice with a variety of problems to enable students to experience complexity and ambiguity
4. Enable students to understand how particular concepts are connected
5. Target for relevance
6. Share inexpressible knowledge
7. Pay explicit attention to prior knowledge
8. Support students in strengthening their problem-solving strategies
9. Evoke reflection
10. Facilitate the development of metacognitive knowledge (learning strategies) and skills (self-monitoring, planning, and evaluation)

<https://doi.org/10.1080/00313831.2015.1119729>

Learning processes:

**Conceptual knowledge
→ practical knowledge**

**Practical knowledge →
conceptual knowledge**

**Reflection: integration (with
self); make it your „own“**

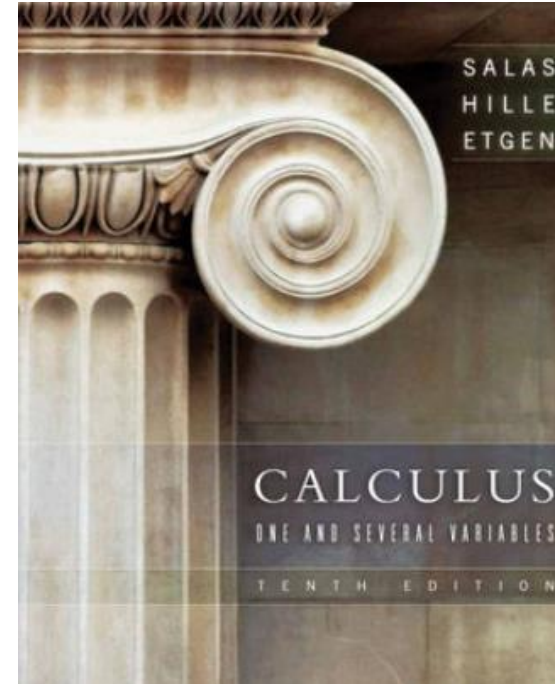
How to accomplish this in practice?

- By practice. A lot of it. Really a lot of it.
- And a lot of exercise. Really a lot of exercise.

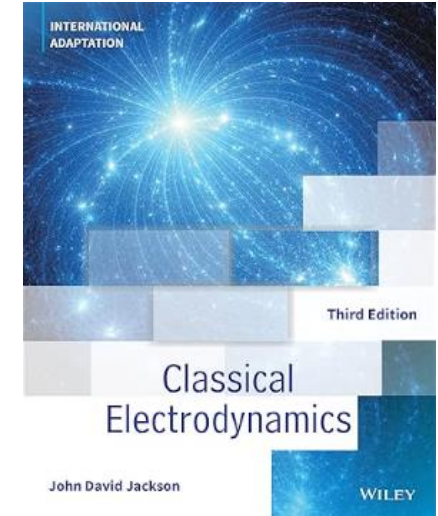
Novice

Time & really
a lot of
continuous
exercise

Expert



> 7000 exercises (on top of
hundreds of worked out
examples)



~ 400 exercises

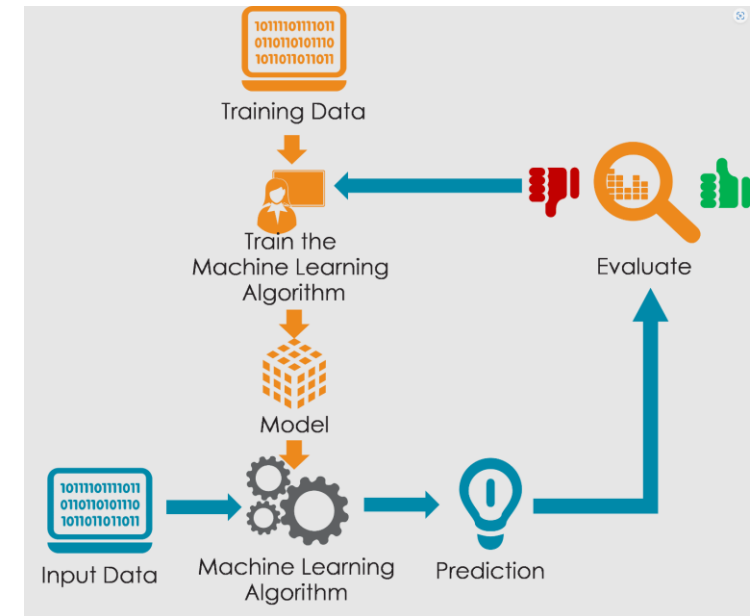


~ 60 worked
out examples

Wait. Worked out examples?

- Isn't that what AI is predestined to be most efficient to assist with?
- How is AI validated?
 1. Has the objective been properly formulated?
 2. Is the AI system free of software bugs?
 3. Is the AI system based on properly representative data?
 4. Can the AI system cope with anomalies and inevitable data glitches?
 5. Is the AI system sufficiently accurate?
- „Questions 2-5 involve more mathematical exercises.“

<https://doi.org/10.1016/j.patter.2020.100037>



<https://intellipaat.com/blog/tutorial/data-science-tutorial/modeling-the-data/>

Unintended effects of learning with AI-support?

- If AI can support me reliably with getting the exercises done,
 - but it is the practice involved in doing the exercises
 - that makes me an expert, then what happens to expertise?
 - And what happens to high-quality decisions by expert-AI systems?
- Expert + AI = HQD
 ??? + AI = ???

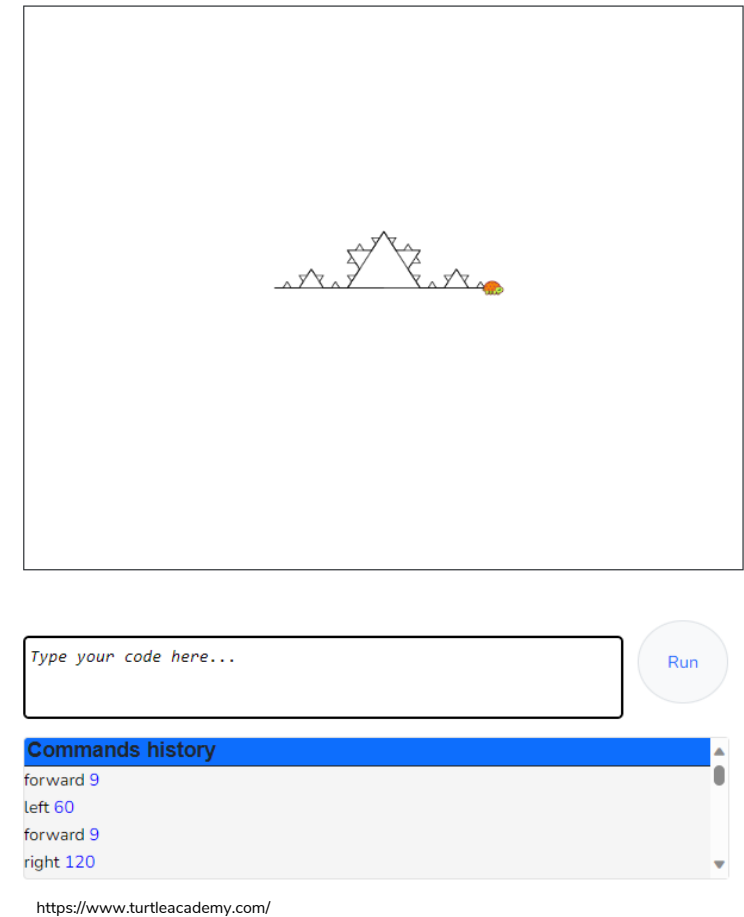
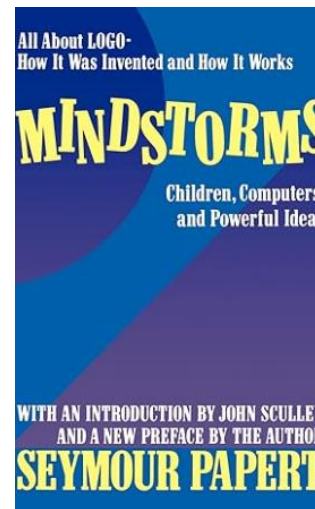


Introducing a vicious cycle?

- **An assessment issue:** certification of expertise is based on task accomplishment, not practice
 - AI can assist with getting the tasks accomplished, not with practice
 - Yet it still is practice that develops expertise
 - Loosing expertise by using (artificial) expertise?
 - Or: Why should I engage in the labour of practice?

Learning from history?

- Decades before ChatGPT:
Seymour Papert (1980)
- Task: Teaching children geometry using computers
- Idea: Let children program computers to make them do things which are meaningful to the children



Breaking the cycle with games?

○ Papert's approach had characteristics of a **well-designed game**

○ **Intrinsic integration**

○ **Meaning**

○ **Autonomy**

○ **Competence**

○ **Relatedness**

○ **Flow**

○ **Attractivity**

**Motivational
power of
games**



Oh, wow,
cool! Let's
draw THIS!!!



https://en.wikipedia.org/wiki/L-system#Example_4:_Koch_curve

Games and expertise

- **Exercise:** Well-designed games realize all instructional principles for expertise development
 1. Support players in their epistemological understanding
 2. Provide players with opportunities to differentiate between and among concepts
 3. Practice with a variety of problems to enable players to experience complexity and ambiguity
 4. Enable players to understand how particular concepts are connected
 5. Target for relevance
 6. Share inexpressible knowledge
 7. Pay explicit attention to prior knowledge
 8. Support players in strengthening their problem-solving strategies
 9. Evoke reflection
 10. Facilitate the development of metacognitive knowledge (learning strategies) and skills (self-monitoring, planning, and evaluation)

„In a well-designed game, the learning becomes its own reward.“

Ryan, R., & Rigby, C. S. (2020). Motivational foundations of game-based learning. In J. L. Plass, R. E. Mayer, & B. D. Homer (Eds.), Handbook of game-based learning (pp. 153–176). MIT Press.

Challenges ahead



VS.



- It seems, games have an amazing potential for securing continuous practice
- But if that is so: Where are all the educational games? Where are all the playful learning experiences?
 - Competition (especially with big-budget productions)
 - Social rejection („Life is not a game but very serious business and education should not be fun.“)
 - Lacking understanding of games as a form of cultural good (a source of meaning) and of social potential and positive effects of games
 - Need to reduce violence, sexism, and discrimination
 - Accessibility and development costs
 - Communities of practice allowing participatory development processes, knowledge production and transfer between educators, developers and researchers

Read more:
<https://doi.org/10.4108/eai.5-11-2015.150611>
<https://doi.org/10.1037/a0034857>
<https://doi.org/10.1016/j.compedu.2009.10.022>
<https://doi.org/10.1177/2042753021995315>

→ Educational game developers as architects or engineers of optimal learning environments fostering sustainable forms of practice and thus development and preservation of human expertise

Conclusions

- Modern economy depends largely on expert-domain knowledge.
- Future economy will depend on cooperation between human expertise and AI.
- Expert performance can be boosted by AI-support.
- At the same time AI-support might put expertise development at risk and will certainly challenge traditional education.
- Preservation of human expertise requires sustainable forms of practice.
- Well-designed educational games or playful educational experiences may help with that and call for new career paths and corresponding infrastructure.