

Christof Teuscher

ECE 410/510: Hardware for AI and ML

Week 7: Recap, outlook, and reminders

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Recap

- How can we accelerate an algorithm?
- What are the most promising ways to do so today?
- What are the biggest bottlenecks in today's traditional computing architectures?
- What is a non-von Neumann architecture?
- What is in-memory computation.
- What is one way to realize in-memory computation?

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What did you learn last week?

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Reminder

Mid-term assessment

The goal of the mid-term assessment is for you and me to assess your knowledge about the topics of this course.

If you've been in class, paid attention, asked questions, and took notes, you should be able to answer these questions in 30min without going back to the slides.

There is a total of 26 multiple-choice questions.

30:00 **5/14/2025 11:59 PM**

Time Limit Due in 2 days

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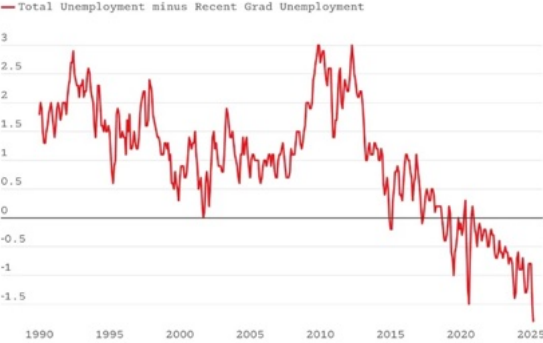
A large, complex industrial machine, likely a gas turbine engine, is shown. It features a dense network of black and silver pipes, valves, and components, all mounted on a black base. The machine is positioned in a room with a concrete floor and a white wall in the background.

~1,200 homes!

<https://cloud.google.com/blog/topics/systems/enabling-1-mw-it-racks-and-liquid-cooling-at-ocp-emea-summit>

The New Grad Gap

AI can do low-level work that you as an entry level grad without job experience would do.



Source: U.S. Census Bureau and U.S. Bureau of Labor Statistics, Current Population Survey (IPUMS).

A

Leaving gaps in your basic knowledge is a key ingredient in the recipe for professional failure.

“Our recommendations emphasize iterative interaction with ChatGPT and independent verification of its outputs. Considering the importance of utilizing ChatGPT judiciously and with expertise, we recommend its usage for experts who are well-versed in the respective domains.”

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ChatGPT is a Remarkable Tool—For Experts

Amos Azaria IT, Rina Aboulay, Shulamit Reiches

Check for updates

Author and Article Information

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Article Contents

ABSTRACT

1. INTRODUCTION

2. OVERVIEW OF THE POTENTIAL OF CHATGPT USAGE IN VARIOUS FIELDS

3. TECHNICAL LIMITATIONS & ETHICAL CONCERNS

4. FLOWCHARTS FOR EFFICIENT CHATGPT USAGE

5. CONCLUSIONS & FUTURE DIRECTIONS

6. ACKNOWLEDGMENTS

AUTHOR CONTRIBUTION STATEMENT

REFERENCES

ABSTRACT

This paper investigates the capabilities of ChatGPT as an automated assistant in diverse domains, including scientific writing, mathematics, education, programming, and healthcare. We explore the potential of ChatGPT to enhance productivity, streamline problem-solving processes, and improve writing style. Furthermore, we highlight the potential risks associated with excessive reliance on ChatGPT in these fields. These limitations encompass factors like incorrect and fictitious responses, inaccuracies in code, limited logical reasoning abilities, overconfidence, and critical ethical concerns of copyright and privacy violation. We outline areas and objectives where ChatGPT proves beneficial, applications where it should be used judiciously, and scenarios where its reliability may be limited. In light of observed limitations, and given that the tool's fundamental errors may pose a special challenge for non-experts, ChatGPT should be used with a strategic methodology. By drawing from comprehensive experimental studies, we offer methods and flowcharts for effectively using ChatGPT. Our recommendations emphasize iterative interaction with ChatGPT and independent verification of its outputs. Considering the importance of utilizing ChatGPT judiciously and with expertise, we recommend its usage for experts who are well-versed in the respective domains.

- “The comparative analysis shows that the ChatGPT-assisted group significantly improved code quality, with fewer rule violations and reduced cyclomatic and cognitive complexities.”
- “These findings suggest that ChatGPT can be beneficial in programming education by helping students write cleaner, less complex code and adhere to coding conventions.”

IEEE Access

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RESEARCH ARTICLE

Does ChatGPT Help Novice Programmers Write Better Code? Results From Static Code Analysis

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ABSTRACT

In the realm of AI-enhanced programming education, there is growing interest in using such tools to help students understand good coding principles. This study investigates the impact of ChatGPT on code quality among part-time undergraduate students in introductory Java programming courses, who lack prior Java experience. The source code of 16 students from the control group (without ChatGPT) and 22 students from the treatment group (with ChatGPT) who completed identical programming exercises focused on coding conventions was analyzed. Static code analysis tools assessed adherence to a common coding convention ruleset and calculated cyclomatic and cognitive complexity metrics. The comparative analysis shows that the ChatGPT-assisted group significantly improved code quality, with fewer rule violations and reduced cyclomatic and cognitive complexities. The treatment group adhered more closely to coding standards and produced less complex code. Violations primarily occurred in line length, final parameters, and the extensibility of object-oriented programming (OOP). These findings suggest that ChatGPT can be beneficial in programming education by helping students write cleaner, less complex code and adhere to coding conventions. However, the study's limitations, such as the small sample size and novice status of participants, call for further research with larger, more diverse populations and different educational contexts.