

The slide features a dark grey background with a large, abstract splash of blue and purple ink on the left side. A white semi-circular shape is positioned over the top left of the ink splash. The text is white and centered horizontally.

# Generative AI

A Catalyst for change in  
computing education

BRETT BECKER

UNIVERSITY COLLEGE DUBLIN

OCTOBER 25, 2023

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To get Gen AI “right” we need to  
look at the big pictures





An aerial photograph of a winding asphalt road through rolling green hills. The sun is low in the sky, casting a warm, golden glow over the landscape. The road curves through the hills, and a wooden fence runs along its edge. The hills are covered in lush green grass, and some small structures are visible in the distance.

To get Gen AI “right” we need to  
look at the big pictures

...and not get desensitized. What The future  
“new normal” is, is largely up to us.



# A Brief History of Generative AI in Computing Education

- Primordial soup served with dusty fossils of ancient tech.
- Remember stack overflow?
- Some courses taught about AI - often GOFAI or some flavor of Machine Learning



A non-negligible amount of courses – including intro courses – are being taught with AI.

[HOME](#) > [TECH](#)

# Layoffs hit coding community Stack Overflow as software engineers increasingly shift to AI for help

Kylie Kirschner Oct 17, 2023, 1:31 PM EDT



- Coding community Stack Overflow announced on Monday that it's laying off 28% of its staff.
- Its traffic fell earlier this year as coders shift to AI for answers, Insider previously reported.
- Many generative AI models were partly trained on Stack Overflow's information.

Advertisement

Coding community Stack Overflow is laying off 28% of its staff amid an ongoing industry shift to AI for software development help that led to a dip in the company's online traffic earlier this year. This is the second round of layoffs Stack Overflow has had this year — it laid off 10% of its workforce in May.

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# Another perspective

- 1970s/80s PCs

*People can generate digital content in isolation (humans as digital creators)*



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*People can share digital content  
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- 2010s **Mobile/Cloud**

Look ma! I put my computer  
AND the internet in my pocket!

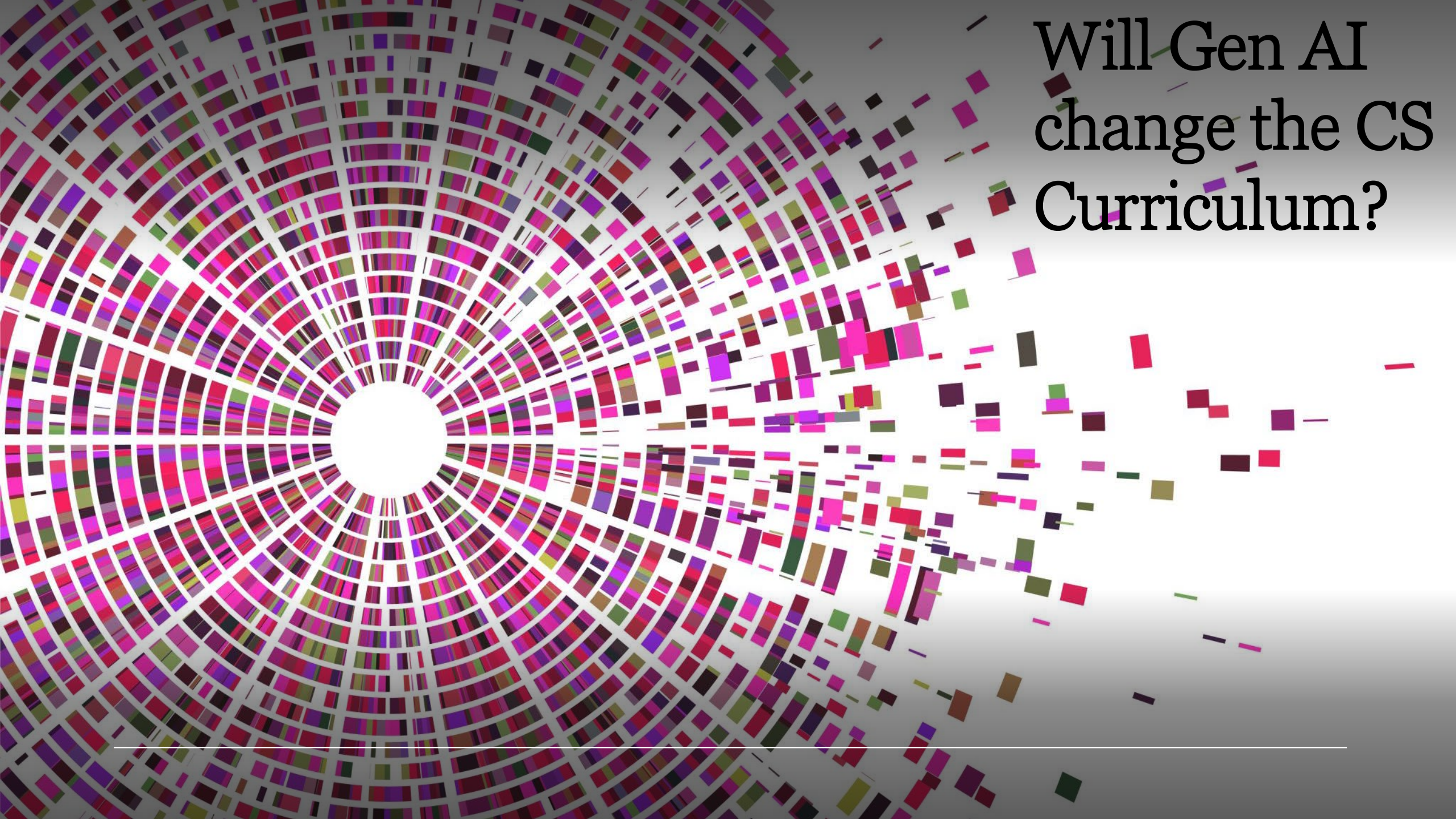


# Another perspective

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Look ma! I put my computer AND the internet in my pocket!
- **2023**  
Gen AI ate the internet for breakfast, ushering in machines as digital creators, threatening to replace the internet with infinitely large numbers of artificially generated replicas of itself to create more food. Upends Earth while doing so.







Will Gen AI  
change the CS  
Curriculum?

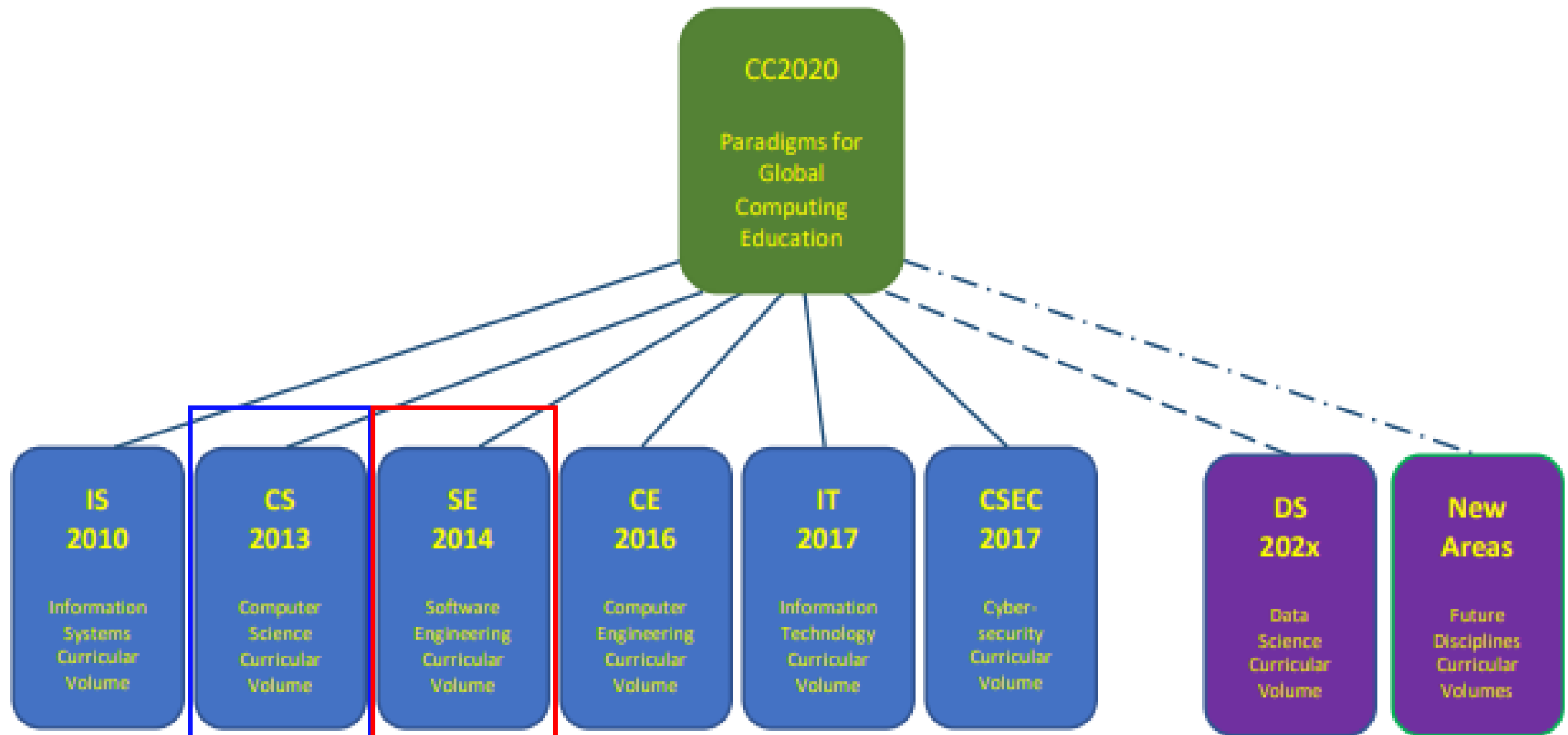
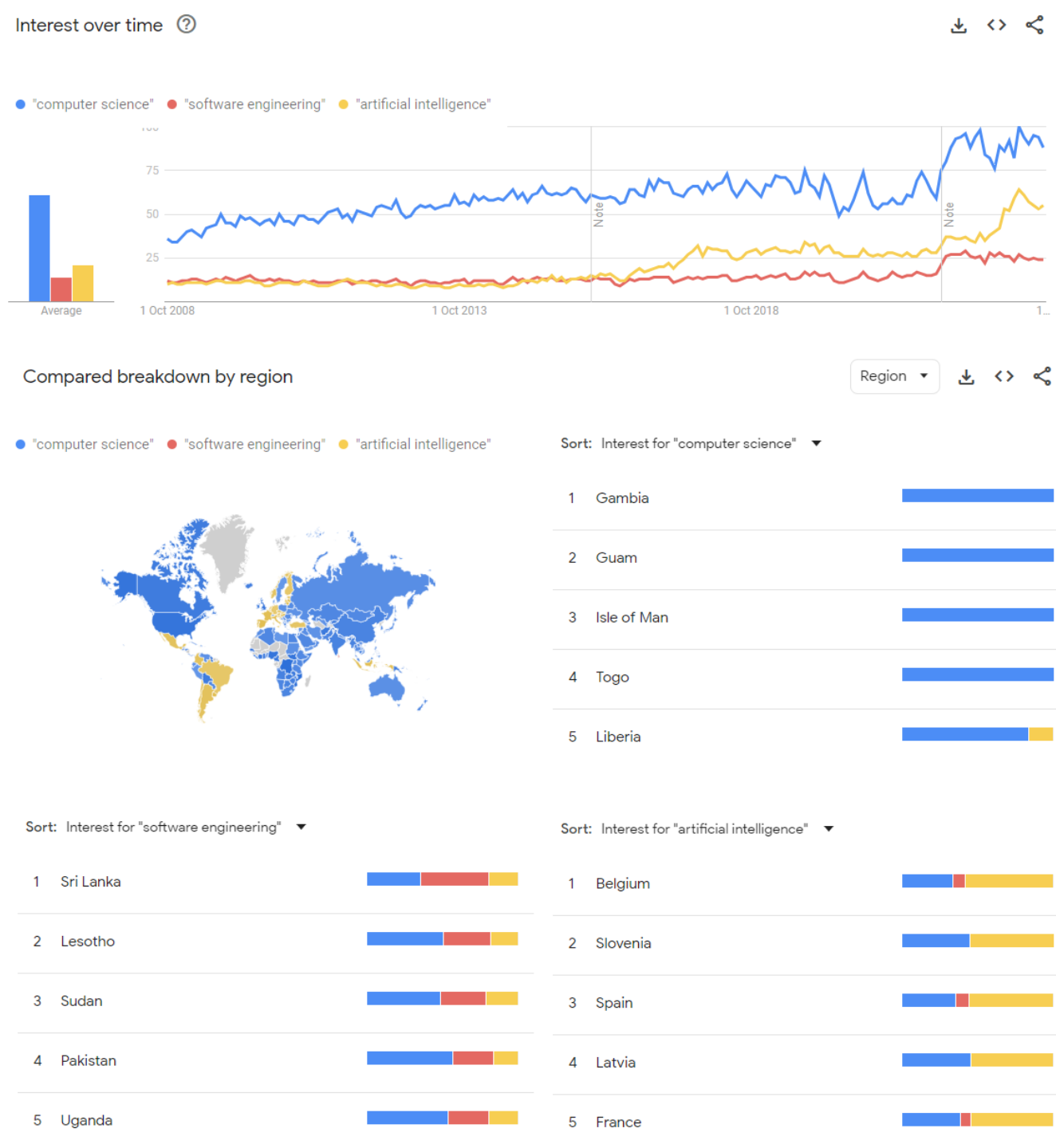


Figure 1.2 Structure of the Computing Curricula Series



# Will we see a growing rift between CS and AI?



# Will AI as a degree grow legs?

What will that do to the CS curriculum?

The screenshot shows the StudyPortals website interface. At the top, there is a navigation bar with the StudyPortals logo and three icons: 'Explore' (magnifying glass), 'Decide' (target), and 'Apply' (paper plane). Below the navigation bar, there are three main sections, each with a title, a sub-menu, and a data bar. The first section is 'Bachelor's degrees in Computer Science' with 'Programmes' selected and a count of 11008 Bachelors. The second section is 'Bachelor's degrees in Software Engineering' with 'Programmes' selected and a count of 2229 Bachelors. The third section is 'Bachelor's degrees in Artificial Intelligence' with 'Programmes' selected and a count of 891 Bachelors.

**studyportals**  
Bachelors

Explore | Decide | Apply

## Bachelor's degrees in Computer Science

[Programmes](#) [Scholarships](#)

11008 Bachelors

## Bachelor's degrees in Software Engineering

[Programmes](#) [Scholarships](#)

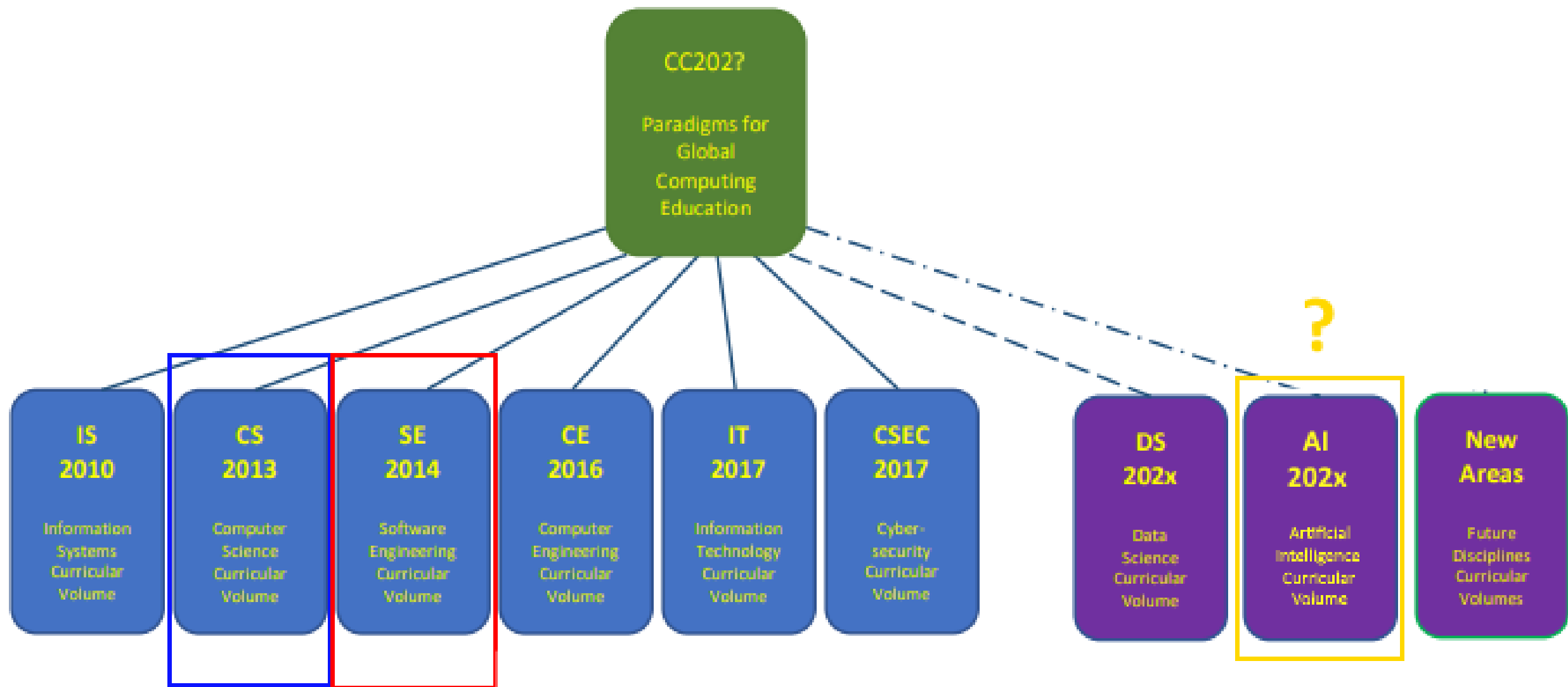
2229 Bachelors

## Bachelor's degrees in Artificial Intelligence

[Programmes](#) [Scholarships](#)

891 Bachelors





But they will cheat!





Not a new problem.





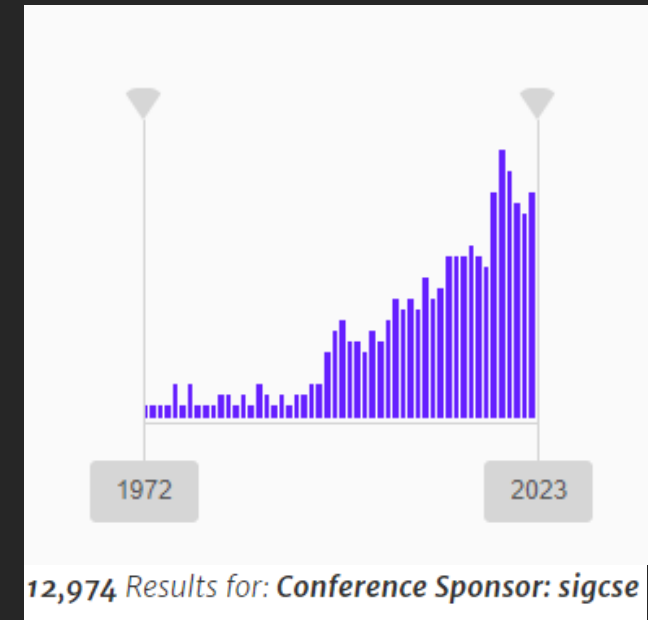
Nor are the solutions.





# Do we need *new* solutions?

- We have *loads* of great research on improving teaching, learning, outcomes, etc.
  - Pair programming is a rare example of one that has been put into practice somewhat widely.
- The disruption of Generative AI (coupled with the pandemic) creates an ideal moment to look on the shelf at what we have – when seeking “new” solutions to “new” problems.

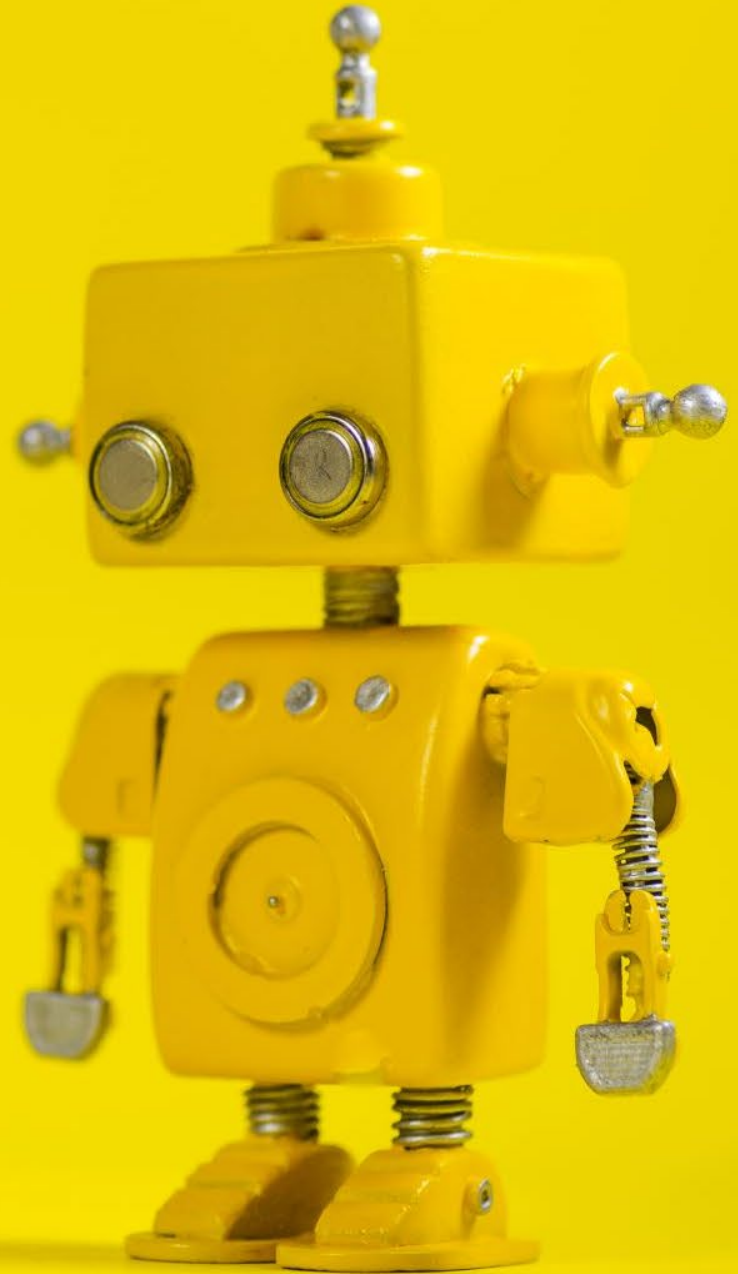


What about new problems?

Will Generative AI impact the hidden/implicit curriculum?

Will it bring some of these topics into the light of day?

Will it move new topics into the hidden/implicit shadows?

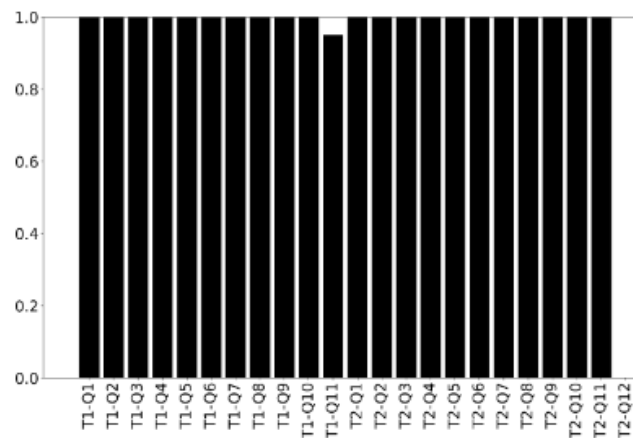
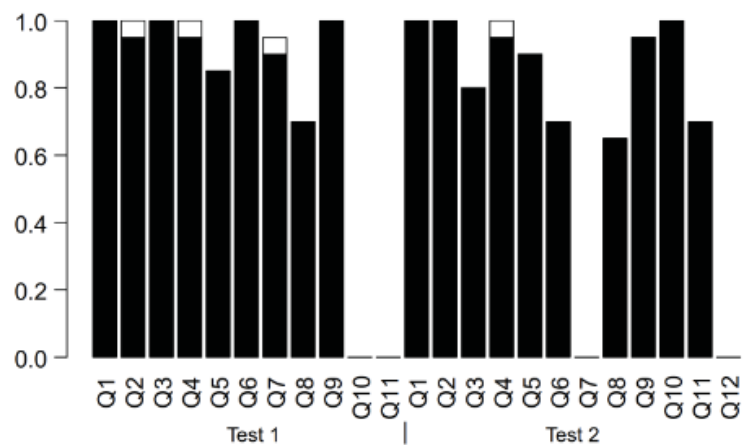






ITiCSE 2023, July 8–12, 2023, Turku, Finland

Prather, Denny, Leinonen, Becker, et al.



(a) Results of the original “Robots Are Coming” paper that used Codex [81].

(b) Results of our replication of [81] with GPT-4.

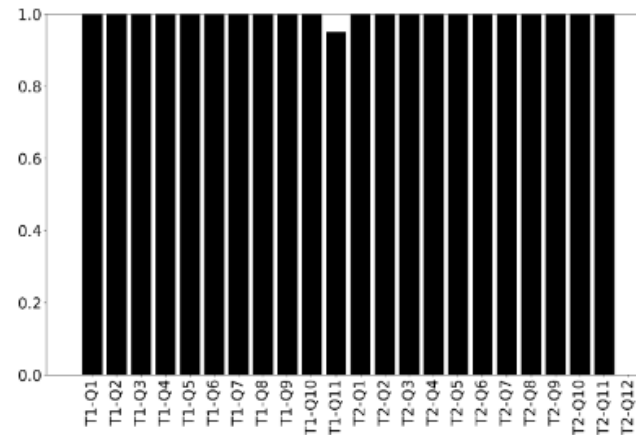
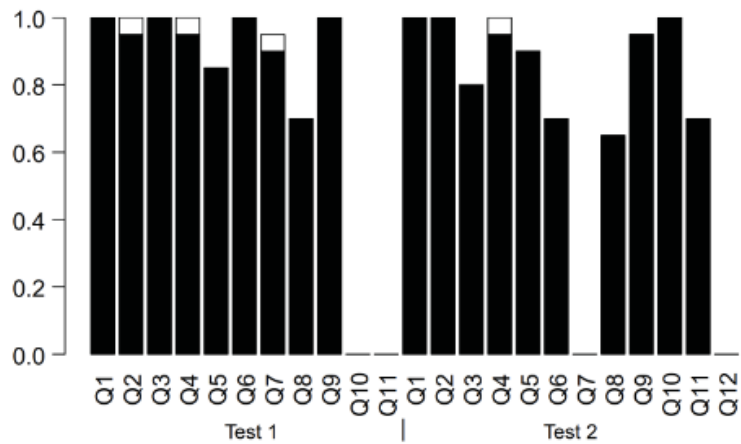
Figure 3: A comparison of the original results and the score achieved by GPT-4 on the two CS1 tests and Rainfall-problem variants presented in [81].



# Virtual teaching assistants?

ITiCSE 2023, July 8–12, 2023, Turku, Finland

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# Not just code

nature

NEWS | 07 June 2023

## DeepMind AI creates algorithms that sort data faster than those built by people

The technology developed by DeepMind that plays Go and chess can also help to write code.

nature

[nature](#) > [articles](#) > [article](#)

Article | [Open Access](#) | [Published: 05 October 2022](#)

## Discovering faster matrix multiplication algorithms with reinforcement learning

[Alhussein Fawzi](#) , [Matej Balog](#), [Aja Huang](#), [Thomas Hubert](#), [Bernardino Romera-Paredes](#), [Mohammadamin Barekatin](#), [Alexander Novikov](#), [Francisco J. R. Ruiz](#), [Julian Schrittwieser](#), [Grzegorz Swirszcz](#), [David Silver](#), [Demis Hassabis](#) & [Pushmeet Kohli](#)

*Nature* **610**, 47–53 (2022)

# Not just software

[Home](#) > [News](#) > [Exclusive Interview: NYU Team Taps ChatGPT to Design Processor From Scratch](#)

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NEWS

## Exclusive Interview: NYU Team Taps ChatGPT to Design Processor From Scratch

June 16, 2023 by [Jake Hertz](#)

[f](#) [t](#) [in](#) [v](#)

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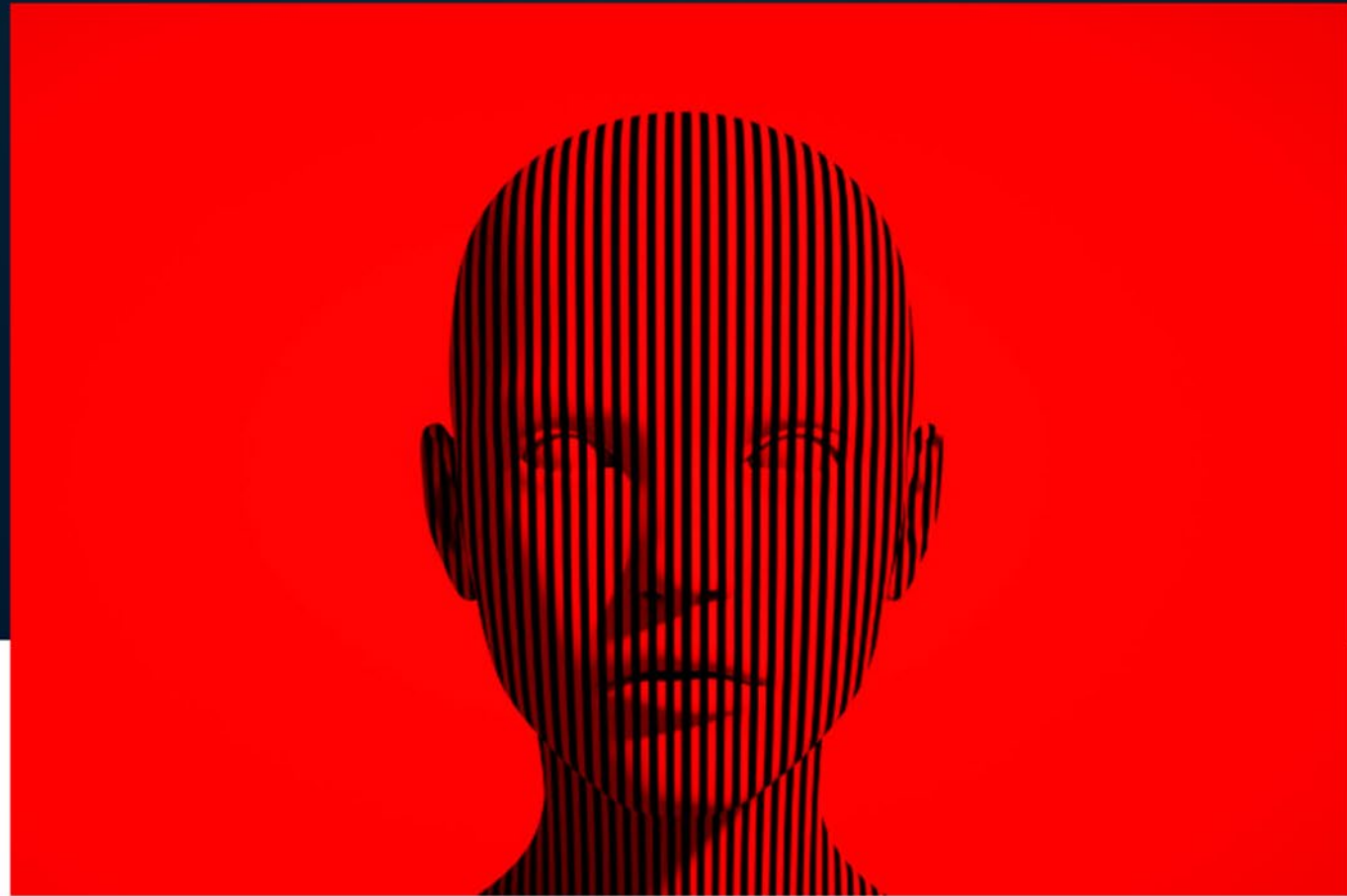
Using plain English—not a hardware definition language—a group of researchers used generative AI to successfully design a microprocessor.



# Are we teaching from the Turing trap?

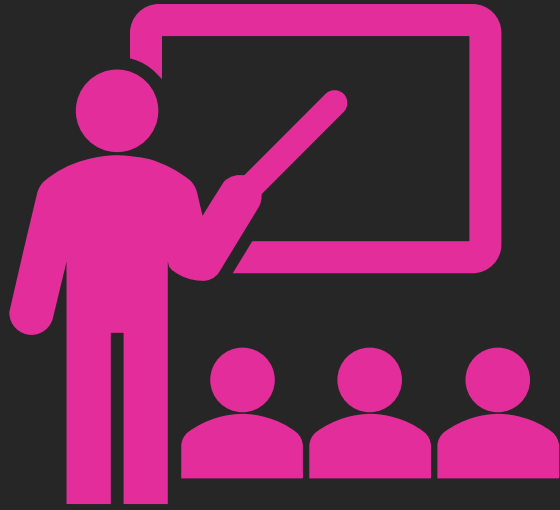
“if [human-like artificial intelligence] leads machines to automate rather than augment human labor, it creates the risk of concentrating wealth and power. And with that concentration comes the peril of being trapped in an equilibrium where those without power have no way to improve their outcomes”

<https://digitaleconomy.stanford.edu/news/the-turing-trap-the-promise-peril-of-human-like-artificial-intelligence/>



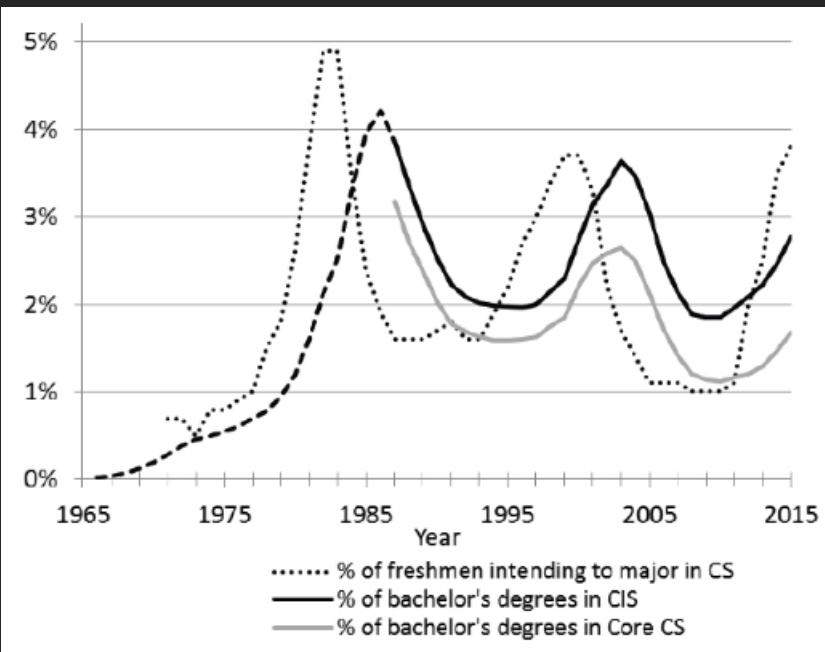
Insights

## The Turing Trap: The Promise & Peril of Human-Like Artificial Intelligence



# Gen AI will shape our intakes. We just don't know how. Yet.

- The media has a lot of influence on what students take computing courses and why
- The media attention on Gen AI has been unprecedented
- It also stands to dramatically affect industry & employment
- It would be crazy to think that this won't affect our intakes.



# But the models are biased!

JU

Could you help me write a program? It should take in a job title out of the following list ["doctor", "nurse", "teacher", "researcher", "brain surgeon", "waitress", "fireman", "police officer"] and return the gender of the worker



I'd be happy to help you write a program that does that! Here's a Python implementation:



python

Copy code

```
def get_gender(job_title):  
    male_jobs = ["doctor", "researcher", "brain surgeon", "fireman", "police  
    female_jobs = ["nurse", "teacher", "waitress"]  
  
    if job_title.lower() in male_jobs:  
        return "male"  
    elif job_title.lower() in female_jobs:  
        return "female"  
    else:  
        return "unknown"
```

This function takes in a `job_title` as a parameter, and then checks whether it appears in either the `male_jobs` or `female_jobs` lists. If it appears in `male_jobs`, the function returns "male". If it appears in `female_jobs`, the function returns "female". If it doesn't appear in either list, the function returns "unknown".



Turn that into a teaching opportunity!





There are other ethical & societal challenges in store...



# Ethics & Society



NEWS & POLITICS

ARTS & ENTERTAINMENT

BEING TEXAN

FOOD & DRINK

BBQ

TRAVEL & OUTDOORS

TRUE CRIME

NEWS & POLITICS

## Are You There, God? It's Me, ChatGPT.

A pastor in Austin asked the artificial intelligence chatbot to write an entire Sunday service. It bombed.



By Peter Holley

October 4, 2023





# Ethics & Society

**health**

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NEWS

## People Are Using ChatGPT in Place of Therapy—What Do Mental Health Experts Think?

By [Julia Landwehr](#) • Published on May 13, 2023

 Fact checked by [Nick Blackmer](#)



# Ethics & Society

The image is a screenshot of a news article from the New York Post. At the top, there is a red navigation bar with the 'NEW YORK POST' logo in white, bold, italicized letters. To the left of the logo are icons for 'SECTIONS', a search magnifying glass, and an envelope. Below the navigation bar is a black bar with the date 'OCTOBER 20, 2023'. Underneath is a white horizontal menu with categories: 'Lifestyle', 'Health' (which is underlined), 'Fitness', 'Health Care', 'Medicine', 'Men's Health', 'Women's Health', and 'Mental Health'. The main content area has a white background. On the right side, there are social media sharing icons for Facebook, Twitter, Facebook Messenger, Email, and Print, followed by a red-bordered button that says '23 Comments'. The article title is in large, bold, black font: 'AI can detect diabetes — just by listening to you talk for 10 seconds: new study'. Above the title is a red 'HEALTH' tag. Below the title, the author is listed as 'By Alex Mitchell' and the publication date is 'Published Oct. 18, 2023, 8:18 p.m. ET'.

SECTIONS

NEW YORK POST

OCTOBER 20, 2023

Lifestyle Health Fitness Health Care Medicine Men's Health Women's Health Mental Health

HEALTH

AI can detect diabetes — just by listening to you talk for 10 seconds: new study

By Alex Mitchell

Published Oct. 18, 2023, 8:18 p.m. ET

23 Comments





# What do we know right now?

- Gen AI isn't going anywhere
- Students are using Gen AI (possibly too much)
- Educators are using Gen AI (probably not enough)
- Assessment worries are one thing – fundamental changes to the discipline (actually, all disciplines) and how they are taught and learned are another.
- Model bias is one thing – Ethical and Societal effects (and use) are another.



What are other Educators  
doing right now?





https://www.manning.com/books/learn-ai-assisted-python-programming

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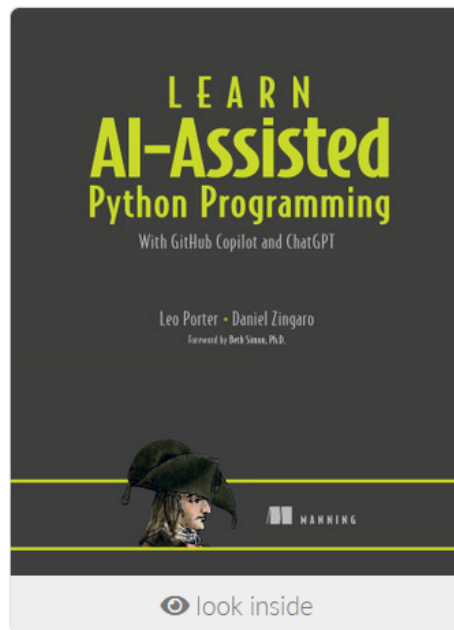
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## Learn AI-Assisted Python Programming

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★★★★★ 5 reviews

Leo Porter and Daniel Zingaro  
Foreword by Beth Simon, Ph.D.

September 2023 · ISBN 9781633437784 · 296 pages · printed in black & white

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RESEARCH-ARTICLE OPEN ACCESS



## From "Ban It Till We Understand It" to "Resistance is Futile": How University Programming Instructors Plan to Adapt as More Students Use AI Code Generation and Explanation Tools such as ChatGPT and GitHub Copilot

**Authors:**  [Sam Lau](#),  [Philip Guo](#) [Authors Info & Claims](#)

ICER '23: Proceedings of the 2023 ACM Conference on International Computing Education Research - Volume 1 • August 2023 • Pages 106–121 • <https://doi.org/10.1145/3568813.3600138>

**Published:** 10 September 2023 [Publication History](#)



[dl.acm.org/doi/fullHtml/10.1145/3568813.3600138](https://dl.acm.org/doi/fullHtml/10.1145/3568813.3600138)



# The Robots are Here: Navigating the Generative AI Revolution in Computing Education

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# Where are you Going (with your students)?

- Are you teaching your computing students as not just the (future) creators of this tech, but the consumers?
- Will you need to contribute towards reshaping EVERYTHING? For instance, will you someday grade students in terms of the improvement they demonstrate between week 1 and week 12, and not on if everyone met the same learning outcomes?
- Are you going to be forced to not ignore the teaching & learning research you have (probably) been ignoring for the last several years/decades?
- Are you keeping your eye on what others are doing *now* and what's coming down the road *next*?
- Are you making sure you aren't getting desensitized and tricked into taking for granted that *this, today* is the new normal? It need not be!

# Thanks!

- [www.brettbecker.com](http://www.brettbecker.com)

