THE IMPACT OF ARTIFICIAL INTELLIGENCE DEVELOPMENT ON THE STEM JOB MARKET

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Abstract. *The use of artificial intelligent chatbots in academics raises controversial opinions in the education field. It has the potential to offer a range of benefits, like increased student engagement, collaboration, and accessibility. However, these tools also raise a couple of challenges and concerns. This paper examines the opportunities and challenges of using chatAPIs, with a focus on their impact on the scientific jobs field. It also considers the potential for these tools as a helping hand to experts.*

Keywords: *ChatGPT, data, overuse, programming, threat*

Introduction

The development of artificial intelligence is expected to have a substantial impact on the STEM (science, technology, engineering, and mathematics) employment sector. AI (artificial intelligence) makes it possible to automate tedious tasks, improve accuracy, make better decisions, personalize experiences, create new products and services, and progress research. Therefore, this is why many people from different domains are scared that their jobs will not be as solicited in the near future.

The automation of many jobs that currently require physical labor or repetitive tasks may modify the skills required for certain roles. Employees will need to learn new technologies and develop new skills, like data analysis and machine learning. The development of AI, on the other hand, is expected to create new job possibilities in sectors including software development, data analytics, and AI research.

The bright side of AI

Numerous areas of the STEM professional market could be revolutionized by artificial intelligence. The following are some opportunities that AI may deliver:

- Automating repetitive processes: AI can automate assessments, giving STEM specialists more time to work on more intricate and creative projects.
- Accuracy advancement: AI algorithms can be programmed to spot patterns and predict outcomes, boosting accuracy and minimizing mistakes in data analysis, simulations, and modeling.
- AI can evaluate vast volumes of data and offer insights that people might overlook, improving decision-making. This can aid decision-making for STEM workers, particularly in industries like finance and healthcare.
- Generating new goods and services: AI can be used to find new product and service markets, particularly in newly emerging industries like robotics, autonomous vehicles, and smart cities [1].
- Providing individualized experiences: In sectors like retail, e-commerce, and entertainment, AI-powered personalization may enhance customer experiences and quality reviews [2].
- Research scientific development: AI can assist scientists and researchers in sorting through enormous amounts of data to find patterns and provide fresh ideas. Studies in domains including medicine, genetics, and materials science might benefit as a result [3].

Consequently, artificial intelligence has the potential to revolutionize the STEM employment market by enhancing accuracy, efficiency, facilitating new discoveries, and offering individualized experiences.

Threats of AI

One of the risks of Artificial Intelligent machines consists in the underuse and overuse of it. The underuse of AI results in the EU missing out on opportunities - more specifically - it might lead to improper execution of important projects such as the EU Green Deal, a loss of competitive advantage compared to other parts of the globe, economic stagnation, and fewer possibilities for individuals. According to 'News' - factors that determine the underuse include inadequate infrastructure, low investments, the lack of data since AI machines depend on it, and a lack of effort [4]. Overuse, on the other hand, represents investing in Ai systems that are ultimately useless, such as trying to apply AI to tasks that aren't appropriate, like discussing social problems.

The design of AI and the kind of data used determine the results it provides. Design and data might be biased either purposefully or unwittingly [4]. Therefore, certain critical elements are not coded into the algorithm or intended to represent and reproduce systemic prejudices. Furthermore, by using statistics to describe complicated social actualities, the AI may look precise and perfect when it is not. Not using artificial intelligence properly, judgments regarding hiring, firing, loan offers, and even criminal processes might be influenced by information regarding sex, age, and nationality.

Artificial intelligence could impact the right to privacy and the protection of personal data used by facial recognition tools or in tracking and influencing individuals. For example, AI has already been accused of tracking someone's latest online behavior and choices, showing things the user would enjoy watching, rather than encouraging a pluralistic, equally accessible public discussion. Incredibly realistic video, audio, and image products — can be created using them and convey social manipulation and economic threats, damage reputations, and affect the ability to make a decision [5]. It could radicalize public discourse, cause division, and be used to influence the voting process.

In the last few years, we have spotted a significant threat of AI and its influence over different jobs. AI in the workplace is supposed to terminate with the disappearance of numerous jobs, such as accountants, professors, taxi drivers, cashiers, travel agents, and others. But at the same time, artificial intelligence (AI) is predicted to enhance jobs, education and play a vital role in eliminating long-term unemployment and ensuring a trained workforce. OECD nations' jobs are very automatable, and another 32% might suffer substantial improvements (estimated by Parliament's Think Tank 2020) [6].

Furthermore, AI applications that interact directly with humans or might end up incorporated into the human body may be unsafe due to the possibility that they have been hacked, misused, or poorly constructed, all of which can have disastrous consequences. Information access discrepancies could be abused. An example of the potential use of AI is for an online vendor to analyze a customer's online activity and other data to predict their likelihood of purchasing without the customer's knowledge. Additionally, political messaging could also change [4]. Furthermore, there may be ambiguity or confusion for individuals whether they are communicating with a human or AI due to a lack of transparency.

ChatGPT: most used chat bot last months

ChatGPT (short for "Generative Pre-training Transformer") is an advanced tool for processing natural language that is capable of generating content and code in real-time through conversing with a chatbot.

Launched in November 2022 by OpenAI, it closely resembles what a human would write or say, so chatting with it appears as a casual conversation between two people, such that some have pointed out that it is difficult to distinguish the generated text from one written by a real person [7]. Carrying out various language-related tasks, such as translation, summarization, answering questions, and creating text, among other things, thereby displaying a broad range of language-related capabilities, ChatGPT had quickly gathered users from all around the world for its effectiveness and

speed. Companies should investigate this new language and implement its functions for their own benefit [8]. It is considered efficient to take over time-consuming tasks, so the human employees can focus on more important work that requires subjectivity. A computer language does not need money to function quickly and with no mistakes, nor gets tired and makes decisions based on mood, personal opinion. Such quality is seen as beneficial to the economy of a company, thus using automation being a better option than human employment.

One of the primary benefits of artificial intelligent chat bots is that they provide asynchronous communication and, therefore, asynchronous learning. Studies have demonstrated that it can enhance student involvement and cooperation by enabling them to inquire about and deliberate on subjects without necessitating simultaneous attendance, thus promoting asynchronous communication [9]. This technology can be utilized to facilitate remote learning, particularly for students who are unable to attend classes owing to physical or mental health problems, making education more accessible to everyone [10]. ChatGPT has the potential to aid STEM researchers in analyzing vast quantities of text, including social media posts, by supplying observations and detecting trends in the data. It can also offer automated reference and information services, such as answering frequently asked questions or presenting information about library resources. Furthermore, it has the ability to generate code snippets in a variety of programming languages like Python, Java, C++, JavaScript, among others.

Tanya Tsui, a blogger, posted about her experience with ChatGPT generating code snippets at her command. "As someone who spends most of her working hours coding, having a chat bot write code for me sounds both incredibly exciting (think of all the hours I could save!) and a little bit scary (does this mean I'll be out of a job in a few years?)" is what she stated in the beginning [11]. For this insight, she requested the chatbot to perform a familiar task of converting a polygon into a grid of cells, which would make it easier to aggregate statistics. Upon receiving the request, the chatbot suggested using gpd.gridify(), a geopandas attribute that the user was not familiar with. The user was initially impressed with the suggestion, but when she attempted to execute the code, she discovered that the suggested module did not have the mentioned attribute. In other words, the chatbot suggested using a tool that seemed useful, but unfortunately, it did not exist. Fig.1 represents the output Tanya expected when typing her request. However, we can see in Fig.2 the actual output she was provided with. The two figures have nearly nothing in common.

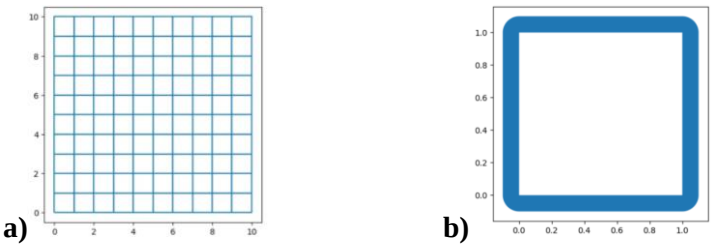

Figure 1. a) The expected output [11]; b) The actual output [11]

After several questions concerning the errors in the actual output, ChatGPT submitted multiple solutions, which, just like before, didn't actually work. By stating her question again but more clearly, she was able to run the simple code generated by the robot and Tanya was satisfied. From her perspective, this brief interaction with ChatGPT reveals two intriguing aspects of the chatbot and, by extension, AI technology. Firstly, it highlights that AI can generate information that may initially appear correct but is, in fact, inaccurate upon further scrutiny. For example, AI-generated images of human faces may appear realistic, but closer examination may reveal unusual abnormalities. Secondly, the goal of ChatGPT is not necessarily to provide accurate information, but rather to simulate what appears to be accurate information. According to the ChatGPT FAQ page, the model is designed to imitate human language as closely as possible, rather than providing us with factual truth [12].

Although ChatGPT can provide several advantages for students, there are a few obstacles that AI language models may face. These include the potential for plagiarism and overreliance on the tool. While these systems are created to generate essays and responses to various problems based on a set of guidelines, relying exclusively on the answers provided by AI chats contradicts the very essence of higher education, which is to challenge and educate students, and could result in a depreciation of academic degrees [13]. Overreliance on AI language models could ultimately result in a reduction in the value of academic degrees and people not being able to think on their own.

Conclusions

In conclusion, AI language models don't pose a direct threat to programmers and other STEM workers. While they can perform some programming tasks, such as generating code snippets or helping with debugging, or assist in data analysis, simulations, and optimization, they are not a replacement for people's jobs. The expertise and creativity of human professionals, especially in areas that require physical experimentation, design, or interaction with the real world are irreplaceable. In fact, many programming tasks require a deep understanding of algorithms, data structures, software design, and other concepts that are beyond ChatGPT's current capabilities. Moreover, programming often involves creative problem-solving, collaboration, and communication skills, which are also difficult for an AI model to replicate. Instead, we should see it as a tool that can assist programmers in many ways, such as automating repetitive tasks, suggesting improvements to code, or providing information on programming languages and libraries. By working together with programmers, we think such bots can help improve their productivity and effectiveness, rather than threaten their jobs.

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