Software Engineering Career Planning in the Age of AGI+/-

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Software Engineering Career Planning in the Age of AGI+/-

~~Ralf Lämmel~~ **Chuck Norris**

~~Software Language Engineer~~ **Research community psychiatrist with *ALL* answers**

Whose SE career planning?

1. Careers of our unis' BSc & MSc (& PhD) graduates in SE
2. Careers of "deployed" software engineers in the wild
3. Careers of junior SE researchers (before tenure track)
4. Careers of non-retiring non-junior SE faculty
5. *What else?*

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5. *What else?*

The elephant(s) in the room

1. Will an SE weather GPT 4+ and AGI?
2. What SE skills/competencies to strive for?
3. Is this the time for a career change? SE to what?
4. How does higher SE education need to adapt?
5. How does (academic) SE research need to adapt?

Career changes — an illustration

2020

[j13] Andrzej Blikle:
An Experiment with Denotational Semantics. SN Comput. Sci. 1(1): 15:1-15:31 (2020)

[–] **2010 – 2019**

2019

[i1] Andrzej Blikle:
An Experiment with a User Manual of a Programming Language Based on a Denotational Semantics. CoRR abs/1905.12444 (2019)

[–] **1990 – 1999**

1996

[j12] Andrzej Blikle:
Why Denotational? Remarks on Applied Denotational Semantics. Fundam. Informaticae 28(1-2): 55-85 (1996)

1991

[j11] Andrzej Blikle:
Three-valued predicates for software specification and validation. Fundam. Informaticae 14(4): 387-410 (1991)

[j10] Beata Konikowska, Andrzej Tarlecki, Andrzej Blikle:
A three-valued logic for software specification and validation. Fundam. Informaticae 14(4): 411-453 (1991)

[j9] Andrzej Blikle, Andrzej Tarlecki, Mikkel Thorup:
On Conservative Extensions of Syntax in System Development. Theor. Comput. Sci. 90(1): 209-233 (1991)

1990

[c14] Andrzej Blikle, Mikkel Thorup:
On Conservative Extensions of Syntax in the Process of System Development. VDM Europe 1990: 504-525

Science of Computer Programming
Volume 12, Issue 3, September 1989, Pages 207-253

Denotational engineering ☆

Andrzej Blikle

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https://doi.org/10.1016/0167-6423(89)90003-8 ↗

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Abstract

This paper is devoted to the methodology of using denotational techniques in software design. Since denotations describe the essential components comprising a system and syntax provides ways for the user to access and communicate with these components, we suggest that denotations be developed in the first place and that syntax be derived from them later. That viewpoint is opposite to the traditional (descriptive) style where denotational techniques are used in assigning a meaning to some earlier defined syntax. Our methodology is discussed on an algebraic ground where both denotations and syntax constitute many-sorted algebras and where denotational semantics is a homomorphism between them. On that ground the construction of a denotational model of a software system may be regarded as a derivation of a sequence of algebras. We discuss some mathematical techniques which may support that process especially this part where syntax is derived from denotations. The suggested methodology is illustrated on two small examples.

https://www.nytimes.com/1998/04/25/business/worldbusiness/IHT-the-a-blikle-pastry-shop-seeks-to-expand-into.html

The New York Times

The A. Blikle Pastry Shop Seeks to Expand Into Luxury Food Market : Polish Brand's Sweet Dreams of Big Sales

By Peter S. Green, International Herald Tribune

April 25, 1998

Charles de Gaulle was once a regular. The Vatican has been known to ring up with special orders for Pope John Paul II. Ignacy Paderewski, Poland's first prime minister, played piano there as a young man. Arthur Rubinstein and Marcel Marceau stopped in whenever they came to town.

Since 1869, A. Blikle has been the pastry shop and café of choice for the Polish elite, surviving Russian partition, German occupation and Communist rule, the centerpoint of Warsaw's elegant shopping street, Nowy Swiat.

https://www.weekendnotes.com/a-blikle-confectionary/

Home > Warsaw > Bakeries | Cafes | Cake Shops | Family | Food and Wine

500

by Lionel (subscribe)

Join me as I travel, play, eat, live and work in cities and places around the world.

Published December 5th 2012

Savour 143 years of Polish history in the pastries

large image

[ADVERT]We left Le Meridien Bristol Hotel and head out on to the Nowy Świat, Warsaw's royal road, in search of morning tea. It was too early for pierogi and vodka at Radio Café. A leisurely stroll along this historic thoroughfare of Warsaw brought me to the green awnings of Café A. Blikle. As we opened the doors to the confectionery, unknowingly we had stepped into a part of Warsaw's history and one of the most famous names in cakes and baked good in Poland.

What's an software engineer?
Essential Software Engineering Skills

https://www.ko2.co.uk/software-engineering-skills/

- Hard skills
  1. Programming and Coding
  2. Object-Oriented Design
  3. Testing
  4. Debugging
  5. Database Administration
  6. Software Development

- Soft skills
  1. Communication
  2. Organisation
  3. Problem Solving
  4. Teamwork
  5. Attention to Detail
  6. Multitasking

Should a Software Engineer instead be(come) …

- an ML engineer,
- an MLOps engineer,
- an ML plumber,
- an AI expert,
- …

?

AGI?

The Future is Here: Rise of Artificial General Intelligence (AGI)

https://www.analyticsvidhya.com/blog/2023/04/artificial-general-intelligence/

Characteristics of Artificial General Intelligence

1. Background Knowledge
2. Common Sense
3. Transfer learning
4. Abstract Thinking
5. Cause and Effect

The Future is Here: Rise of Artificial General Intelligence (AGI)

https://www.analyticsvidhya.com/blog/2023/04/artificial-general-intelligence/

Applications of Artificial General Intelligence

1. Healthcare
2. Finance and business
3. Education and training
4. Space exploration
5. Military and defense

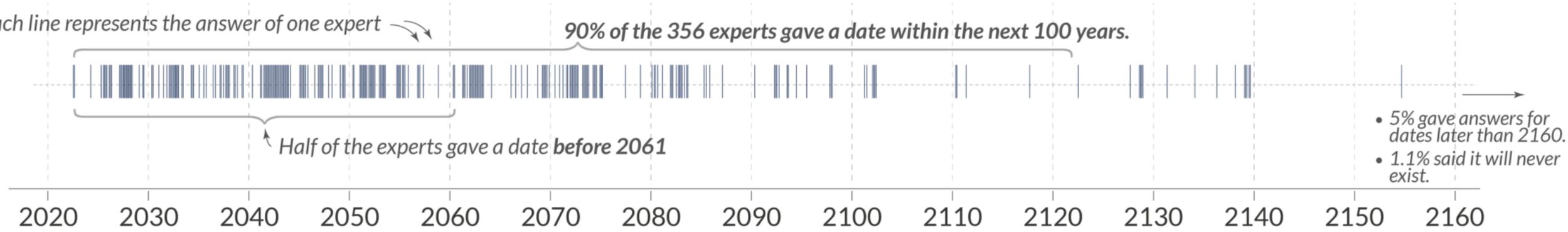
AI timelines: What do experts in artificial intelligence expect for the future?

https://ourworldindata.org/ai-timelines

When will there be a 50% chance that Human-level Artificial Intelligence exists?

Our World in Data

Timelines of **356 AI experts**, surveyed **in 2022** by Katja Grace and colleagues.
The experts were asked when unaided machines will be able to accomplish every task better and more cheaply than human workers.



Data from Zach Stein-Perlman, Benjamin Weinstein-Raun, Katja Grace – 2022 Expert Survey on Progress in AI.

https://www.newyorker.com/science/annals-of-artificial-intelligence/can-we-stop-the-singularity

ANNALS OF ARTIFICIAL INTELLIGENCE

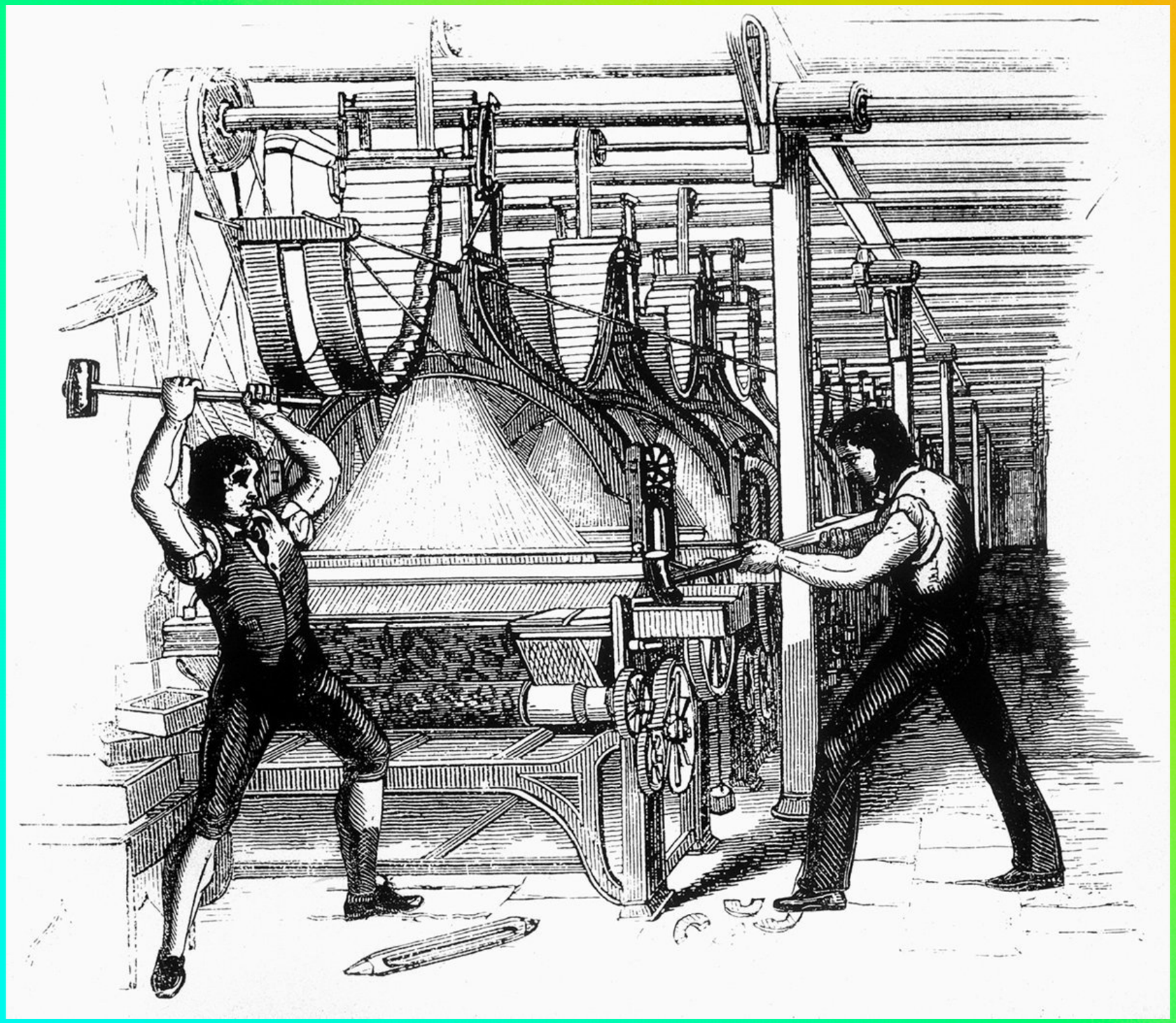
CAN WE STOP RUNAWAY A.I.?

Technologists warn about the dangers of the so-called singularity. But can anything actually be done to prevent it?

By Matthew Hutson

May 16, 2023

Will we see another type of *Swing Riots*?



Von Chris Sunde; original uploader was Christopher Sunde at en.wikipedia. - Original unknown, this version from http://www.learnhistory.org.uk/cpp/luddites.htm (archive), Gemeinfrei, https://commons.wikimedia.org/w/index.php?curid=4150391

How do we assess the SE situation?

Let’s assume AGI will need a bit more time.

Alternatively, let’s assume it will be highly controlled.

https://blogs.itemis.com/en/chatgpts-impact-on-software-developers

ChatGPT's impact on software developers

by **Nikolas Rieder**
Mar 23, 2023

7 min. reading time

Paradigm Shift With ChatGPT

In recent years, the use of AI in software development has become more widespread, with many large companies incorporating AI technology into their development processes. The main areas where AI is used are code optimization and bug fixing. One of the most popular examples is Copilot, created by GitHub and OpenAI. It can analyze code, identify potential issues and even make fixes automatically.

While AI is already playing a significant role in software development, it is likely to continue to impact the industry in the coming years. As AI technology advances, it will become increasingly capable of performing complex tasks.

The rise of language models like ChatGPT has the potential to dramatically change the way software is developed. As AI is increasingly becoming a powerful tool that is also more and more accessible, the role of software engineers may evolve to include more collaboration with language models and less time spent on routine tasks like debugging and code reviews or actual coding. ChatGPT reduces the time spent on searching for the answer to a specific problem. A simple query will bring you a solution in many cases. Surely, the more complex the problem, the more input ChatGPT will need. Nevertheless, it will likely solve your problem or give you at least a big chunk of the solution. By having such a mighty tool, the way that we work will change.

https://hackernoon.com/chatgpt-in-software-engineering-a-glimpse-into-the-future

ChatGPT in Software Engineering: A Glimpse Into the Future

What Can ChatGPT do for Software Engineers?

I decided to ask ChatGPT directly about its possibilities.

Me: *How can you help in software engineering?*

ChatGPT: *“As a language model, I can assist in various aspects of software engineering such as:*

1. *Code generation and automation of repetitive tasks*

2. *Providing technical information and best practices on programming languages, algorithms, design patterns, and architecture.*

3. *Suggesting solutions to coding problems and debugging issues.*

4. *Generating explanations and summaries of complex technical concepts.*

https://xpirit.com/is-chatgpt-a-better-software-engineer-than-me/

Is ChatGPT a Better Software Engineer than Me

A Deeper Dive into AI Tools for the Modern Developer

GitHub CoPilot Chat

GitHub CoPilot X is an innovative, AI-powered code assistant designed to enhance the software development process. By offering context-aware code suggestions, this sophisticated tool allows you to expedite your coding tasks while simultaneously reducing errors. CoPilot X goes a step further by incorporating a ChatGPT-like experience within Visual Studio Code and all IntelliJ IDEs, ensuring developers receive relevant and context-specific answers to their questions.

Acting as a knowledgeable partner, CoPilot X provides invaluable assistance and guidance throughout every phase of the coding journey. Its seamless integration with popular development environments ensures that you have access to expert advice and support whenever you need it. In essence, GitHub CoPilot X is the ultimate coding companion, helping you navigate the complexities of software development with ease and efficiency, serves as an informed companion, expertly guiding you through each stage of the coding process.

https://www.infoworld.com/article/3689172/chatgpt-and-software-development.html

ChatGPT and software development

For now, generative AI can help fill gaps and accelerate implementing solutions within the software development life cycle, but we will still need developers to drive appropriate experiences. “ChatGPT misses the ability to understand the human context of computing to do programming well, “says Conn. “Software engineers can add more details about the purpose of the software they’re creating and the people who will be using it. It’s not just a bunch of programs sprung together with regurgitated code.”

https://www.theguardian.com/commentisfree/2023/apr/01/chatgpt-write-code-computer-programmer-software

Programmers, beware: ChatGPT has ruined your magic trick

Writing computer programs, for instance.

Last week, Steve Yegge, a renowned software engineer who - like all uber-geeks - uses the ultra-programmable Emacs text editor, conducted an instructive experiment. He typed the following prompt into ChatGPT: “Write an interactive Emacs Lisp function that pops to a new buffer, prints out the first paragraph of *A Tale of Two Cities*, and changes all words with ‘i’ in them red. Just print the code without explanation.”

https://uk.pcmag.com/news/146345/samsung-software-engineers-busted-for-pasting-proprietary-code-into-chatgpt

Samsung Software Engineers Busted for Pasting Proprietary Code Into ChatGPT

Multiple employees of Samsung's Korea-based semiconductor business plugged lines of confidential code into ChatGPT, effectively leaking corporate secrets that could be included in the chatbot's future responses to other people around the world.

One employee copied buggy source code from a semiconductor database into the chatbot and asked it to identify a fix, according to *The Economist Korea*. Another employee did the same for a different piece of equipment, requesting "code optimization" from ChatGPT. After a third employee asked the AI model to summarize meeting notes, Samsung executives stepped in. The company limited each employee's prompt to ChatGPT to 1,024 bytes.

Just three weeks earlier, Samsung had lifted its ban on employees using ChatGPT over concerns around this issue. After the recent incidents, it's considering re-instating the ban, as well as disciplinary action for the employees, *The Economist Korea* says.

https://levelup.gitconnected.com/chatgpt-will-replace-programmers-within-10-years-91e5b3bd3676

ChatGPT Will Replace Programmers Within 10 Years

Predicting The End of Manmade Software

Foreward — Addressing AI Fallacies

Human predictions are notoriously nearsighted, especially in regard to technology:

- In 1903, the New York Times predicted it would take humans over a million years to fly. Nine weeks later, the Wright Brothers did just that.
- That same year, a prestigious bank president said of investing in Henry Ford "t*he horse is here to stay but the automobile is only a novelty —a fad.*
- Regarding the radio, "t*he wireless music box has no imaginable commercial value. Who would pay for a message sent to no one in particular?"*

https://www.stackchief.com/blog/ChatGPT%20and%20the%20Future%20of%20Software%20Engineers

ChatGPT and the Future of Software Engineers

StackChief LLC
Last updated on April 16

In a world of ChatGPT, automation, and low code obsession, it's hard to imagine a future where software engineers are highly paid.

In fact, it's hard to imagine a future at all! With Microsoft's recent $10 billion investment in OpenAI, applications like ChatGPT are generating all the buzz for their uncanny ability to produce content in a conversational and human-like manner.

Not only can these deep learning models generate text on the fly, they can also generate artwork, provide live feedback on call center conversations, and even generate code...

A reason to worry?

https://www.coyotiv.com/blog/posts/chatgpt-vs-software-engineers-can-it-replace-software-engineers

ChatGPT vs Software Engineers: Can it Replace Software Engineers?

What are ChatGPT's limitations?

1. Lack of understanding of the context

ChatGPT and other language models cannot fully understand the context in which they are being used. This situation can lead to errors or misinterpretations. For example, ChatGPT may generate code that works in one specific context, but not in another.

2. Reliance on large amounts of data

ChatGPT and other language models rely on large amounts of data to learn and make predictions. This can be a limitation as it requires significant resources to train the models and may not be applicable to smaller projects or specific industries.

3. Limited understanding of code

ChatGPT and other language models have a limited understanding of code and programming concepts, which can lead to errors or misinterpretations when working with code.

4. Limited creativity

ChatGPT and other language models cannot come up with new ideas or solutions. And can only generate responses based on the data it has been trained on.

https://www.commandshift.co/post/will-chat-gpt-ai-replace-software-developers-no-heres-why/

Will ChatGPT and AI Replace Software Developers? No, and here's why.

- Machines have to be told what to do.
- ChatGPT isn't always right, you know!
- AI has no creativity.
- Who would fix it without Software Developers?
- What about Critical Thinking?
- It wasn't made to replace. It was made to complement.

https://medium.com/lost-but-coding/chatgpt-is-not-going-to-destroy-software-engineering-899bbf848d9d

ChatGPT Is Not Going To Destroy Software Engineering

But It Will Destroy CS Education

But there is something that ChatGPT will do to software engineering. Not to me or you. Unless you're in University right now. Then good for you. But for people that are in school learning about computer science.

And that is cheating. We are going to see a wave of cheating unlike anything we've seen before. Well, maybe not unlike anything we've seen before.

So, in case you don't know, computer science has had a massive cheating problem. Like when I was taking my first university course on cs the prof would say over and over again 'don't cheat', 'don't cheat', 'don't cheat'. Once he even said that he ran the plagarism detection program and some people were cheating and it wasn't too late to unsubmit your work. And apparently this isn't an isolated thing. It's also happening at Harvard.

https://qr.ae/pyvSSv

Can Chat GPT-4 replace software engineers?

ChatGPT is a fantastic accelerant to coding tasks. In a world where all software engineers do is when given precise requirements, produce code that implements these requirements to a T, then for most of us it would be time to explore other careers.

https://www.businesstoday.in/technology/news/story/software-engineer-jobs-in-danger-due-to-chatgpt-like-tools-heres-what-google-ceo-sundar-pichai-has-to-say-376341-2023-04-06

Software engineer jobs in danger due to ChatGPT-like tools? Here's what Google CEO Sundar Pichai has to say

In a podcast with The New York Times, Pichai spoke about fear among software engineers losing jobs due to AI. He stated, “I believe there will be a lot of societal adaptation with this one. And as part of that, we may all need to alter our paths.”

When asked if the success of OpenAI’s ChatGPT surprises him, he said that he was not shocked by it. He explained “We had been following GPT 2 and GPT 3. We knew the quality of the people there, so that portion came as no surprise.” He explained that even Bard will expand in the coming days.

He further added, “We clearly have more capable models. Pretty soon, we will be upgrading Bard to some of our more capable Pathways Language Model (PaLM) models, which will bring more capabilities; be it in reasoning, coding, it can answer maths questions better." Notably, Google’s Bard is not yet available in India.

He also spoke about Bard’s limitations, “To me, it was important to not put out a more capable model before we can fully make sure we can handle it well.”

Pichai also pointed out that the development of AI is moving too fast right now and “perhaps poses a threat to society”.

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These Are the 34 Jobs Researchers Say Are 'Safe' From Artificial Intelligence

https://www.thestreet.com/technology/jobs-safe-from-artificial-intelligence

1. Agricultural Equipment Operators
2. Athletes and Sports Competitors
3. Automotive Glass Installers and Repairers
4. Bus and Truck Mechanics and Diesel Engine Specialists
5. Cement Masons and Concrete Finishers
6. Cooks, Short Order
7. Cutters and Trimmers Hand
8. Derrick Operators Oil and Gas
9. Dining Room and Cafeteria Attendants and Bartender Helpers
10. Dishwashers
11. Dredge Operators
12. Electrical Power-Line Installers and Repairers
13. Excavating and Loading Machine and Dragline Operators, Surface Mining
14. Floor Layers, Except Carpet, Wood, and Hard Tiles
15. Foundry Mold and Coremakers
16. Helpers–Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters
17. Helpers–Carpenters
18. Helpers–Painters, Paperhangers, Plasterers, and Stucco Masons

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17. Helpers–Carpenters
18. Helpers–Painters, Paperhangers, Plasterers, and Stucco Masons
19. Helpers–Pipelayers, Plumbers, Pipefitters, and Steamfitters
20. Helpers–Roofers
21. Meat, Poultry, and Fish Cutters and Trimmers
22. Motorcycle Mechanics
23. Paving, Surfacing, and Tamping Equipment Operators
24. Pile Driver Operators
25. Pourers and Casters, Metal
26. Rail-Track Laying and Maintenance Equipment Operators
27. Refractory Materials Repairers, Except Brickmasons
28. Roof Bolters, Mining
29. Roustabouts, Oil and Gas
30. Slaughterers and Meat Packers
31. Stonemasons
32. Tapers
33. Tire Repairers and Changers
34. Wellhead Pumpers

These Are Some Jobs Researchers Say Are At Risk

https://www.thestreet.com/technology/jobs-safe-from-artificial-intelligence

1. Mathematicians
2. Tax Preparers
3. Financial Quantitative Analysts
4. Writers and Authors
5. Web and Digital Interface Designers
6. Court Reporters
7. Simultaneous Captioners
8. Proofreaders
9. Copy Markers
10. Accountants
11. Auditors
12. News Analysts
13. Journalists
14. Administrative Assistants

https://boards.greenhouse.io/openai

OpenAI — Current Job Openings

Applied AI Engineering

Engineering Manager — ChatGPT Infrastructure
San Francisco, California, United States

Senior Software Engineer- Identity Platform
San Francisco, California, United States

Software Engineer, Billing and Monetization
San Francisco, California, United States

Software Engineer (Full Stack) – API
San Francisco, California, United States

Software Engineer (Full Stack) – DALL·E
San Francisco, California, United States

Software Engineer, Model Inference
San Francisco, California, United States

Software Engineer, Platform Reliability
San Francisco, California, United States

https://www.bloomberg.com/news/newsletters/2023-04-17/chatgpt-ai-github-copilot-for-coding-threatens-india-tech-jobs

India's 5 Million Coders Will Reckon With an AI Jobpocalypse

If the sort of technology underpinning ChatGPT displaces software engineers, no single country would be impacted more than India, home to over 5 million coders.

SE Teaching Adaptation

SE *Teaching* Adaptation — *DON'Ts*

1. Don't ban the use of AI.
2. Don't ignore the new role of AI.
3. Don't grade homework likely done by LLM.
4. Don't aim at outsmarting the AI.
5. Don't belittle the AI.
6. Don't downplay the problem.
7. Don't dehumanize SE.

SE *Teaching* Adaptation — *DOs*

1. Encourage LLM *leverage* for productivity
2. Encourage *structured* AI usage
3. Provide strong source declaration for AI usage
4. Use human-to-human interaction for validation
5. Make teaching formats more interactive
6. Revisit teaching objectives to make room
7. Cover AI ethics and policy or relate to it

https://kms-technology.com/emerging-technologies/ai/30-best-chatgpt-prompts-for-software-engineers.html

30 Best ChatGPT Prompts for Software Engineers

Principles of Prompting ChatGPT for Software Engineering

1. Clearly define the problem or task
2. Phrase the input in natural language
3. Provide thorough context
4. Refine and iterate outputs
5. Check your work

On the DO “Encourage structured AI usage”

SE Teaching Adaptation — *Example*

***My* programming-oriented courses in this semester**

- *Don't*: Submission of code assignments to qualify for exam (done in the past)
- *Do*: In-class discussion of codes to qualify for exam (done now)
  - Start with short presentation of solution — possible generated.
  - Switch to Q&A format to **verify human understanding**.
- Scalability issue:
  - We could previously check any number of submissions.
  - Now we need "presentations slots during meetings".
    - Only few presentations per student/team.
    - Labs need to be small enough, requiring thus multiple instances.

SE Research Adaptation

SE *Research* Adaptation

Empirical research	-
SDLC	
HCI	
Trustworthiness incl. AI policy and etics	+
ML Engineering / MLOps	+
ML as a “domain”, e.g., AI architectures	+

Let’s discuss

1. Experiences with the use of AI in teaching
2. … in research
3. First noticeable impact on SE careers
4. …