USER EXPERIENCES OF CHATGPT AMONG ENGINEERING STUDENTS, TEACHERS, AND WORKING PROFESSIONALS IN INDIA

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ABSTRACT

The introduction of Chat Generative Pre-Trained Transformer (ChatGPT) in November 2022 brought about rapid changes in the workplace and academia. Its usage ranged from student assignments to workplace targets in the engineering field. Although it has brought novel ideas to its application in various fields and task efficiency in the workplace, its perceived application varies among students, teachers, and professionals. This study employed the snowball sampling technique and interviews with eight students, eight faculty members, and eight working professionals from computer science engineering who used ChatGPT regularly. The study adopted a qualitative research design and employed the narrative data analysis technique. Researchers conducted in-depth, semi-structured interviews to elicit user experiences from the recruited samples. The findings brought out six main and twelve subordinate themes regarding ChatGPT user experiences: adapt, adopt, embrace, ease, speed, engage, and automate. The inclusion criteria involved ChatGPT users from the computer science engineering domain only. Future research may focus on developing ChatGPT user policies for various fields of their applications.

Keywords: *chatbot, GPT3 model, artificial intelligence (AI)*

INTRODUCTION

Chat Generative Pre-Trained Transformer (ChatGPT) was a large language model launched in November 2022. It is an open artificial intelligence (AI) platform which has the potential to provide partially concise responses and build up informative conversations with the user. It aims to facilitate the user to get accurate information about almost any query, though there are many opportunities for misuse. Students have started using ChatGPT for various requirements, such as class assignments, project proposals, and reports. They are not putting in any effort as learners to write assignments and are even escaping from similarity indexes as ChatGPT writes original text, which defies educational aims and objectives (Khalil & Er, 2023).

Zhai (2022) argues that there is a need to develop newer assessment methods for students' assignments, including measuring their critical and creative thinking ability within the assignments, as the integrity of the online submissions are at stake. The ability of ChatGPT to possess high critical thinking skills and produce highly realistic texts is a threat and questions the integrity of electronic submissions of student assignments, and even the conduct of online examinations.

In a recent study, Susnjak (2022) reported the issue of maintaining fairness in assessments through drawing strategies to tackle the challenges of using ChatGPT. It is imperative for universities to implement certain policies and undergo the necessary training to detect any type of academic

dishonesty by students in their internal and external assessments (Cotton et al., 2023). In academia, the use of ChatGPT may generate incorrect data, biased information, and tamper with intellectual property. Therefore, there is a need for a foolproof strategy to address these issues (Baidoo-Anu & Ansah, 2023). Additionally, as ChatGPT is an AI-enabled communication tool, it lacks contextual understanding and needs specialized domain features (Alshater, 2022). Moreover, in a conversation between ChatGPT and an author, ChatGPT identified a growing concern with plagiarism in academia (King & ChatGPT, 2023). However, Maddigan and Susnjak (2023) compared various GPT3 models and reported that ChatGPT is more secure and generalizable. Williamson et al. (2023) revealed that ChatGPT still needs redesigning to ensure data safety and use as an educational tool.

Where Does ChatGPT Get Its Information?

ChatGPT is an artificial intelligence-enabled conversational interface, which uses natural language processes. Ever since its release in November 2022, the magnitude of its stored information is increasing. It has a large corpus of textual data and is believed to have more than 175 billion parameters. To answer all user queries, ChatGPT searches the entire data available online through web scraping software. It searches books, journals, blogs, Wikipedia, encyclopaedias, knowledge databases, news articles, social media, and open data sources. (De Angelis et. al., 2023; Lee et. al., 2023). In addition, it learns and retrieves information from its regular conversation with users and their feedback.

Human Interaction with ChatGPT

ChatGPT receives user queries and fetches prompt responses from the Internet (Pavlik, 2023). A recent study reports that ChatGPT responses to user queries are not always accurate (Menéndez, 2023). ChatGPT, as a machine-generated data tool, certainly provides basic information on user queries, which users can fine-tune as per their requirements (Noever & Ciolino, 2022). The technological progression of chatbots, such as ChatGPT, is influencing human learning (Luan et al., 2023). Furthermore, ChatGPT lacks an exclusive, external knowledge base to respond to user queries. Thus, it fetches results from multiple databases (Bang et al., 2023). Further, researching with ChatGPT has brought about unbelievable support to researchers in terms of citations, designs, and review of literature (Dowling & Lucey, 2023).

ChatGPT in Academia

The impact of ChatGPT on education is immense. Therefore, it creates strategies to utilize it in various aspects of education. In a recent study, ChatGPT scored a grade point of 7.18 in an English comprehension exam, which was equivalent to all students' grades in the Netherlands (de Winter, 2023). Some researchers opine that ChatGPT is the screw in the coffin of educational integrity, as it can raise unhealthy competition among academicians when not used properly, especially when academia exerts pressure on publications and expects cent percent pass results after examinations (Graham, 2022). Bishop (2023) asked ChatGPT the difference between mechanical and advanced writing and the response turned out to be well-referenced and researched. ChatGPT can positively affect intended educational outcomes, as it deals with enormous corpus data. While cross-checking with responses given by ChatGPT, a study observed that 44% of the response cases were correct, and the rest of the 56% were partially correct, which clearly opens up new avenues for educational assessment and evaluation (Jalil et al., 2023). However, ChatGPT lacks the ability to think like a human being and thus provides information based on the neural network that may have its own limitations (Atlas, 2023).

Academia in the twenty-first century must view ChatGPT as a boon rather than a bane. Embracing ChatGPT as an educational platform will help students to learn and increase their knowledge as the way forward (Trust, 2023). One of the biggest limitations of ChatGPT is that it seldom provides incorrect responses and apologizes for it. This is because it cannot provide information about unreported incidents (Project, 2022). It is high time that teaching and learning utilize strategies to use ChatGPT, while preserving the underlying values of education (Zhang, 2023). Chatbots like ChatGPT should act as a scaffold for students' learning. Debates and discussions in classrooms may utilize it to get ideas for effective learning (Anders, 2023). Despite its inherent flaws, recent studies reveal positive perspectives of ChatGPT, thus giving educational setups a boost (Haque et al., 2022). It has proved to be beneficial for academicians, enabling the writing of essays, research papers, learning languages, and

generating computer codes, which has stunned and converted many academicians to become its users (Hern, 2022).

ChatGPT in Other Professions

Even though the present study is specific to engineering stakeholders, its implications might expand the knowledge of AI application in other disciplines. Moreover, review of literature brings to light several research studies conducted in such a short time, especially in the fields of medicine and education. Therefore, the present study reviewed a few of those research studies to understand the relevance of ChatGPT user experiences.

Medical Profession

As an aid for medical education, ChatGPT, posing as a potential facilitator, scored an average of 55% in an assessment test (Gilson et al., 2022). ChatGPT answered 76.9% of questions on cirrhosis accurately and scored 55.8% on ophthalmology (Antaki et al., 2023). ChatGPT cannot replace medical practitioners, as it is merely a background information provider that supports medical students in their knowledge upgradation and patients with information on illnesses, symptoms, and prescriptions (Yeo et al., 2023). However, medical and dental educators have limited knowledge about AI, so using ChatGPT to learn more about the updated curricula of various institutions is revolutionary (Thurzo et al., 2023). In medical research, ChatGPT has entered like a storm. A set of researchers asked it to generate abstracts for articles from high-impact factor journals. They found vague and ambiguous clouds in them. Furthermore, they found that AI tools have the ability to check for plagiarism (Gao et al., 2022). Moreover, when ChatGPT generated medical abstracts and tested for plagiarism, it showed similarities only up to 66%. Humans could detect only 32% correctly when asked to detect the differences between fabricated and real abstracts. This shows the danger of reliability upon ChatGPT-generated data (Else, 2023). Furthermore, studies expressed the need for proctoring patient-ChatGPT interaction to maintain the welfare and integrity of the medical field (Nov et al., 2023). Korean medical researchers have concluded that acceptable explanations and correct answers from ChatGPT and human interventions are not the same. The minute interpreting ability is still a human capital, and ChatGPT cannot replace it (Huh, 2023).

Engineering

The AI-enabled chatbots or translators, such as Dreamfusion, Audio LM, and Galactica, have lost their significance after the launch of ChatGPT (Gozalo-Brizuela & Garrido-Merchan, 2023). ChatGPT has a lot to contribute to engineering. Though there are concerns about the dishonest practices of ChatGPT by engineering students, the efficiency outweighs the deficiency, and future research can easily curb such dishonest practices. However, professors are attempting to use ChatGPT in a more beneficial way (Qadir, 2022). A popular software-testing curriculum asked ChatGPT some questions, out of which 44% of the answers were correct. ChatGPT provides correct or partially correct answers to most of the questions (Jalil et al., 2023). Furthermore, ChatGPT hinted at expected outputs for certain problems through dialogue progression. In this way, it fixed 31 bugs out of 40, thus proving to be a useful bug-fixer (Sobania et al., 2023). However, to keep track of ChatGPT outputs, there is a need to develop regulations and user policies (Hacker et al., 2023). Hence, ChatGPT, if used carefully and ethically, has the potential to be very effective for professionals, especially when it comes to engineering.

Teaching

ChatGPT as a generative Artificial intelligence technology has the potential to facilitate as a guide for instructional tasks among teachers (Prakasha & Kenneth, 2023; Zhai, 2022). All written work in teaching and learning may use ChatGPT-generated content in the near future and might lead to less human intervention, which could also harm human learning. Recent research has found ChatGPT to be a good language-learning tool (Aydın & Karaarslan, 2022) as written tasks through ChatGPT scaffolds the learners. A significant contribution of ChatGPT is visible in handling rapidly growing literature (Wenzlaff & Spaeth, 2022). Although students use ChatGPT dishonestly for writing essays and research papers, it may be detrimental to the originality of their research work. Still, many researchers are giving the authorship to ChatGPT, which is debatable as it is merely an AI interface (Graham, 2022). Additionally, ChatGPT cannot genuinely interpret abstract ideas (Lehnert, 2023). Furthermore, it cannot create literature, so it sometimes provides only entertainment (Thorp, 2023). It is a good translator of spoken language rather than written data (Jiao

et al., 2023). Its increasing popularity is demanding that writers should disclose their usage of ChatGPT. There is a need for newer assessment tools to sustain the reliability and creativity of the user (Zielinski et al., 2023). ChatGPT has significant issues regarding ethics and ethical conundrums (Zhou, 2023). When a study checked the response time and quality of content on ChatGPT, the study found syntax, citation, and other kinds of errors (Kumar, 2023). Further, a qualitative sentiment analysis revealed that only a limited number of users are concerned about ChatGPT misuse, which is a threat to the field of education (Haque et al., 2022). It is time for educational stakeholders to step in and respond to the changing situation.

Thus, from the studies conducted so far, it is evident that ChatGPT has a variety of uses, and research studies are yet to explore the consequences. Thus, it is essential to understand the user experiences among computer science professionals, which might inform its application in other educational disciplines and workplaces. The present study aims to explore the user experiences of computer science engineering discipline professionals regarding ChatGPT.

THE STUDY

Context of the Study

ChatGPT is a booming, disruptive technology of the twenty-first century. It is the latest open, AI-enabled platform that catalyses the delivery of information to students, faculties, and working professionals in various domains. It is completely dependent on available online literature and databases (Atlas, 2023). Sometimes it provides data that may not be true, thus creating reliability issues among users (Menéndez, 2023). However, from available literature since November 2022, one cannot deny its usage and limitations in various fields. India hosts the highest number of engineering educational institutions in the world. It has about 2,500 engineering colleges that produce almost 15 lakh engineers per year (Thakur, 2021). Nevertheless, Indian engineering institutions feature in the top universities of the world. The graduates chose to work across the globe, thus, their shared experiences of using ChatGPT may help future users. The usage is affecting the quality of education and workplace among low-income developing countries, such as India. These countries are unable to figure out its consequences in various fields, as they lack advanced technologies.

ChatGPT is being used for various purposes inadvertently. Scientists are yet to explore its pitfalls. Thus, the present study aims to bring out the user experiences of computer science professionals, who are competent enough to utilize it in multiple ways, which others may not be able to see easily. Thus, asking computer science stakeholders about its usage and their revelations may help others. Engineering professionals have the potential to reveal certain subtle information on ChatGPT, which may be useful for future development. The present study may contribute positively to the effective use of ChatGPT to improve society, not as a threat to social norms. Future research may debate the idea of ChatGPT as a competitor or facilitator for computer science professionals and others.

Theoretical Framework of the Study

Vygotsky's theory of learning and development guides the present study. ChatGPT takes the position of an adult mentor and scaffolds the user's ability to do better. The zone of proximal development (ZPD) is the space between the user's performance on a learning task with or without its help (Vygotsky & Cole, 1978). The study further seeks the support of the Technology Acceptance Model (TAM), as people are using it as a mode of information generation. Although the AI-enabled ChatGPT technology is new, studies must explore if it is well received by people who believe that it is useful for their routine work as students, faculty members, or working professionals. The present study explores these groups' perception of the ChatGPT application in their routine work and their comfort level in using it (Davis & Davis, 1989). Further, the unified theory of acceptance and use of technology (UTAUT) explains that the use of ChatGPT comes from the behavioral intention of its users. People may use it based on its performance, ease of use, social influence, and supporting conditions (Venkatesh et al., 2003). In addition, the labor process theory (Braverman, 1998) could guide the stakeholders on how it may scaffold a mediocre employee to achieve productivity, rather than by a skilled working professional.

Research Inquiries

1. To explore the perception and user experiences of ChatGPT among computer

science engineering students, faculty, and working professionals

2. To investigate whether ChatGPT is a threat or facilitator in the domain of computer science engineering

METHOD

The present study adopts a qualitative approach and employs the snowball sampling technique to recruit samples. The researchers conducted semi-structured interviews with engineering professionals who are using ChatGPT regularly, which included eight students from computer science engineering, eight faculty members, and eight engineers in the field. The study approached both male and female participants representing students, faculty, and working professionals in the computer science engineering domain. Female working professionals declined to participate, without giving any reasons. However, three female students, three female faculty members, and two female working professionals did participate.

The researchers developed an interview guide, used to consult with the experts. Table 1 shows the items of semi-structured interviews used in the study. Researchers established the face and content validity with the subject experts and incorporated their comments in the final form of the interview guide. The researchers conducted the phone interviews and recorded each one with permission from the participants. Researchers of the present study conducted the interview under the supervision of the corresponding author, who has a PhD in education with experience in organizing qualitative interviews. At the beginning of each interview, each lasting about 10–15 minutes, researchers introduced its purpose and confirmed the participants' consent. The guide directed the interviews pertaining to both the research questions raised in the present study. Based on the participants' responses, the interviewer constructed on-the-spot, subsequent questions to each interviewee's responses to elicit in-depth information. Further, to combat respondents' biases, the interviewer asked indirect, spontaneous questions that included third-party examples and created situations. The researchers transcribed the recorded semi-structured interview data and encrypted the transcripts in a password-protected file to ensure data security and confidentiality. The data is accessible only to the authors of the present study. The study employed the narrative data analysis technique, which included the experiences shared by engineering students, faculty members, and professionals regarding ChatGPT usage.

Researchers went by the following step-by-step procedures while carrying out the narrative analysis:

- Read the interview transcripts thoroughly multiple times.
- Identified and assigned initial codes to specific segments or phrases in the narratives, which captured important ideas, concepts, or themes. Researchers initially focused on descriptive codes that directly represented the content from the transcript.
- Organized initial codes into a coding framework, providing a structure for systematic organizing and categorizing of the data. It grouped related codes and identified potential relationships or connections between them.
- Applied the coding framework to the entire dataset, systematically coding each segment of the narratives. This process involved reading the data, identifying relevant codes from the framework, and applying them to the appropriate segments.
- Revised and refined some codes as any new information challenged the initial codes. It revised the codes iteratively to ensure that they accurately reflected the data. Eventually, it consolidated similar codes and considered merging or splitting them as needed.
- Achieved the validity and reliability of the coding process by reaching consensus among all researchers at each stage of coding.
- Analyzed the coded data by looking for patterns, relationships, and connections between the codes. Identified overarching themes that emerged from the data. This involved synthesizing and interpreting the coded segments as a whole.
- Based on the analyzed coded data, researchers identified major themes that represented the essence of the narratives, ensuring that the themes are meaningful, coherent, and reflective of participants' experiences. Researchers used the coded segments and

supporting evidence to justify and illustrate each theme.

- Refined and redefined the themes iteratively to ensure accuracy. Further sought feedback from colleagues to enhance its credibility and rigor.
- Reported the identified themes along with supporting evidence from the narratives and interpretations.

Researchers followed a similar analysis pattern in all types of samples (students, faculty, and working professionals). Table 3 presents the themes and subthemes evolved out of the narrative analysis.

Table 1.
The Semi-Structured Interview Items

Engineering Students
Since when have you been using ChatGPT? What is your experience as a user? Explain.
For what purposes did you use ChatGPT? Elaborate.
How did ChatGPT support you in your class assignments? Explain.
Do you feel using ChatGPT is a breach of academic integrity? Is it a threat or a facilitator? Elaborate.
Engineering Faculty
Since when have you been using ChatGPT? What is your experience as a user? Explain.
For what purposes did you use ChatGPT? Elaborate.
What do you think are the limitations of ChatGPT? Explain.
What are the ethical concerns to be addressed regarding the usage of ChatGPT? Is it a threat or a facilitator? Explain.
Engineers at the Workplace
Since when have you been using ChatGPT? What is your experience as a user? Explain.
For what purposes did you use ChatGPT? Elaborate.
What do you think are the limitations of ChatGPT? Explain.
What are the ethical concerns to be addressed regarding the usage of ChatGPT? Is it a threat or a facilitator? Explain.

Ethical Considerations

The present research sought IRB clearance from the university to carry out the study. The researchers employed a snowball sampling method to recruit the study participants with their consent. Researchers confirmed their willingness to participate in the beginning of each interview. The researchers gave privileges to the participants to withdraw any time from participating if they felt uncomfortable. To ensure anonymity, researchers assigned pseudonyms to each participant. Table 2 presents the pseudonym and other demographic details. Further, to address data security, researchers stored the interview files and the transcripts in a password-protected file which is accessible only to researchers.

Table 2.
Demographic Details of the Participants

Participant (Pseudonym)	Age (Years)	Gender	Student/ Faculty/ Working Professional	Program/ Department/ Designation
S1	21	M	Student	B.Tech
S2	27	M	Student	Masters in CS
S3	22	M	Student	B.Tech
S4	22	M	Student	B.Tech
S5	26	M	Student	Masters in CS
S6	23	F	Student	M.Tech
S7	21	F	Student	BE
S8	22	F	Student	MTech
F1	40	M	Faculty Member	Computer
F2	38	M	Faculty Member	Science
F3	37	M	Faculty Member	Engineering
F4	32	F	Faculty Member	Computer
F5	40	M	Faculty Member	Science
F6	42	M	Faculty Member	Engineering
F7	37	F	Faculty Member	Computer
F8	33	F	Faculty Member	Science
W1	26	M	Working	Engineering
W2	22	M	Professional	Computer
W3	30	M	Working	Science
W4	30	M	Professional	Engineering
W5	27	M	Working	Computer
W6	28	M	Professional	Science
W7	31	F	Working	Engineering
W8	30	F	Professional	Computer
			Working	Science
			Professional	Engineering
			Working	Electrical &
			Professional	computer
			Working	science
			Professional	MCA
			Working	Machine Learning
			Professional	Engineer
				Data Analyst
				Software
				Engineer
				Software
				Engineer
				Data Analyst
				Data Analyst
				Computer
				Engineer
				Network
				Engineer

RESULTS AND DISCUSSION

The interviews from the three different samples—including engineering students, engineering faculty, and engineering working professionals—highlighted perceptions, attitudes, and experiences about the ChatGPT platform. Table 3 presents the themes and sub-themes that emerged from a narrative analysis of the interviews' transcripts.

Table 3.
The Themes and Sub-Themes Evolving from the Narrative Analysis

Interview Participants	Theme Type	Theme and Sub-Theme Titles
Engineering Students	Main Theme 1	**Easy, instant, and engaging**
	Sub-Theme 1.1	• Guide and consultant
	Sub-Theme 1.2	• Work faster
	Main Theme 2	• Technical solutions
	Sub-Theme 2.1	• Practice and assignments
	Sub-Theme 2.2	• End-term projects
	Sub-Theme 2.3	• Plagiarism
Engineering Faculty	Main Theme 3	**Adapt, but not resist**
	Sub-Theme 3.1	• Consternation
	Sub-Theme 3.2	• Embrace
	Sub-Theme 3.3	• Avoid repetition
	Main Theme 4	• Enhanced educational experience
	Sub-Theme 4.1	• Student engagement
	Sub-Theme 4.2	• Abuse
Engineering Working professionals	Main Theme 5	**Adapt, adopt, and embrace**
	Sub-Theme 5.1	• Giant data backup
	Main Theme 6	**Automate tasks**
	Sub-Theme 6.1	• Efficiency

Main Theme 1: Easy, Instant, and Engaging

Most of the students said that ChatGPT is another search information tool, like Google and Bing. They all were of the opinion that they can get direct, channelized search results. They started using it in December 2022 and found it easy, with immediate answers to any kind of query, except one or two times when a "server busy" error occurred. As it is a new online tool, the students felt that it was very engaging. It fetched customized responses of an appropriate length to their questions, as compared to other ICT search engines.

- Student 5: "I found it quite interesting and it has honestly helped me a lot."
- Student 3: "The best thing about it is that it responds like any other human being. …I like chatting with it."
- Student 2: "I felt I had more freedom and autonomy to ask anything I like."

Sub-Theme 1.1: Guide and Consultant

ChatGPT is a guide to most students, as it responds to almost any question. A majority of students shared that whenever they suffered technical glitches, the only consultant that was easily accessible was ChatGPT. They admitted that they used it to understand difficult concepts and to get coding syntaxes for new program ideas. It helped them to polish their answers and codes. It was accessible 24/7, like a savior to their academic inquiries.

- Student 2: "…if I am having a doubt on a particular topic or something, I will just use it as a tutor."
- Student 4: "I use it when I cannot get a direct answer from Google…to write a statement of purpose while filling applications for high school admissions."

Sub-Theme 1.2: Work Faster

Students agreed that ChatGPT accelerates their assigned response time and deadlines for in-class activities. ChatGPT is faster, unlike other search engines. It is a one-stop answer box where students can get what they are looking for. It also responds in a few minutes, including from relevant sources across the World Wide Web. Students found it very useful, as it gives innovative answers to traditional questions, including citations and reference lists.

- Student 1: "Rather than searching articles over Google Scholar and other research search engines, I started preferring ChatGPT. Also, I would get a quick answer in minimal time."
- Student 4: "I break complex questions into smaller pieces and obtain accurate responses."
- Student 5: "Citing references was very hard and time consuming before. Now it is such a joy to cite with its help."

Main Theme 2: Technical Solutions

The students admitted that they frequently use ChatGPT to get a quick solution for routine class task programming and debugging codes. They said that if the solution is quickly available, it can help with various learning topics. Students felt that its backup data are huge and it can customize the solution exactly, as per the questions asked. However, when too many people use it, students will receive a "Server is busy" error message multiple times.

- Student 4: "It even helps in debugging some problematic codes. …most of the time it gives very helpful suggestions."
- Student 1: "It provides a good and efficient code for any program or any function."
- Student 6: "I compare my program codes with its results, which is a huge learning experience."
- Student 3: "It has given me new ideas and ways to think about codes. Otherwise I would not have gotten the ideas on my own."

Sub-Theme 2.1: Practice and Assignments

Students mostly use ChatGPT for preparing their internal assessment assignments. They get a better understanding and a structured response, which they can easily modify according to the requirements of a particular assignment. Students feel confident about the responses that emerge, unlike normal Google searches, which tend to show anything and everything. Many students feel that it is a good platform to practice as it fetches answers numerous times from a variety of relevant sources. Changing search terms or questions in ChatGPT brings out a wide variety of responses, so the overall reading helps in learning.

- Student 3: "I have also used it to help me in my assignments."
- Student 5: "For some of my assignments, I essentially use it to search for something. It gives me a more direct and explainable answer."
- Student 2: "I started using it as a practicing platform for my coding exam."
- Student 4: "It reduced my assignment anxiety, as I am sure I get some information and I can easily develop on it."

Sub-Theme 2.2: End-Term Projects

Many students admitted that they used ChatGPT for their final semester end-term project or professional internships. ChatGPT helps them to prepare their project proposals and designs and analyze ideas to finalize their theses. As it answers any question, it is easy to ask ChatGPT to provide iterative ideas to create novel and innovate end-term project titles. Most students shared that they used ChatGPT to create attractive project titles and write its statement of purpose.

- Student 6: "In order to get ideas and stuff, instead of going through many websites, I use this to say I want to download journals or articles."
- Student 5: "Usually, choosing a title was very difficult for me. What I did with ChatGPT was to explain what I was trying to do in my paper. I gave a brief overview of my model and what I was trying to achieve. It came up with a cool acronym to go with the title."

Sub-Theme 2.3: Plagiarism

ChatGPT has raised a conceptual argument about plagiarism, the definition of which needs to be clarified. All the students interviewed said that they do not consider ChatGPT as a mode for cheating. Rather, it is a facilitator for better comprehension and gathering of ideas. According to them, it is a complementary guide which can be consulted for summarizing, searching, and for conceptual clarity. Many said that even when they wrote borrowed ideas, they paraphrased and cited. Similarly, ChatGPT was paraphrasing via artificial intelligence and they could add citations to it; therefore, it was not plagiarism.

"We used to refer to many reading materials and write, but the only support we get here is that it readily fetches the content we want," a student said. Others were worried that too much dependence on it might decrease their browsing or researching skills in the long run.

- Student 2: "I do not think it is cheating or plagiarism. It is paraphrasing instead of humans doing it."
- Student 4: "Relying on it is definitely not correct, because it is plagiarism. If you are using it as a research tool or like to

understand stuff as I mentioned earlier, then it can be very helpful."

- Student 5: "[…] educators must measure creativity over completion of the process in assessment… as long as evidence of learning is available, it is not cheating."

Main Theme 3: Adapt but Do Not Resist

Most faculty members felt they needed to adapt to these innovations in information and communication technology. In the future, there will be increasingly more of such AI-enabled platforms for teaching and learning. Academia may consider the positive side, how it is beneficial to both the faculty and students, rather than as something negative. Its best feature is its ability to learn from human interactions to strengthen its functionality every day. A few of the faculty members mentioned that there is a need to orient students for the responsible use of the ChatGPT.

- Faculty 2: "I use it to frame creative assignments."
- Faculty 4: "I generate feedback comments and store in a comments bank."
- Faculty 6: "It helped me generate class instructions and compose official emails."
- Faculty 3: "I even generated an FAQ…check for students' repetitive questions on."

Sub-Theme 3.1: Consternation

Contrary to the positive opinions on the benefits of ChatGPT, many of the faculty members said that the creation of regulations on the restrictive access of this chatbot by educational institutions is imperative. We should not accept ChatGPT as a credited author, as it would not take responsibility or ownership, nor can we retract it. As it is a language model, it may have errors unlike the other search engines that trend only the web pages. Faculty also expressed their concern that the assignments should be more application-based and creative, to prevent students from misusing the chatbot to obtain the answers. They said that it cannot replace educators, who are always needed, but it can be utilized for the benefit of teaching and learning matters. It cannot replace human engineers, as domain expertise emerges from them.

- Faculty 3: "I will not allow students to cite ChatGPT as an author."
- Faculty 6: "It may create confusion in measuring students' actual writing capabilities."
- Faculty 1: "Let's create assignments with it rather than without it."
- Faculty 2: "I used it to generate students' guided feedback and it saves lot of time when compared to providing individual feedback."

Sub-Theme 3.2: Embrace

Faculty members were embracing this new AI and using it obtain information about workplace-related matters. They said that ChatGPT is here to stay and has several positives. They revealed that they used it to obtain different perspectives on concepts as an entertaining interactive platform and to restructure questions that will help them to understand the difficulty levels of learners. It helped to provide a wide variety of examples to the class. They can use it to provide guided feedback, develop assessment rubrics, and as a scaffolding technique for emerging writers, for language learning and acquisition skills. Comparing and contrasting its write-ups with that of students helped in understanding students' relative strengths and weaknesses. For instance, co-lesson plan writing between bots and teachers helped trainees and math and science teachers to give drill sums or problems in physics and math.

- Faculty 1: "AI will intervene in many other parts of life, so there is nothing to be scared of or worry about cheating."
- Faculty 4: "It understands exactly what I need, roughly speaking the exact word that I wanted to know, and I will get the information within no time."
- Faculty 5: "It helps me in composing official emails, lesson planning, creating assessments, worksheets, etc."
- Faculty 6: "It is a quick class preparation resource when I am caught up with a lot of other administrative work."

Sub-Theme 3.3: Avoid Repetition

Faculty revealed that they found ChatGPT extremely exciting and fruitful. They used it for

conglomeration of information and code reviews, mundane tasks like emails, and regular applications that needed repetition. Hence, according to them, it is a time-saver. Some even shared that they used ChatGPT for eliminating grammatical errors in papers, articles, and letters. They also said that it might develop a tinge of dependence among students and faculty. The faculty expressed that the chatbot is only trained with text, not with images or videos, which would be more helpful.

- Faculty 2: "I use it for a code review, such as for the research work that I am doing."
- Faculty 3: "[…] the main reason to use ChatGPT is for coding, to demonstrate various examples."
- Faculty 5: "I am teaching computer science, so it is a great advantage for me because it could create many programs for us in a better way."
- Faculty 1: "I learned newer ways of coding with it."
- Faculty 3: "Instead of giving repetitive feedback to students, I used it to create guided feedback and an FAQ check."

Main Theme 4: Enhanced Educational Experience

Most of the faculty considered ChatGPT to be a platform for self-learning, as it provided enriching experiences for both students and faculty members. It could build students' confidence and critical thinking ability. One could elicit a variety of responses on the same query, which involved a lot of information. The variety of responses excited the faculty, too. Contrary to this, a faculty member also said that it provided lot of cheap knowledge and even portrayed anti-societal information as legitimate. Both students and faculty needed training in using it for the benefit of teaching and learning.

- Faculty 1: "I use it for continuous learning, to get a different perspective about the same topic, and to get advanced information."
- Faculty 3: "It gives answers…I think based on the training received from the language model. And, yeah, the results are impressive."
- Faculty 6: "…I even asked ChatGPT to provide response in various types."
- Faculty 5: "It created a lesson plan with a variety of resources which I cannot even think of."

Sub-Theme 4.1: Student Engagement

Most of the faculty mentioned that as it is an online platform, and students used it positively or negatively, it kept students engaged. It also engaged faculty members for class preparation and work. It accelerated students' work and saved them time. Most of the faculty mentioned that it is a potential tool to develop critical and creative thinking ability among students. Faculty members can use it to create assignments that trigger students' critical and creative thinking, rather than assessing a traditional assignment alone. Many students were intrinsically motivated to spend time with ChatGPT as a learning resource and also as a study companion.

- Faculty 2: "I have given an assignment to my students for which they have to take an entirely new piece of code, which they do not understand. They have to put it in ChatGPT and get to know the working of the code so that they understand the systematic execution from ChatGPT."
- Faculty 6: "Writing as a means of thinking is lost if students use chatbot to provide quick write-ups."
- Faculty 3: "I saw students working on ChatGPT during computer lab hours."

Sub-Theme 4.2: Abuse

Many faculty members expressed their concerns regarding students using ChatGPT to complete their assignments and projects, which may defy the aim of self-learning. They expressed reservations about the likelihood of students becoming overdependent on this AI platform, which could curb students' thinking abilities. This could lead to addiction, so pro-active steps from educators to curb dependency is the need of the hour. ChatGPT-related fraudulent cases, plagiarism, and malpractices may increase among students. Several academic journals have already established restrictions on the submission of ChatGPT-generated manuscripts, when discovering that professors had

been submitting AI-generated content. There is a need for orienting both faculty and students on the responsible use of ChatGPT.

- Faculty 4: "It is like reproduction of the data…It is not good advice for students to use it."
- Faculty 4: "Students should have more creativity within them to identify what is not there and what to do with the responses fetched by it. It fetches incorrect responses, also."
- Faculty 1: "I saw students' assignments generated using ChatGPT and we easily can make out that it is not written by the student. When we checked other assignments done by the same student without the use of ChatGPT, there is a clear difference in the writing style."
- Faculty 6: "Abuse of ChatGPT may lead to academic dishonesty, and academic integrity will be in danger."

Main Theme 5: Adapt, Adopt, and Embrace

The working professionals were ready to adapt this new AI bot. They were not at all thinking of this as a problem. Rather, most of the working professionals thought that it helped them by fetching skeletal ideas of coding. It saved their time from writing official emails and letters. Many mentioned that it helped them to create company-related forecasting presentations with instant data points, graphs, and charts. It provided IT professionals systematic instructions to create their new projects. It even supplied them with scripts and custom files to work on their company projects.

- Working Professional 1: "I gave it a prompt to write a piece of code on which I was working. The output was decent, as it was able to provide me with a skeletal structure of the code."
- Working Professional 2: "I just wanted to explore what I call 'oversampling.' I wanted to know the code for it. I asked… and got a fair response."
- Working Professional 6: "It gave me step-by-step instructions to work on my project."
- Working Professional 3: "It increased the competition among IT companies, as it can provide them with free program codes… and brings efficiency into the system."

Sub-Theme 5.1: Giant Data Backup

All professionals agreed that ChatGPT has a giant data backup until 2021. With 90% data accuracy, it acts as a code guide and facilitator. Antaki et al. (2023) reported that accuracy achieved by ChatGPT in medical exams is commendable. Most of the working professionals agreed that ChatGPT learned from human and machine interactions and added it to its database. Thus, the compounding effect improved its functionality constantly in almost all the knowledge domains. It drew information from huge corpus data, with nearly 175 billion parameters. GPT4 is providing further enhanced features, such as an eight-times faster processor that can understand images. ChatGPT used web scraping software to fetch most of the information.

- Working Professional 3: "It gathers information from most of the knowledge databases."
- Working Professional 4: "Most of the time, the data that it gives is accurate and helpful."
- Working Professional 6: "GPT4 comes with a processor that is eight times faster and more improved over the last version. It is capable of understanding images."

Main Theme 6: Automate Tasks

Professionals used it to write program codes and algorithms that bring in automation of tasks in the workplace. They said that people are nervous and think that they might lose their jobs, as it can automate tasks, which human beings use to complete in several steps. Thus, there is uncertainty in the workplace. ChatGPT may replace a few daily information retrieval jobs, such as code generation, bug fixing, and documentation, but cannot replace programmers.

- Working Professional 3: "I feel automation is the future and brings efficiency to the workplace."
- Working Professional 1: "You cannot rely on it 100% in your professional work. In addition, human intervention is definitely needed."

- Working Professional 2: "ChatGPT is trained on datasets, so whatever the bias is, due to the high volumes of certain topics on the Internet, may get incorporated into the learning by the AI for its reports."

Sub-Theme 6.1: Efficiency

The professionals clearly said that ChatGPT was very efficient. It saved time for searching, browsing, giving responses, and data retrieval. It saved time and energy for creating newer codes for any program. It did a quick, basic job so that working professionals could give a critical polish to it. The new language platform had a huge potential and could be a facilitating platform for all. However, a limitation of ChatGPT was that open-ended holistic outcomes were still lacking. Professionals said that ChatGPT users could write 60% more documents in a day than non-ChatGPT users, thus enhancing the productivity at the workplace.

- Working Professional 1: "It simply saves time and energy."
- Working Professional 3: "It can effect layoffs in data entry and the customer support sector, and basic coding too, because AI will be there 24/7."
- Working Professional 2: "I read that it can boost companies' productivity by 14%."

DISCUSSION

The exploration of the perception and user experiences of ChatGPT among computer science engineering students, faculty, and working professionals brought out several significant pointers to all stakeholders. Engineering students narrated that ChatGPT was interesting to engage with for learning, as it was user-friendly and fetched near-accurate information instantly from a large corpus of data. Similar observations were made by Biswas (2023), that ChatGPT brought in efficiency and helped people to complete their tasks faster. Further, Surameery and Shakor (2023) reported that people used ChatGPT to fix bugs and get instant support for their work. Since ChatGPT is capable of understanding natural human language, students perceived more connectedness with it and accepted it as a technology that was easy to use and accepted by all for its functional value, as guided by the Technology Acceptance Model (Davis & Davis, 1989). Students found ChatGPT as an alternative 24/7 tutor with high efficiency. Most of the students shared that they did not perceive anything unethical or plagiarized, as it was paraphrasing with accurate citations in no time. Students felt that ChatGPT is their study companion, to whom they can turn to when they need to fix a programming bug, fetch a coded syntax to get ideas for their end-term project, and to write or verify their assignments. A study by Shidiq (2023) also observed that ChatGPT was helpful in practicing and completing student assignments. Students are seeking the support of ChatGPT for creating end-term projects and adapting to utilize ChatGPT whenever possible (Malinka et al., 2023). Students shared that they gradually began to understand what they can originally write and how their writing changed with the help of ChatGPT, in tune with the Vygotsky and Cole (1978) zone of Proximal Development theory.

Faculty members initially did express their apprehension towards ChatGPT's use by students and programmers. They said students might use it to create all their assignments, including code puzzles for class activities. It was difficult to track students' critical and creative thinking abilities and actual capabilities. A recent study also reported that users fetch a basic coded syntax for their queries and refine it to answer their class assignments (Tlili et al., 2023). They recommended the restrictive use of ChatGPT in academia and the need for orientation of students and faculty for its responsible use. However, their narrative on positive aspects included adapting it and not resisting. They said they used it for many purposes, such as creating class assignments; researching; developing guided student feedback and FAQs for repetitive, mundane tasks; composing emails and letters; lesson planning; and creating innovative assignments rather than traditional assignments and testing. The faculty perceived that ChatGPT could scaffold (Vygotsky & Cole, 1978) student learning. They found students working with ChatGPT on various advanced and complex topics in their leisure time and lab hours on their own, which was an indication of improved student engagement towards learning. A study by Rathore (2023) reported that ChatGPT-customized responses engaged its users. However, they did express their doubts on dependency or

addiction to chatbot and hinted that it had led to an increase in malpractices in students' assignments.

Working professionals appreciated the capabilities of ChatGPT with huge data backup. They clearly expressed that corporations should accept, adopt, and embrace chatbots. A study conducted by Delacroix (2023) also reported that academia must adapt and adopt ChatGPT, and not resist it. On the contrary, Darlington (2023) reported apprehension about its use in academia. It can bring efficiency within the workplace by automating many routine jobs, such as programming, code generation, bug fixing, and documentation. They shared that it can save time on many aspects, such as preparing forecasts, generating innovative codes, and creating step-by-step procedures for any tasks. It can bring 60% more documentation per day if automated appropriately. Dwivedi et al. (2023) also reported the uses, challenges, and opportunities of ChatGPT from a multidisciplinary perspective. Thus, ChatGPT is a boon for the economic growth of a country, and advanced chatbots like GPT4 could contribute much more, being eight times more capable and able to understand images.

Cotton et al. (2023) reported how universities can take a proactive, ethical approach to the use of ChatGPT, which is in tune with the recommendations made in the present study. McGee (2023) reports that introducing ChatGPT has created consternation among its users. In the present study, engineering faculty members expressed concerns on various aspects of teaching and learning. One of the sub-themes that emerged from the revelation by engineering faculty members is "embrace." A recent study also emphasized embracing AI-enabled chatbots as a way forward (Abdullah et al., 2022). A study by Kashyap and OpenAI (2023) suggested the use of ChatGPT for repetitive, mundane routines through automation. Engineering professionals in the present study also revealed the same. From the engineering faculty interviews, one of the main themes was enhanced educational experience, meaning that ChatGPT enhances students' engagement as a learning tool. Similarly, a study by Qadir (2022) found that ChatGPT could build enhanced learning experiences that are both engaging and interactive.

Another theme that emerged from faculty interviews included abuse of ChatGPT. Sebastian (2023) also revealed similar findings and reported that the possible exploitation of ChatGPT was by malicious actors in the computer science domain. Lund and Wang (2023) revealed the impact of ChatGPT in academia and the library, unlike the present study which focused on computer science engineering education. Mökander and Schroeder (2022) suggested the need for people in society to update themselves with ChatGPT knowledge for a more immersive experience and engagement, similar to the implications of the present study.

CONCLUSION

The present study explored the perception and user experiences of ChatGPT among computer science engineering students, faculty, and working professionals. It further explored whether ChatGPT is a threat or ally in the domain of computer science engineering. The study brought out six main themes: (1) easy, instant, and engaging content; (2) technical solutions; (3) adapt, but don't resist; (4) enhanced educational experiences; (5) adapt, adopt, and embrace; and (6) automate tasks. The subordinate themes are: (i) guide and consult; (ii) work faster; (iii) practice and assignments; (iv) end-term projects; (v) plagiarism; (vi) consternation; (vii) embrace; (viii) avoid repetition; (ix) student engagement; (x) abuse; (xi) giant data backup; and (xii) efficiency.

Themes and sub-themes explained the user experiences, threats, and applications of ChatGPT from computer science engineering students, faculty, and working professionals. The study included only stakeholders from computer science and employed the snowball sampling technique to recruit study samples. Furthermore, it conducted only a narrative analysis of semi-structured interview data to arrive and present the results. The study narrated how computer science engineering students, faculty members, and professionals perceived ChatGPT use in their day-to-day lives and what its threats and benefits are. The implications of the study helped stakeholders from other disciplines to consider ChatGPT as a facilitator and not a threat. Further, they could understand how it is useful to their particular discipline, what kinds of policies need to be put in place, and what improvisation is needed to develop future AI systems. Social media portrays ChatGPT negatively. However, stakeholders felt the need to adapt to it more positively and inclusively to benefit society. Their views expressed the productivity and efficacy in all its fields of application. As ChatGPT has just entered society, many qualitative,

quantitative, mixed method, and program evaluation studies are warranted to have in-depth understanding of its applications. Future research may focus on understanding the effective use of ChatGPT in various fields, such as academia, automating workplaces, data analytics, computer programming, and in developing policies concerning its ethical usage and inclusive practices.

CONFLICT OF INTEREST

The authors of the present study have no competing interests to declare. All co-authors have equally contributed to the present study under the supervision of corresponding author.

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