Making computers do what you want

In relation to

Computer Science and Medical Education & Simulation

The actual schedule – as it was

- The logics of programming
  - Learning objective 1: Know of limitations of computer logic
  - Learning objective 2: think like a computer
- Programming and data
- AI for doing things

Computers doing what I want

- Secret: Make script that specifies it

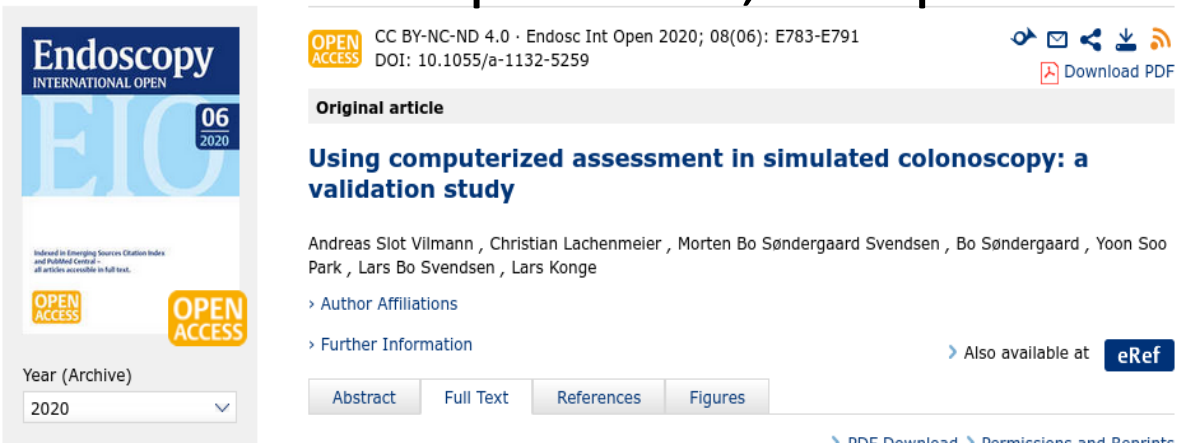
- To me:

  Automation (Data analysis, quantification of XYZ)

  Bringing things to live

My experience with coding

- Engineering (Biomedical), B.Sc.Eng.
- Engineering (Environmental), M.Sc.Eng.,
- Ph.d. (Physiology|Biology)
- Making toilets
- Research at CAMES
- Associate professor, computer science UCPH



- The logics of programming

Wife: "*Please go to the store and buy a carton of milk and if they have eggs, get six.*"

Husband coming back with six cartons of milk Wife said,

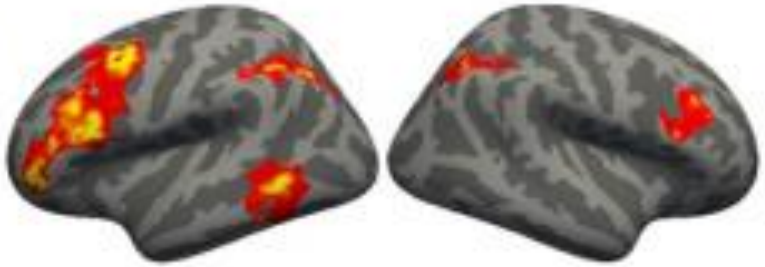
Wife: "*why the *¤#%! did you buy six cartons of milk*"
Husband: "*They had eggs*"

Another good version, joking with an infinite loop is:
"*While you're out, pick up some milk*" - he never came back

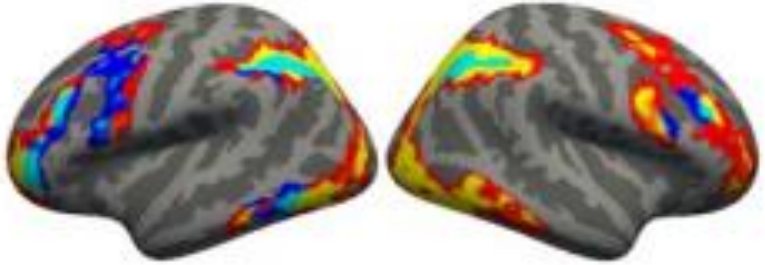
I imagine him arms full of milk in the supermarket, crashed on the floor :)

https://www.reddit.com/r/Jokes/comments/15n8ek/a_carton_of_milk_and_eggs/

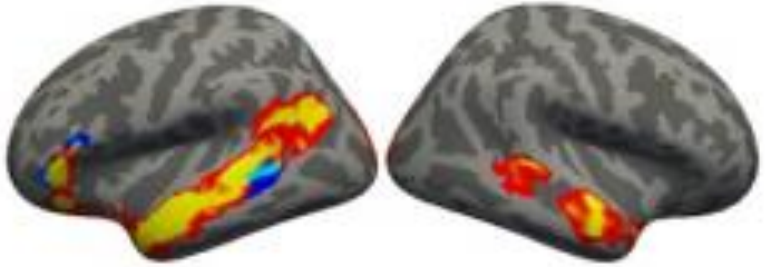
Reading programming code



Logical puzzle



Language



https://elifesciences.org/articles/59340

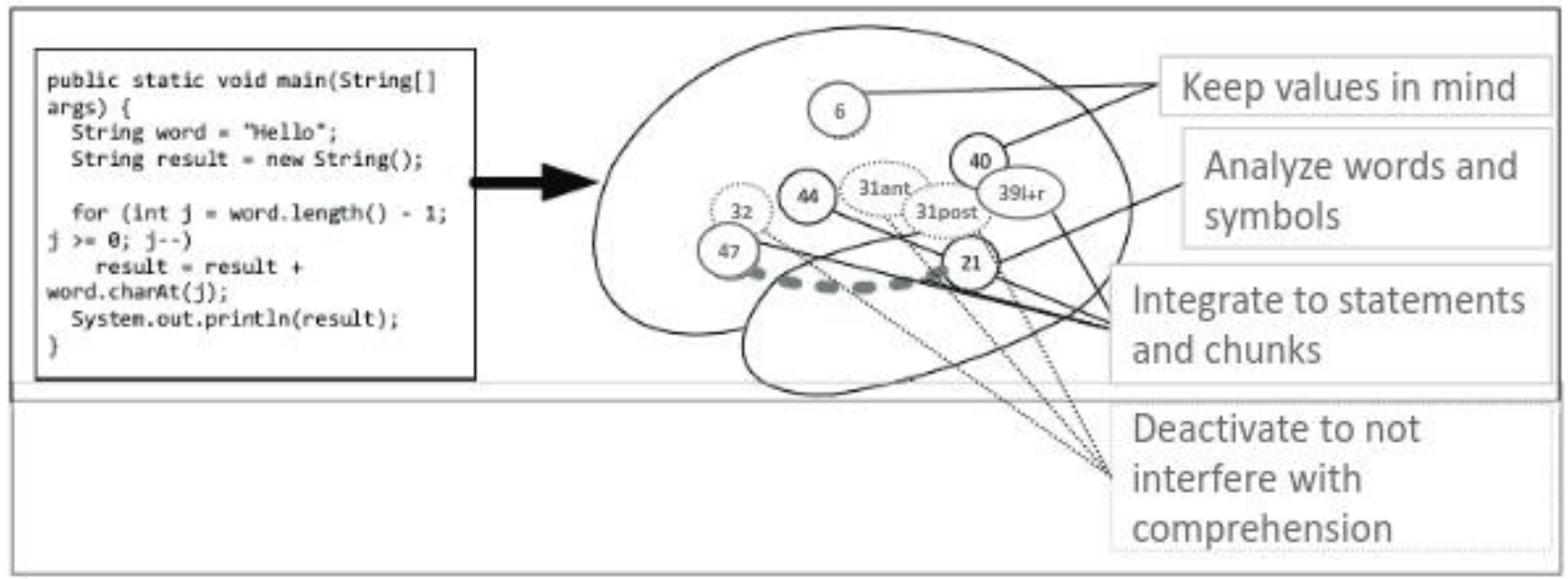


Fig. 10. Visualization of how bottom-up program comprehension might take place.

Programmers are also studied like clinicians. A technical skill

Industry Perceptions of the Competencies Needed by Computer Programmers: Technical, Business, and Soft Skills

10.1080/08874417.2007.11645951

Table 1. Summary of the survey results. High demand (H) is greater than 66 percent, moderate demand (M) is between 33 and 66 percent, and low demand (L) is less than 33 percent.

	System analyst			Software designer			Computer programmer			Software tester		
Soft skills	**H**	**M**	**L**	**H**	**M**	**L**	**H**	**M**	**L**	**H**	**M**	**L**

https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=1012&context=electricalpub

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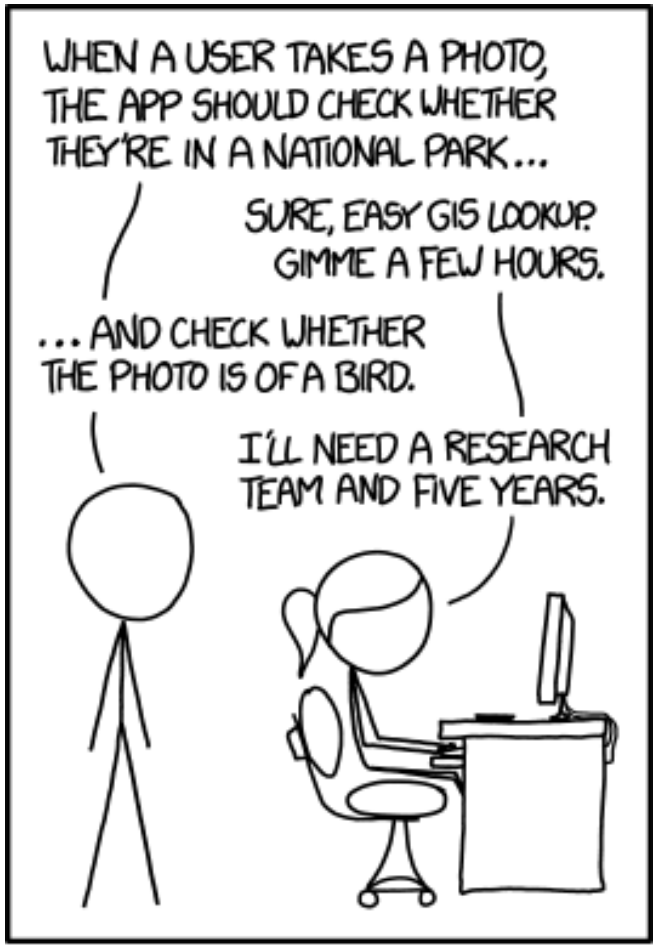
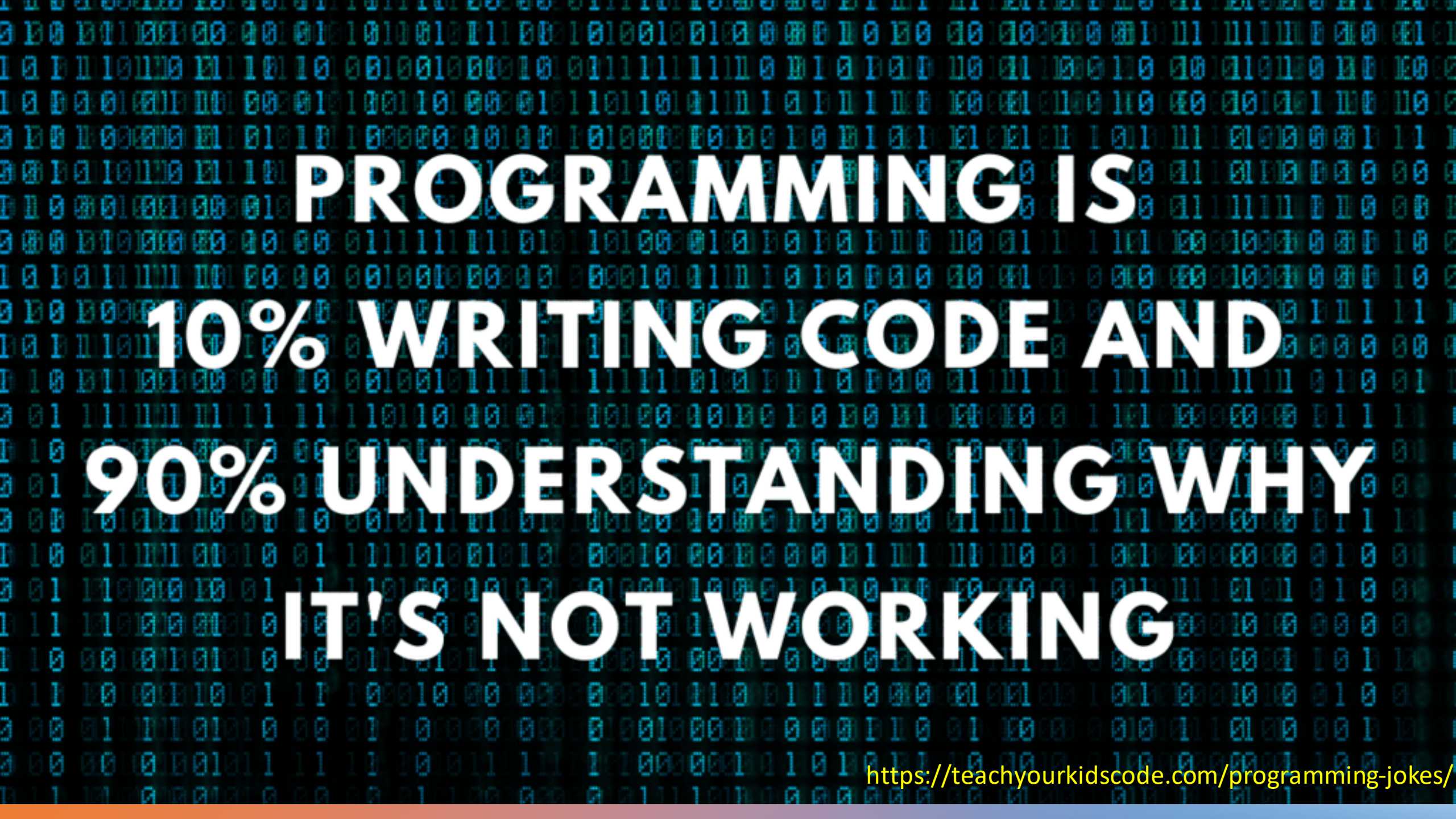
Soft skills	**H**	**M**	**L**	**H**	**M**	**L**	**H**	**M**	**L**	**H**	**M**	**L**
Communication skills	√			√			√			√		
Interpersonal skills			√	√				√			√	
Analytical and problem-solving skills	√				√			√			√	
Team player	√				√			√				√
Organizational skills		√				√		√			√	
Fast learner			√			√			√			√
Ability to work independently			√			√		√				√
Innovative			√			√			√			√
Open and adaptable to changes			√			√			√			√

https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=1012&context=electricalpub



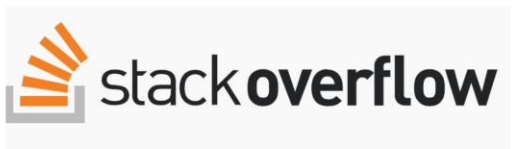
IN CS, IT CAN BE HARD TO EXPLAIN THE DIFFERENCE BETWEEN THE EASY AND THE VIRTUALLY IMPOSSIBLE.

xkcd: 1425

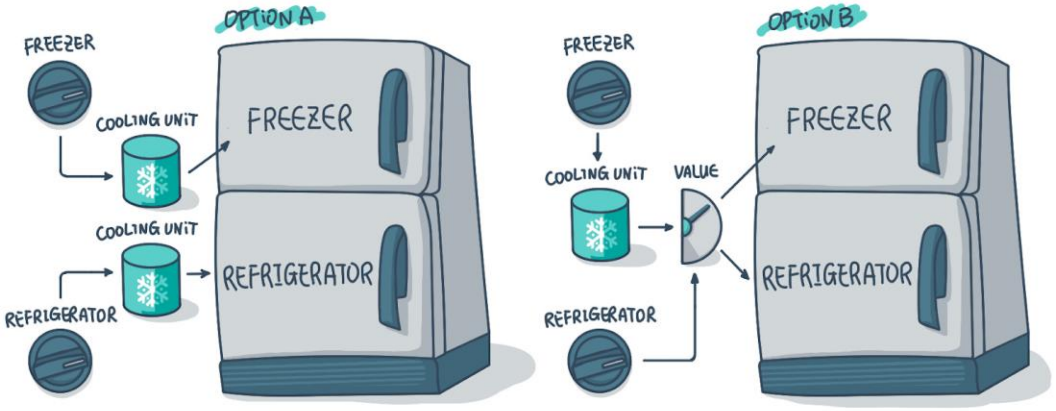


https://teachyourkidscode.com/programming-jokes/

Before



Now



https://www.factoftheday1.com/p/march-14-mental-models-with-an-example

Weather
Gravity
Fridges

I am aware of the parrallel logic nature of the slide. But the take aways are

1: You use things based on the mental model you have of them

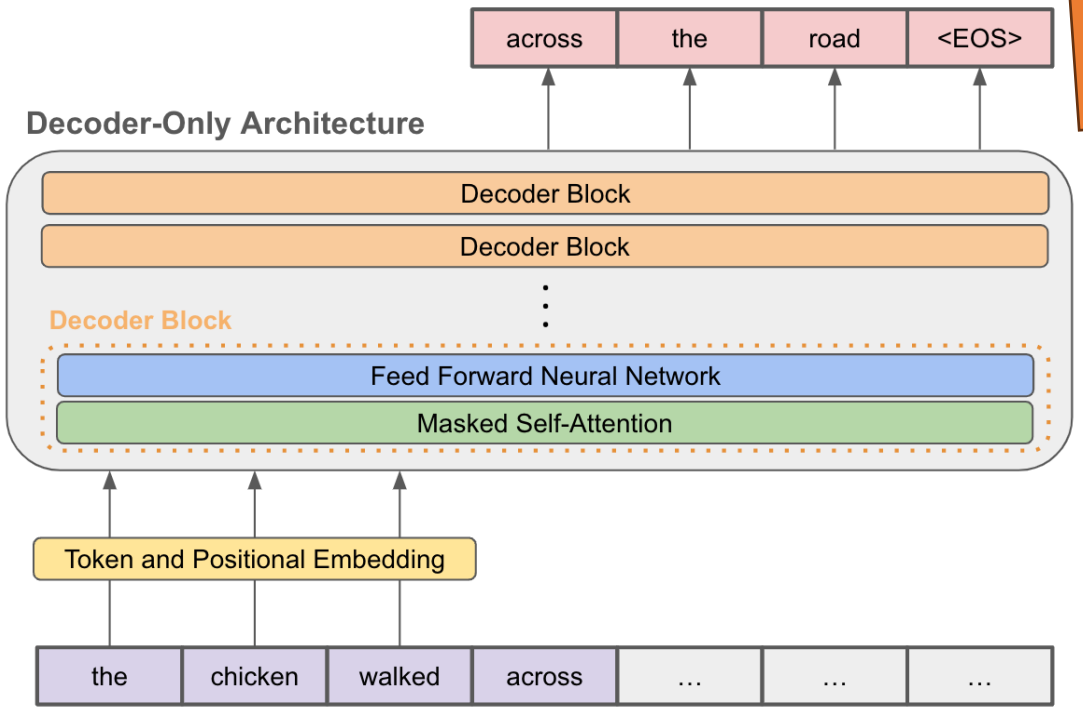
2:Mental models can be very different from actual technology, but it helps knowing what knobs you can turn.

We also used the concepts to see how GPT versions would explain gravity. GPT3.5 I think got it right, and then gave wrong explaination at to why

My mental conception of ChatGPT is "Autocorrect on steroids"

Thus I never think of ChatGPT to be able to provide me with "new" knowledge. Just the most likely completion of my input

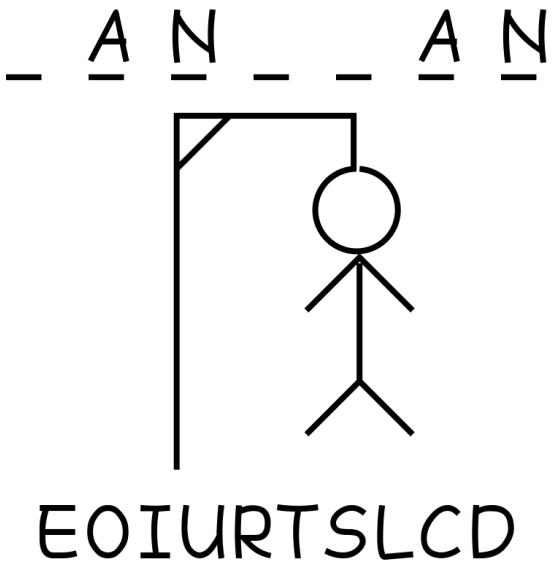
There was a great example of when you ask GPT for a reference for a scientific text. It can provide really plausible title and authors – a statistical best fit – but not reality



https://towardsdatascience.com/language-models-gpt-and-gpt-2-8bdb9867c50a

Hangman (wikipedia)

- Hangman is a guessing game for two or more players. One player thinks of a word, phrase, or sentence and the other(s) tries to guess it by suggesting letters or numbers within a certain number of guesses. Originally a paper-and-pencil game, there are now electronic versions.



Counting number of first author ships

```
        if author_list:
            # Check for first authorship
            if author_name_standard in author_list[0]:  first_author_count += 1
```

- Author_list[0]:
  MBS Svendsen, ….
  MB Svendsen, ….
  Morten Bo Bo Svendsen, …
- Author_name_standard = "MBS Svendsen"

NOTE that there is not a single or simple solution to this problem, so seemingly simple, but could take a long time to perfect. To me, a robust solution would require statistical analysis. I have made one solution, using multiple comparisons in the colab link, but I know it does not account for all exceptions

First I match last name of Author_name_standard to first author, then it check whether first author initials are in Author_name_standard. It is a bit more robust, but still flawed. E.g. MS Svendsen would be a false negative.

Making a randomization key

- Three groups
- OpenAI
- Local, (Python, R, ..?)
- Manual
- Excel
- Online tool not allowed

NOTE. I observed large differences in the actual output. Even the request is "the same", but ofcause the requests are not equal in terms of a computer's logic. If you ask for help you get help, if you ask for a list, you get a list.

I also noted, that a lot noted, that especially the 3.5 model, did not provide logical or correct anwsers when asked for a e.g. three groups.

https://chat.openai.com/share/9b815f19-5651-4e8a-a128-ee770597a32d

Here is a link to the example of me asking it. Note that the first outputs provided are in python (as asked for), but also that they follow Python Language best practices in language. This makes it easy to understand, easy to test for intended functionality, easy to debug.

When I prompt it initially, at least in this case– I try to be very specific in terms of input, processing steps, and output. Simulating requirement text. I later played a bit, and it easily converts python to js, so one could make html file and thus their own version of an online tool – draft level still

Other examples, that we did not go through (last two). But note the difference of 3.5 and 4 in the last two links. GPT3.5 just makes some code, and then ask for me to provide a textfile with all english words in. GPT4 makes a solution based on letter frequency, that actually simulateds the process of hangman – one letter at a time, whereas gpt3.5 just guess the word. Both are incomplete > but I also did ask it a large thing. Not the specific steps in solving hangman

Er det fredag - (showing gpt being really good at reading and explaining code)

- https://chat.openai.com/share/d58acde0-5c37-43b8-aaca-03b6dcc68851

Hangman, gpt 3.5

- https://chat.openai.com/share/bcb68397-65ca-4465-8f47-af0b105b8ffa
- Hangman, gpt4
- https://chat.openai.com/share/23d5d2e7-f20d-4cea-8f8a-ca806d5059e4

I could not help myself, so now I made an hangman solver assistant using only gpt to see how it would go.

https://github.com/bigb8/Hangman

Using python

- On your laptop
- On google colab
- On pythonanywhere