RESEARCH-ARTICLE

Exploring the Adoption of Generative AI Tools in Computer Science Education: A Student Survey

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Open Access Support provided by:

FH Campus Wien

Published: 21 January 2025

ICETC 2024: 2024 the 16th International Conference on Education Technology and Computers
September 18 - 21, 2024
Vlaams-Brabant, Porto, Portugal

https://doi.org/10.1145/3702163.3702188
ISBN: 9798400717819

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Abstract

The integration of generative AI tools into education has the potential to revolutionize learning experiences, particularly in computer science. This paper explores the adoption and utilization of generative AI tools among computer science students at the University of Applied Sciences Campus Vienna in Austria through a comprehensive survey. The study aims to understand the extent to which AI tools like ChatGPT are integrated into students' academic routines, their perceptions of these tools, and the challenges and opportunities they present. The survey results indicate a high level of acceptance and frequent use of AI tools for tasks such as programming, exam preparation, and generating simplified explanations. However, concerns about the accuracy of AI-generated content and the potential impact on critical thinking skills were also highlighted. The findings underscore the need for clear institutional guidelines and ethical considerations in the use of AI tools in education. This paper contributes to the growing body of literature on AI in education and provides insights for educators and policymakers to enhance the responsible integration of AI technologies in computer science curricula.

CCS Concepts

• **Applied computing**; • **Education**; • **E-learning**;

Keywords

Artificial Intelligence, Computer Science Education, Generative AI Tools, Higher Education

ACM Reference Format:
Sigrid Schefer-Wenzl, Christoph Vogl, Sahani Peiris, and Igor Miladinovic. 2024. Exploring the Adoption of Generative AI Tools in Computer Science Education: A Student Survey. In *2024 the 16th International Conference on Education Technology and Computers (ICETC) (ICETC 2024), September 18–21, 2024, Porto, Portugal*. ACM, New York, NY, USA, 6 pages. https://doi.org/10.1145/3702163.3702188

ICETC 2024, September 18–21, 2024, Porto, Portugal

ACM ISBN 979-8-4007-1781-9/24/09
https://doi.org/10.1145/3702163.3702188

1 Introduction

In recent years, the advent of advanced artificial intelligence (AI) technologies has significantly influenced various academic disciplines, particularly computer science. Among these innovations, generative AI (GenAI) models, such as ChatGPT developed by OpenAI, have emerged as powerful tools for both educational and research purposes. Their ability to understand and generate human-like text makes it a potential valuable asset in the context of education, where it can serve as an assistant for learning, coding, and even problem-solving (see, e.g., [1–3]). These capabilities have the potential to transform traditional educational practices and significantly improve student outcomes.

GenAI tools have already started influencing how students learn and interact with educational content. These tools can assist students in understanding complex concepts, generating code snippets, debugging programs, and even preparing for exams [4–6]. The integration of AI tools in educational settings promises a more interactive and engaging learning environment, catering to the individual needs of students and potentially leading to better retention of knowledge and skills.

Despite the evident advantages, the adoption of generative AI tools in computer science education is not without challenges. One major concern is the ethical implications of AI use, particularly regarding the accuracy and reliability of AI-generated content [8, 12]. There is a risk that students might rely too heavily on these tools without critically evaluating the information provided, which could undermine the development of essential problem-solving and analytical skills. Moreover, issues related to academic integrity, such as plagiarism and the misuse of AI-generated content, pose significant challenges for educational institutions.

Another critical aspect is the level of familiarity and expertise required to effectively use these AI tools. While some students might find AI tools intuitive and easy to use, others might struggle with understanding how these tools work and how to utilize them effectively. This disparity can lead to unequal learning experiences

and outcomes. Therefore, it is essential to investigate students' knowledge and attitudes towards these tools, their usage patterns, and the perceived opportunities and risks associated with AI in education.

Furthermore, the institutional policies and guidelines governing the use of AI tools in educational settings play a crucial role in shaping students' attitudes and behaviors. Clear and comprehensive guidelines are necessary to ensure that AI tools are used ethically and responsibly. Educational institutions need to balance encouraging the use of innovative technologies with maintaining academic standards and integrity.

The adoption and impact of GenAI tools in educational settings, especially among computer science students, remain largely underexplored. This gap in knowledge presents an opportunity to investigate how such AI tools are being integrated into the learning processes of those at the forefront of technology education. This paper aims to fill this gap by surveying computer science students at the University of Applied Sciences Campus Vienna in Austria regarding their usage, perceptions, and experiences with GenAI tools. It examines the extent to which these students utilize them for their coursework and personal learning, the benefits they perceive from its use, and the challenges they face in integrating this technology into their academic lives. By doing so, the study not only contributes to our understanding of generative AI's educational applications but also informs educators and developers about potential areas for further enhancement of AI tools in educational settings.

The remainder of this paper is structured as follows: Section 2 provides an overview of related work, with a particular focus on studies examining the use of generative AI tools among students in higher education. In Section 3, we outline our study design. Section 4 details the results of our study, and Section 5 discusses the key findings and their implications. Finally, Section 6 concludes the paper.

2 Related Work

GenAI tools are already being utilized by high school and undergraduate students, significantly influencing how students learn and communicate early on in their education. Forman et al. reveal in [10] that this technology is deeply integrated into modern life with students using ChatGPT for academic assistance, social communication, and personal management in both educational and social settings. In [8], on the other hand, the potential opportunities and challenges of integrating advanced AI tools are discussed. The author concludes that integrating AI into undergraduate computer science education can lead to positive outcomes and better prepare students for the workforce.

Valova et al. [12] highlight ChatGPT's potential in education but emphasize the need for responsible integration. They advocate for teaching students to discern AI-generated content and stress the irreplaceable role of human guidance, urging ethical AI education to ensure students critically evaluate technology's impact on learning. While the majority of studies underscore the positive aspects, there is also research indicating a skeptical attitude among students. An Ngo found in [9] that students generally had a favorable opinion of ChatGPT's application, citing benefits such as saving time and providing assistance in learning. However, barriers include difficulties in assessing the quality and reliability of sources and accurately citing them.

Singh et al. reveal in [11] that while many students are familiar with ChatGPT, they do not regularly use it for academic purposes. Students are skeptical about its positive impacts on learning and believe universities should offer clearer guidelines and better education on its use. The study concludes that ChatGPT can enhance learning and teaching activities if used responsibly but emphasizes the need for improved guidance for students.

Further research seems to indicate that the use of AI tools is similar among different student groups. Das and Madhusudan [13] show positive perceptions of ChatGPT's academic use, with no significant influence from gender or academic programs. Garrel and Mayer [4] provide a good overview of the topic with detailed data on the results. In their study, a large group of students was surveyed in comparison to the other studies. The survey found that almost two-thirds of the students use or have used AI-based tools, with engineering, mathematics, and natural science students being the most frequent users. The main reasons for using AI tools include clarifying understanding and explaining subject-specific concepts.

During the literature research, special attention was also given to studies from the field of computer science, focusing on the suitability of AI tools in this area. Randall et al. [5] explore the impact of AI on software engineering education, focusing on the use of AI tools by students. They suggest that it is beneficial to integrate AI usage into software engineering courses and incorporate AI tools into examinations for more effective learning. Their research indicates that reliably preventing the use of AI tools is not feasible, nor is it desirable, given the multitude benefits AI provides for students. According to [6], 93% of software engineering students utilize ChatGPT for their projects indicating a high level of acceptance and usage among software engineering students. 50% of the students reported satisfaction with the assistance and for 50% it improved their productivity. Less than half of the students were familiar with Large Language Models and their usage in ChatGPT, and 61.3% of the students were aware of prompt engineering.

In [7], the authors note that students appreciate ChatGPT's quick and effective responses, time-saving capabilities, and support in debugging code in the programming learning process. However, concerns arise regarding potential laziness, accuracy of answers, and its potential to cause professional anxiety. While ChatGPT enhances cognitive abilities and learning outcomes, there is a need to balance its use with the development of critical thinking skills.

Most studies show a positive influence of AI tools in the area of teaching. However, potential risks and challenges are also mentioned. Responsible use of the new tools must first be learnt, and the possible limitations identified. Universities therefore have a duty to openly regulate their use and impart the necessary knowledge for using the new tools. As ChatGPT has only been available for about a year and a half and many new AI tools have come onto the market in recent months, we wanted to investigate the current attitude of students, specifically from the field of computer science at the University of Applied Sciences Campus Vienna, in a survey among all our students. Many of the studies mentioned come from

Asia and the number of participants is rather low. In order to have valid data for decision making and to be able to adapt teaching in the field accordingly, we launched a new survey presented below.

3 Study Design

The aim of this survey is to gain insights into how computer science students at the University of Applied Sciences Campus Vienna use GenAI tools in their studies and to ascertain their attitudes towards these tools. The results are intended to help the program management rethink or revise guidelines for the use of GenAI tools in studies and teaching and to give lecturers insight into the importance of these tools for students.

This paper addresses the following questions:

- Which GenAI tools do students use, how often are they used, and for what purposes?
- How well do students understand how these GenAI tools work, and what opportunities and risks do they perceive in these new tools?
- From the students' perspective, how should educational institutions manage the use of GenAI tools, and are students aware of the implications of using these tools in an academic environment?

The questionnaire was developed based on existing research (e.g., [4–7, 14–17]) to enable comparison with other studies and identify possible differences. The quantitative survey was available for four weeks in February 2024. It was distributed to all students in the Bachelor's degree programs "Computer Science and Digital Communications" (full-time and part-time), and the Master's degree programs "Software Design and Engineering" (part-time) and "Multilingual Technologies" (part-time) at the University of Applied Sciences Campus Vienna. The survey included a general section with questions on gender, age, occupation, semester, and degree program. Participation was anonymous, and answering personal detail questions was optional.

Students were asked about their use of GenAI tools, including which tools they use, in what context (privately, for their studies, or professionally), and how often (using a 5-point scale: daily, several times a week, once a week, once a month, less often, or not at all). The survey also queried the importance of various aspects when evaluating/selecting GenAI tools (using a 5-point scale: very important, important, neutral, not important, or not important at all). Students' knowledge and attitudes towards AI-based tools were assessed (using a 5-point scale: strongly agree, agree, neutral, disagree, or strongly disagree), as well as their evaluation of the advantages, opportunities, disadvantages, and risks of GenAI tools.

Additionally, the survey examined the use of GenAI tools in teaching and how universities should manage the use of AI in education (using a 5-point scale: strict prohibition, encouragement not to use, permission to use with restrictions, permission to use, or encouragement to use). Finally, participants were invited to leave comments on the topic and provide their email addresses for further personal interviews.

4 Results

A total of 91 students participated in the survey, with 68 pursuing a Bachelor's degree and 22 a Master's degree (one person did not respond to this question). The majority of surveyed students were in the 25-34 age bracket (41 participants), followed by the 18-24 age group (35 participants). The 35-44 age range included 11 individuals, while one participant was under 18 (three did not respond to this question). Of the total participants, 59% were male (54 individuals), 32% female (29 individuals), one identified as non-binary, and seven did not answer the gender question.

The largest group represented in the survey was students enrolled in the Bachelor's program in Computer Science and Digital Communications, comprising 68 individuals (39 full-time and 29 part-time). Both Master's program included 11 individuals each. Among these students, 67 have a job alongside their studies, while 21 are full-time students (three did not respond to this question).

Of the students who participated in the survey, 90% (82 individuals) use GenAI tools for their studies, 91% (83 individuals) use them in their personal time, and 46% (42 individuals) use them in their workplace. The questionnaire revealed that students primarily use GenAI tools for generating simplified explanations, programming, and exam preparation, as shown in Figure 1.

The most frequently used GenAI tool among the participants is ChatGPT, with 55 participants using it more than once a week. The most important criteria for choosing a GenAI tool, as indicated by the survey respondents, are the avoidance of errors in the generated output (69% marked as very important), the explainability of the generated decisions (57% marked as very important), and availability at any time (53% marked as very important). The least important factors are the price of the AI tools (29% marked as very important) and multilingual capabilities. Figure 2 illustrates these results.

Regarding the usage of GenAI tools in educational institutions, 54 respondents answered "yes" to having clear regulations, 22 answered "no", and 15 had a neutral opinion. When asked whether GenAI tools should be prohibited in educational institutions, 80 students voted "no", making a clear statement against prohibition. Figure 3 illustrates the participants' opinions on how universities should handle the use of AI tools in the following areas: thesis, homework (papers), exams, independent study, lecture exercises, and lectures.

5 Discussion

The data comes from a small sample of computer science students, so the results may not be representative for the entire student population. Therefore, the findings primarily serve to clarify students' attitudes to make targeted adjustments to our or similar degree programs.

The study conducted in [4] shows that 63.8% of students did not use AI-based tools for studying, whereas, in the study presented in this paper, 90% have used such applications. The most frequently used tools are ChatGPT, DeepL, and DALL-E. However, the tasks for which AI tools are used differ. While both studies highlight the importance of clarifying comprehension issues and subject-specific concepts, this study also emphasizes programming and exam preparation, whereas participants in [4] focus more on text analysis, creation, research, and literature study. The criteria for assessing GenAI tools also differ, likely due to the broader range of

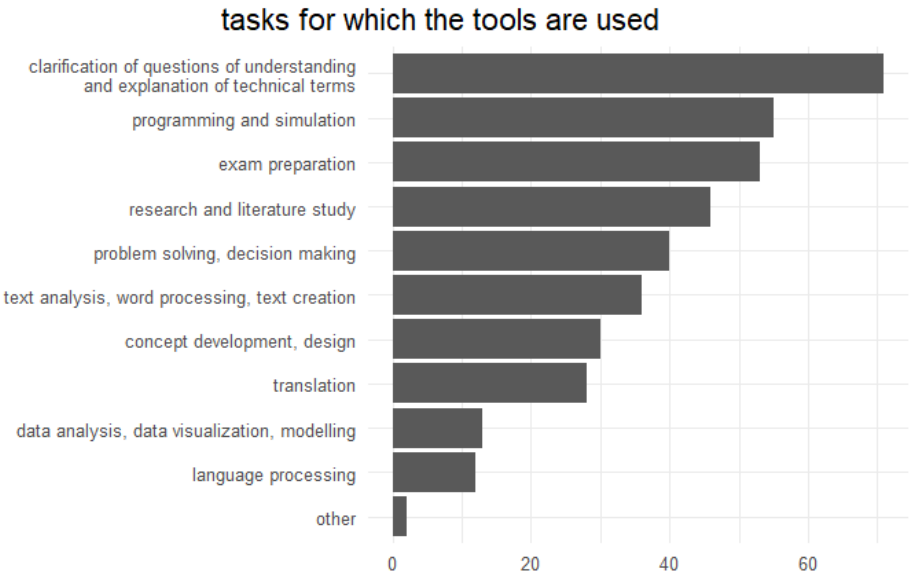

Figure 1: Tasks for which students use GenAI tools

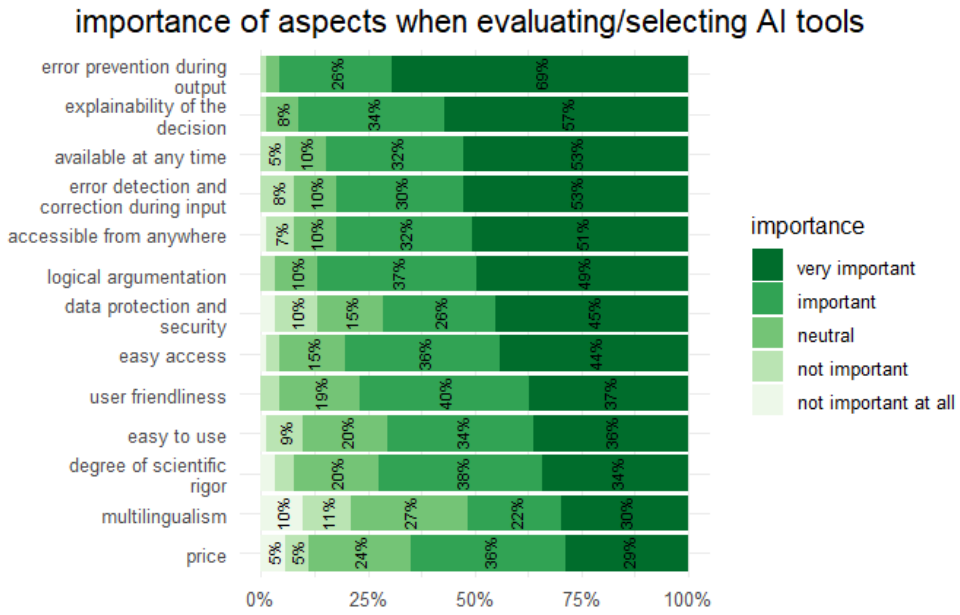

Figure 2: Criteria when evaluating/selecting GenAI tools

fields of study surveyed in [4] compared to the focus on computer science students in this study.

Randall et al. [5] also identified ChatGPT as the most important GenAI tool. In their study, 79% of software engineering students used GenAI tools for coding, compared to 60% in this study. This difference may be due to the study presented in [5] was conducted specifically in a programming course. The proportion of students who have never used such tools is very low in both studies, at 2% and 3%, respectively. In [5], AI is seen as helpful for research, programming, and text summarization, similar to the findings presented in [4] and in this paper. While 44% of students vote that GenAI tools should be strictly forbidden in exams (45% in [5]), 57% support their use for self-study (56% in [5]). Randall et al. found that the key advantages of GenAI tools are time-saving, better adaptation to individual needs, personalized learning, and improved learning outcomes.

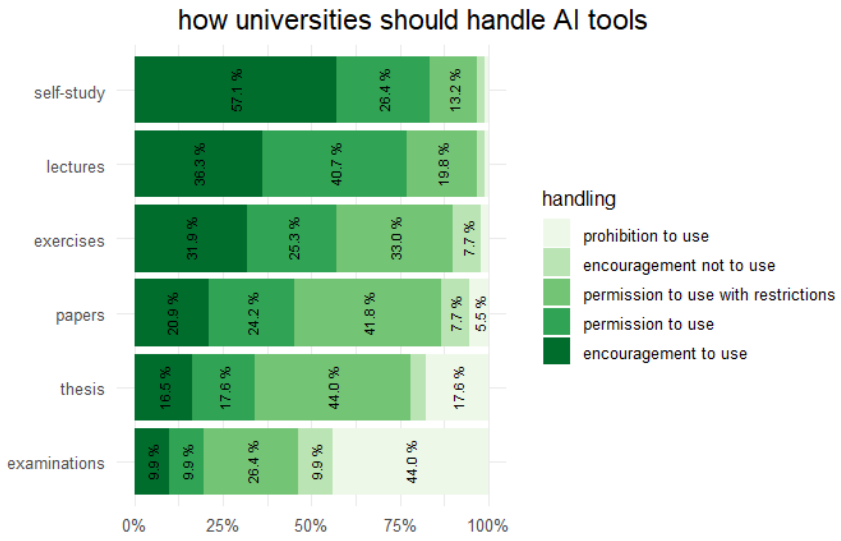

Figure 3: Opinions on how universities should handle GenAI tools

In [6], 48% of software engineering students were familiar with large language models (LLMs) and their usage in ChatGPT, while 61% were aware of prompt engineering, compared to 52% and 60% in this study. These results are consistent with our findings.

According to [10], 58% of students used ChatGPT daily, 28% several times a week, and 14% weekly or less frequently. This study shows different results, with only 12% using ChatGPT daily in their private lives, 9% for their studies, 59% several times a week for their studies, and 40% privately. With lower frequency use, the figures are 48% for private use and 33% for studies. Further results from [10] indicate that over half of the students (54.9%) agree or strongly agree that they depend on ChatGPT for academic success, while 45.1% disagree. The use of AI tools in academia also differs slightly: 74.6% of students found ChatGPT useful for assignments or projects, 61.9% for exam preparation, 46.5% for research or literature reviews, and 31.0% for essay or presentation ideas.

In [13], most students from different academic programs use ChatGPT several times a week (32.7%) or once a week (21%). Less than a quarter (24.7%) use it rarely. These figures are lower than those reported in this study, where 67% use ChatGPT several times a week, 21% once a week, and only 12% less often. According to [13], 68% agree that ChatGPT helps save time for completing assignments, compared to 86% in this study. In [13], 70% agree that the tool helps better understand difficult concepts, while this study found that value to be 81%. 72% in [13] think that ChatGPT helps in personalized learning, while this study found that 58% agree.

Singh et al. [11] found that 39% of students believe the greatest threat from ChatGPT arises from diminished critical thinking and originality. 34% believe employers should consider knowledge of AI tools like ChatGPT a skill, while 43% think it depends on the specific job. Approximately 47% find the tool most useful for obtaining explanations to clarify their doubts which is consistent with the results of this study. In [7], the authors found that the key benefits of using ChatGPT in programming include quick and effective responses to questions, reduced time spent researching solutions, assistance in debugging, generation of ideas for solving complex problems, and provision of detailed information on the subject.

Valova et al. [12] show student behavior regarding GenAI tools. A significant portion of respondents (54%) did not see the benefit in informing their teacher about using GenAI tools, as they do not believe it will improve the teaching or course content. Additionally, 16% are afraid to mention it to the teacher for fear of negatively affecting their final grade. 42% used ChatGPT solely for guidance on their issue, while an equal percentage found errors in the answers and rectified them before submission or implementation. A noteworthy 9% directly applied the received answers without any modifications. 30% of students do not verify the answers from ChatGPT, while 25% trust them entirely. Nearly 20% check each answer, and 50% assess whether the answer is usable before verification.

In this study, only 24% fear being accused of plagiarism due to using AI tools such as ChatGPT. Similarly, only 24% fear violating academic and university policies by using AI tools. This suggests that students are not sufficiently aware of the consequences. Only 29% agreed with the statement, "The probability of being caught using AI tools such as ChatGPT illegally is low." However, 82% are aware that the unauthorized or unmarked use of AI tools in written work is considered plagiarism, and 92% know that unauthorized use of AI tools, especially for solving examination tasks, falls into the category of "use of unauthorized aids". This contradiction could indicate that some questions may have been answered based on what is expected rather than actual understanding.

In the comments section of our survey, many students emphasized that a critical approach to using GenAI tools is essential and that they should assist rather than replace independent thinking. Most comments indicated that AI tools are an inevitable part of the future and should not be prohibited, likening them to calculators. Students also demanded that educational institutions educate them

on the proper use of AI tools and establish explicit guidelines for their use in studies.

According to our study, a ban does not seem to be a solution, as 88% disagree with banning GenAI tools in educational institutions. However, 56% would not use helpful GenAI tools if they were not permitted. 69% believe GenAI tools do not cause much harm in a university context, and 70% think they should be integrated into courses. Only 34% feel sufficiently informed about the permitted use of GenAI tools during their studies, and 59% believe the university should establish clear guidelines and codes of conduct for their use. Farhi et al. [15] state that developing comprehensive ethical guidelines for ChatGPT usage is the responsibility of both students and the institution, ensuring responsible and fair use.

6 Conclusion

The study presented in this paper provides valuable insights into the adoption and use of generative AI tools among computer science students at the University of Applied Sciences Campus Vienna. The findings indicate a high level of acceptance and usage of AI tools, particularly ChatGPT, among students for various academic purposes, including programming, exam preparation, and generating simplified explanations. The survey results reveal that while students recognize the benefits of these tools, such as time-saving and personalized learning, they also acknowledge potential risks, including the accuracy of AI-generated content and the need for critical evaluation skills.

The study underscores the importance of integrating AI tools responsibly into educational curricula. Students have expressed the necessity for clear guidelines and comprehensive education on the ethical use of AI tools. The results suggest that universities should not only permit but also encourage the use of AI tools in a regulated manner, ensuring that students are well-informed about the potential consequences and ethical considerations.

Furthermore, the comparison with existing literature highlights similarities and differences in the use and perception of AI tools across different regions and study fields. This paper contributes to a deeper understanding of how generative AI tools are reshaping computer science education and provides a foundation for future research and policy-making aimed at optimizing the integration of AI in educational settings. To maximize the benefits and mitigate the risks, educational institutions must continue to adapt their teaching methods and provide the necessary support and guidance to students in navigating the evolving landscape of AI in education.

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