ISSN (Online) 2456 -1304

International Journal of Science, Engineering and Management (IJSEM)

Vol 11, Issue 12, December 2024

Benefits and Challenges of Large Language Model AI in University Classrooms

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Abstract*— *In today's technological world, the use of Large Language Model artificial intelligence (AI) programs in university classrooms is a foregone conclusion. The goal of this project is to highlight the challenges faced by university educators as they navigate the nebulous pathway between original student work and that of artificial intelligence in their classrooms. A review of recent literature demystifies some of the various examples of Large Language Model AIs and describes their characteristics. Interviews with university instructors and research from online experts outline challenges and benefits of utilizing and recognizing AI in student work. In addition, the paper looks at methods that can help identify AI generated work from that generated by students.

Index Terms*— *Large Language Models (LLM), Artificial Intelligence (AI), ChatGPT, LLaMA, Claude 2.

I. INTRODUCTION

Large Language Models (LLMs) are a specialized subset of artificial intelligence (AI) within the domain of Natural Language Processing (NLP). They are designed to process and generate human-like conversations and texts. The ability to do this is based primarily on machine learning through massive datasets. Although the terms Artificial Intelligence (AI) and Large Language Models (LLMs) are often used interchangeably, LLMs focus specifically on natural language tasks, such as language translation, summarization, and question-answering. AI, however, includes a much broader scope of technologies such as the ability to produce graphics from written descriptions (computer vision), robotics, and decision-making algorithms; LLMs specialize in generating and understanding human language. This makes them especially suited for educational applications [1]. Although there are differences in the specifics of AI and LLM, both researchers and users typically refer to LLMs as AI language models or simply AI.

II. COMMON AI MODELS: STRENGTHS AND WEAKNESSES

In recent years, AI language models have increasingly been finding their way into university classrooms, offering new opportunities for both students and educators. While there is no definitive list of the most frequently used AI by university students, there are some that tend to show up as leaders on most lists. Models that are frequently employed by students include ChatGPT-4, Microsoft Copilot, LLaMA, ChatGPT-3, and Claude 2. Each has characteristics that make it desirable to both students and educators, but each has its own strengths and weaknesses.

A. ChatGPT-4:

Known for its conversational capabilities, ChatGPT-4 maintains better context and provides more accurate and comprehensive responses than its earlier versions. It is very effective at assisting with tasks that require in-depth analysis and multi-turn conversations [2]. In spite of its well-established capabilities, ChatGPT-4 can still produce incorrect information with an air of confidence, leading students to trust inaccurate information. If a university were to consider implementing ChatGPT-4 site-wide to support academic research or to provide automated services, it would be resource-intensive and costly [2].

B. Microsoft Copilot:

Copilot is designed to seamlessly integrate with Microsoft Office products such as MS Word and Excel. It can assist with productivity tasks such as drafting documents, analyzing data, merging separate parts of a research report, and formatting assignments. This makes it highly effective for students managing large workloads [3]. However, Copilot's usefulness is limited outside of Microsoft, which limits its versatility compared to more general-purpose language models like ChatGPT-4 [4].

C. LLaMA:

Because it is open source, LLaMA is customizable, allowing users to modify it to meet their specific needs. It is particularly suitable for academic research in situations where fewer resource are available. It works well in places where computing power, memory, and storage are more limited. It is designed with efficiency in mind with fast response times [5]. However, LLaMA lacks the conversational and writing capabilitie of ChatGPT-4, making it less effective in general educational settings that require in-depth research and computational ability [6].

ISSN (Online) 2456 -1304
International Journal of Science, Engineering and Management (IJSEM)
Vol 11, Issue 12, December 2024

D. ChatGPT-3:

ChatGPT-3 is an earlier model of ChatGPT-4. It is more accessible in terms of computational cost and is still highly capable for straightforward academic tasks like basic research, creating detailed outlines for papers, summarizing research, and answering factual questions [7]. A recurrent limitation of ChatGPT-3 is its decreased ability to retain context over long conversations, resulting in less accuracy for in-depth academic pursuits [8].

E. Claude 2:

Claude 2 is designed with safety and ethical considerations in mind. It was designed to minimize risks related to bias, misinformation, and harmful outputs. Claude 2 is touted as safe and aligned with human values. It excels in handling ethical and philosophical topics [9]. While its popularity is on the rise, Claude 2 is a newer model and is less widely adopted, which limits its user base. Compared to more well-established natural language models, it tends to lag behind in some technical areas such as content generation and speed of reply. It has also been criticized for being overly cautious as a trade-off for additional safety [10].

All these tools have been lauded for their accessibility and potential to augment learning, but, like all new technologies, they also raise concerns related to academic integrity, over-reliance, and equitable availability.

III. BENEFITS OF AI LANGUAGE MODELS

The inclusion of AI in university settings presents numerous advantages. First, they can act as personalized tutors, providing students with instant feedback and explanations on complex subjects, thereby enabling a more individualized learning experience [11]. This capability is particularly valuable in large classes where interaction with professors is limited. In addition, AI can assist with research by quickly summarizing academic papers, generating literature reviews, and drafting portions of academic texts. This ability allows students greater opportunity to focus on critical thinking and analysis [12]. The use of natural language models in collaborative tools, such as Microsoft Copilot, allows students to work more efficiently by merging tasks from different areas of the Microsoft suite into a single document [13].

Another significant benefit of AI is its capacity to promote inclusivity. Students who may require additional learning support, such as non-native language speakers or individuals with learning disabilities, can benefit greatly from AI tools which can simplify language, translate content, and offer multiple ways to explain concepts. These features can create a more inclusive learning environment by offering support for individual student needs. These benefits suggest that there is significant potential for enhancing the educational experience when used AI is used responsibly.

IV. CHALLENGES OF AI LANGUAGE MODELS

Despite the numerous well-known advantages, the use of AI in university classrooms also presents challenges. One of the primary concerns is the potential for academic dishonesty. Tools like ChatGPT-4 and Microsoft Copilot can generate essays, code, and solutions to problems, which could tempt students to submit AI-generated content as their own work [14]. This raises ethical questions about the role of AI in education and the importance of maintaining academic integrity.

There is valid concern that reliance on AI to generate assignments can inhibit critical thinking and problem-solving skills among students. Students may become overly dependent on AI to perform tasks that would otherwise require cognitive effort, diminishing their ability to think critically and creatively [15]. This concern is particularly notable in fields such as mathematics and computer science, where the process of problem-solving is as important as the solution itself. There are also concerns regarding potential bias and limitations of all language models, as they are trained on vast datasets that may contain biased information, potentially promoting stereotypes and misinformation [16].

In addition, heavy reliance on AI raises significant data privacy and security concerns. Students' personal information, along with their academic work, could be exposed to third parties, making it essential for institutions to establish stringent data privacy protocols. Addressing all these challenges requires a careful approach to the use of AI in educational settings, including the establishment of clear guidelines, the use of AI detectors to uphold academic standards, and appropriate safeguards to protect personal information.

V. AI DETECTORS

To address the risks associated with AI-generated content, many universities have adopted AI detectors such as Turnitin, GPTZero, and OpenAI's AI Detection Tool. These tools help educators differentiate between student-generated and AI-generated work [17].

A. Turnitin Strengths and Weaknesses:

Turnitin was originally designed to detect plagiarism but has grown to identify AI-generated text by analyzing writing patterns, syntax, and style consistency [18]. Turnitin's extensive database and ability to analyze text make it highly effective in detecting AI-generated content in addition to plagiarism [18]. However, like all AI detectors, it can at times produce false positives, especially if students use formal, structured writing styles that resemble AI outputs. Turnitin's high cost can be a barrier for smaller institutions.

B. GPTZero Strengths and Weaknesses:

GPTZero was specifically designed to detect text generated by language models like GPT-3 and GPT-4, making it particularly effective in identifying AI-generated

ISSN (Online) 2456 -1304
International Journal of Science, Engineering and Management (IJSEM)
Vol 11, Issue 12, December 2024

content in academic work [19]. However, GPTZero struggles to detect content that has been heavily edited, limiting its reliability in some cases.

C. OpenAI's AI Detection Tool Strengths and Weaknesses:

This detection tool, created by OpenAI, is tailored specifically to identify text generated by its own models. It offers a high degree of accuracy in detecting content from GPT models [20]. However, it is limited to identifying content generated by OpenAI models, making it less effective for detecting AI-generated content from other systems like LLaMA or Claude 2.

These tools are useful but not foolproof and can sometimes produce false positives, leading to concerns about the fairness and accuracy of AI detection in academic assessments [21]. As the use of AI continues to grow, more sophisticated and reliable detection tools will need to be developed.

VI. TYPES OF QUESTIONS

One of the fundamental capabilities of an AI is its ability to process enormous amounts of data and extract meaningful insights to answer questions and solve problems. However, the effectiveness of AI in addressing different types of questions varies depending on factors such as the nature of the question and the available data on the topic. Some types of questions are very easy for AI to respond to, while other types are often beyond their ability to provide more than superficial answers.

A. Types of Questions AI is Best at Answering:

AI is particularly strong at addressing questions that involve structured data and well-defined problem domains. Some of the types of questions that AI excels at answering include:

Fact-Based Questions: AI systems equipped with natural language models can efficiently retrieve factual information from both databases and textual sources. Even virtual assistants like Siri, Alexa, and Google Assistant can answer questions about historical events, geographical locations, and scientific facts [22].

Predictive Questions: Machine learning enables AI systems to analyze historical data patterns and make predictions about future events or outcomes. In fields such as finance, marketing, and healthcare, predictive analytics powered by AI helps organizations forecast trends, identify potential risks, and optimize decision-making processes [23].

Diagnostic Questions: AI-driven diagnostic systems use pattern recognition and expert knowledge bases to identify anomalies, detect problems, and recommend appropriate actions [24].

B Types of Questions AI Struggles With:

AI language models, however, cannot respond equally well to all types of questions. These are types of questions which are more difficult for AI to answer.

Open-Ended Questions: All large language models often struggle to generate meaningful responses to open-ended questions that require creative thinking, subjective judgment, or human-level reasoning. Understanding humor, sarcasm, metaphors, and cultural references presents difficult challenges for AI systems [25].

Contextual Understanding: AI language models may encounter difficulties in understanding and interpreting questions within the appropriate context, especially in ambiguous or contextually rich scenarios. Resolving problems with semantic ambiguity and capturing subtle nuances of human language remains active areas of research [26].

VII. INSTRUCTORS CAN DETECT AI

Tools like ChatGPT and other AI language models can assist students, but relying too heavily on AI can be detrimental to producing original work. Educators need effective methods to distinguish between human-authored and AI-generated content, and while AI detectors can help, they are not always immediately available for educator use [28]. Classroom teachers can employ a variety of detection methods to identify AI-generated work, including:

Inconsistencies in Writing Style: AI-generated texts tend to exhibit a formal, polished style but lack the nuance of a student's individual writing voice. Educators can compare a student's previous work to a new submission to identify unexplained improvements or changes in writing style [29].

Unexplained Advanced Vocabulary or Concepts: Sudden changes to advanced vocabulary or uncharacteristic explanations of complex concepts may indicate AI use, especially if the same depth of understanding is not evident during discussions or exams [30].

Overly Formal Structure: AI-generated essays often follow a rigid structure with highly formal language. This mechanical approach can be identified when students consistently produce flawless, highly formal writing that lacks personal insight or creativity [31].

Detection of Specific Phrase Patterns: AI tools like ChatGPT tend to repeat certain phrases or sentence structures. Educators familiar with AI-generated work can often identify repetitive patterns, particularly in longer documents [32].

Fact-Checking for Incorrect Information: AI can sometimes include factual errors or provide information that sounds reasonable but is incorrect. Cross-referencing facts in students' work with reliable sources can help show the presence of AI work [33].

Use of Contextual Clues and Tasks: Assigning in-class tasks where students must present or explain their written work can show discrepancies in their understanding. If a student struggles to explain content presented in their written assignment, this could indicate AI usage [34].

Noting Unusual Submission Times: AI language models allow students to quickly generate long essays or projects. Noticing the time spent to complete assignments can provide clues; for example, if a student submits complicated work on a difficult topic unusually fast, AI-generated content may be involved [35].

Peer Review Comparisons: Incorporating peer review sessions into the classroom allows students to compare each other's work. Unusually polished or consistent essays compared to those of peers could stand out, leveraging peer insight to spot irregularities [36].

Randomized Questioning and Rewriting Exercises: Asking students to answer random follow-up questions or rewrite parts of their essays can help assess their true understanding. If a student struggles to reproduce or explain content in their own words, it could be an indicator of AI use [37].

While AI detection tools are generally favored to ensure academic integrity, educators can employ numerous methods in their classrooms. Many of these are already used by educators for daily assignments.

VIII. CONCLUSION

The use of AI language models in university classrooms presents both significant opportunities and considerable challenges. Tools such as ChatGPT-4, Microsoft Copilot, LLaMA, ChatGPT-3, and Claude 2 have demonstrated their potential to enhance personalized learning, improve productivity, and increase accessibility for diverse student populations. These models can support students in tasks ranging from drafting essays to conducting research, while enabling educators to focus more on higher-order teaching and interaction. However, an increased reliance on AI also raises concerns about academic integrity, over-reliance on AI, and potential declines in critical thinking skills. As AI-generated content becomes more prevalent, the role of detection tools such as Turnitin, GPTZero, and OpenAI's detection tool will be crucial in maintaining the integrity of academic assessments.

Universities will need to adopt thoughtful policies that balance the benefits of AI with the ethical challenges that accompany them. This includes clear guidelines for AI language model usage in academic work, investments in quality detection technologies, and an emphasis on educating students about the responsible use of AI tools. As large language models become more sophisticated, so too must detection systems evolve and grow. With appropriate safeguards, AI has the potential to greatly improve the educational experience, providing a richer and more inclusive learning environment. Realizing this potential will require continuous dialogue between educators, technologists, and policymakers to ensure these powerful tools are used responsibly and effectively.

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