ChatGPT promotes healthcare: current applications and potential challenges

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Dear Editor,

The Chat Generative Pre-trained Transformer (ChatGPT) is a language model designed to engage with users in a conversational manner, resembling human communication. As a large language model (LLM), ChatGPT possesses extensive language understanding and generation capabilities. Through extensive pre-training and fine-tuning with vast amounts of internet text, the model can generate accurate and coherent responses across various domains and topics. Moreover, ChatGPT can handle diverse inputs and produce realistic human-like responses.

To gain insights into the potential applications of ChatGPT, we conducted a literature search using the Web of Science up to 23 August 2023, yielding 1044 records related to ChatGPT. By performing keyword cluster analysis on keywords that appeared more than three times, we categorized the relevant themes into seven clusters (Fig. 1). The results highlight various applications of ChatGPT, such as scientific research, scientific writing, health care education, and medical consultation[1]. It accelerates scientific research and academic writing by efficiently accessing and summarizing medical literature. A recent study investigating the impact of ChatGPT on mid-level professional writing tasks has revealed significant achievements in terms of efficiency, quality, and satisfaction[2]. The integration of LLMs in medical education has the potential to revolutionize how students acquire knowledge about biomedical sciences. As a virtual tutor, ChatGPT provides students with immediate access to medical information and explanations. ChatGPT also holds great potential in automating the delivery of accurate healthcare information pertaining to disease prevention and screening. By integrating and analyzing diverse medical data, ChatGPT assists healthcare professionals in

diagnosing diseases and providing treatment advice. LLMs are able to generate relevant differential diagnoses based on specific imaging patterns, highlighting their potential for supporting decision-making in diagnostic radiology. In terms of treatment advice, the majority of answers provided by ChatGPT-4 regarding common vitreoretinal procedures are appropriate and easily understandable.

The medical field contains diverse data types, including images, audio, text, and genomics, making multimodal learning a pivotal approach to integrate and apply these data modalities in clinical settings. A potential trend for the future lies in Natural Language Processing methods that incorporate clinical informatics, bioinformatics, and medical imaging. Advancements and further applications of LLMs can potentially lead to personalized medicine, enabling the model to offer individualized and more effective treatment recommendations according to patient-level data. Digital health leverages digital technology to improve the quality and efficiency of healthcare services. Recent advancements have opened new opportunities. A health system-scale language model NYUTron[3] achieved high accuracy on five different clinical and operational prediction tasks. BiomedGPT[4], a unified and generalist Biomedical Generative. Pre-trained Transformer model, offers comprehensive and inclusive representations of biomedical data. Med-PaLM[5], answers consumer medical queries with remarkable performance. Google has preliminarily developed a large multimodal generative model *Med-PaLM M* that flexibly encodes and interprets biomedical data with the same set of model weights, including clinical language, imaging, and genomics. It has demonstrated excellent performance in multiple tasks, including (visual) question answering, report summarization, report generation, and medical image classification. As an artificial intelligence (AI) technology, LLMs like ChatGPT can be integrated with digital health to provide more intelligent and efficient healthcare services.

However, it is essential to recognize and address the challenges associated with establishing a universal multimodal medical model. In addition to addressing concerns raised within the academic community regarding the promotion of ChatGPT, it is essential to consider the ethical dilemmas it brings forth. These concerns primarily revolve around ethics, authorship, transparency, trust, and plagiarism. By conscientiously addressing these issues, we can promote the benefits of the model while upholding academic integrity.

Given the unequal distribution of medical resources, variations in disease treatment options across regions are expected. Therefore, a general medical AI model should take this aspect into account. Accuracy is of paramount importance in medical and other professional scenarios, as a wrong

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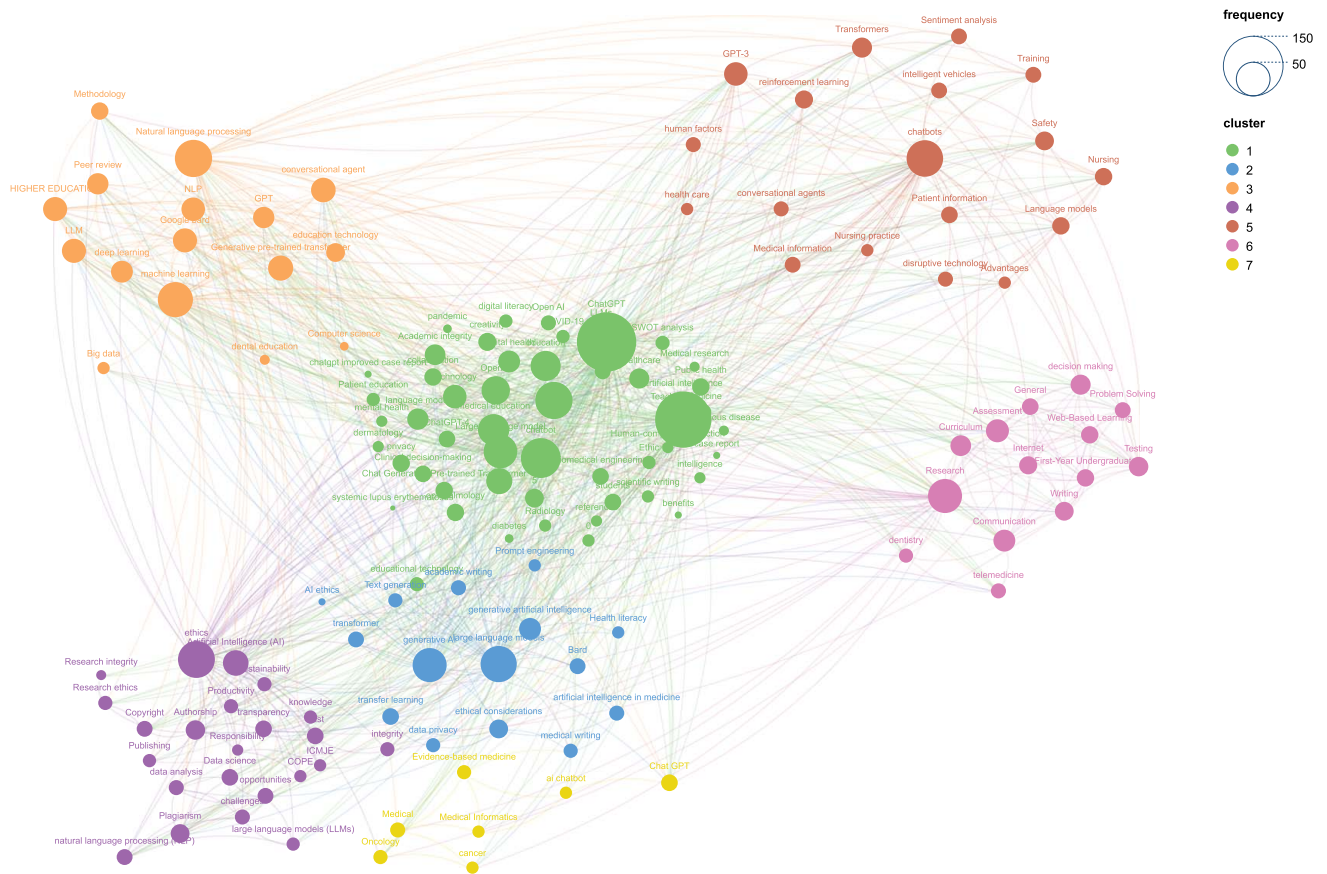
Figure 1. Map of keyword clustering showed keywords with a minimum of three occurrences and divided into seven clusters. The large icon indicates the keywords that appeared at a high frequency.

answer can have severe consequences, including accidents. One major challenge of utilizing large deep learning models like ChatGPT is the lack of explainability, making it difficult to understand how the model arrives at specific answers, potentially posing risks in medical applications. Consequently, in clinical settings, data privacy and security concerns related to sensitive patient information must be carefully addressed to ensure patient confidentiality and safety. Establishing relevant ethical guidelines and regulations is critical to ensuring the safe, responsible, and ethical use of ChatGPT's expanding applications in our life.

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References

[1] Tan Z, He Q, Feng S. The collision of ChatGPT and traditional medicine: perspective from bibliometric analysis. Int J Surg 2023; Epub ahead of print. doi:10.1097/JS9.0000000000000662

[2] Noy S, Zhang W. Experimental evidence on the productivity effects of generative artificial intelligence. Science 2023;381:187–92.

[3] Jiang LY, Liu XC, Nejatian NP, *et al*. Health system-scale language models are all-purpose prediction engines. Nature 2023;619:357–62.

[4] Zhang K, Yu J, Yan Z, *et al*. BiomedGPT: a unified and generalist Biomedical Generative Pre-trained Transformer for vision, language, and multimodal tasks, 2023 Published online May 26. doi:10.48550/arXiv.2305.17100

[5] Singhal K, Azizi S, Tu T, *et al*. Large language models encode clinical knowledge. Nature 2023;620:172–80.