



Editorial

From Artificial intelligence (AI) to Artificial General Intelligence (AGI) – the road ahead



Artificial intelligence (AI), which we are familiar with and use daily, in tools like ChatGPT, is now categorized as narrow AI. The evolution of AI with the help of machine learning (ML) and deep learning (DL), along with reinforcement learning and natural language processing (NLP), to address specific problems is quite interesting. Traditional AI, or rule-based AI, does not learn from past experiences but relies on specific algorithms to solve problems based on pre-defined rules. When ML and DL were incorporated, AI systems could adapt and learn, either supervised or unsupervised, from datasets exposed to them. AI incorporated reinforcement learning and used trial and error through feedback from its actions and experiences to determine what is best for a given situation.

NLP and large language models (LLMs), the terms often used interchangeably, are considered the formative steps in generative AI or Artificial Generative Intelligence, wherein machines can understand and generate new text, videos, images, music, and even audio at the human-like level and that too at an unprecedented scale. After releasing their advanced LLM, OpenAI's o1 system, on September 23, 2024, Sam Altman, the chief executive of OpenAI, stated, "We may have superintelligence in a few thousand days; it may take longer, but I'm confident that we'll get there" [1]. This has largely renewed the interest among all major companies in Artificial General Intelligence (AGI), which has been held only as a theoretical concept until now. Within two months, on December 20, 2024, Open AI released the latest and most advanced version, o3, along with its cost-efficient sibling, o3 mini.

AGI can be loosely defined as "AI systems that possess a reasonable degree of self-understanding and autonomous self-control, and have the ability to solve a variety of complex problems in a variety of contexts, and to learn to solve new problems that they didn't know about at the time of their creation" [2]. Goertzel summarized high-level approaches that researchers followed in the field of AGI into – symbolic (as symbolic thought is the crux of human intelligence), emergentist (as the human brain is a set of neurons capable of self-organizing in reaction to experiences in the human body), hybrid (see the human brain as a hybrid system in which many parts and principles work together to create something synergistically) and universalist (takes into consideration the mathematical essence of general intelligence) [3]. At the launch of Open AI o3, the frontier AI model developed to offer advanced reasoning and intelligence, the CEO, Sam Altman, said that these models could do more complex tasks that require much reasoning. o3 can solve challenging problems in coding, general intelligence, and maths.

Abstract and Reasoning Corpus for Artificial General Intelligence (ARC-AGI) published by Francois Chollet in 2019 is the test used to measure the efficiency of AI skill acquisition on unknown tasks [4]. In December 2024, Open AI's o3 scored 85% on the ARC-AGI benchmark, well above the 55% scored by any other AI program previously. Similarly, o3 also excelled in mathematical reasoning with a score of 96.7% compared to o1's 83.3% in the recent Artificial Intelligence in Medicine (AMIE) conference in 2024. Also, in GPQA (Graduate-level Google-Proof Q & A Benchmark), which measures PhD level science questions, o3 achieved an accuracy of 87.7%. These are considered on par with the human average score and indicate that it can solve challenging mathematical problems on its own [5]. Francois Chollet says, "o3 searches through different 'chains of thought' describing steps to solve the task and then choose the best according to some loosely defined rule or heuristic."

However, with these enormous capabilities of AI systems come significant risks and threats to human life. As AI systems become more powerful and intuitive, they pose the risk of misuse or can be used for unsafe interactions. Open AI has proactively adopted a safety strategy using 'deliberative alignment,' which goes beyond traditional safety approaches. This approach enables AI systems to evaluate user prompts with built-in rules, ensuring decisions align with human safety and ethical standards. Some of the key features of this safety strategy include proactive safety measures (rejecting harmful or illegal prompts), reducing unsafe responses (curbing frequency of unsafe outputs using pre-defined guidelines), and synthetic data training (reducing latency and making a faster training process, which is effective).

The stimulus of this editorial is one patient referral made by ChatGPT to my dental office with a temporomandibular joint problem. Conversing with him, I could infer that he is well informed about the whole issue, and the AI system has provided him with a detailed flowchart on how to approach the problem, right from consulting appropriate physicians and surgeons to the diet restrictions that should be followed along with home-care instructions. As AI systems develop to their full potential, are we moving towards what Stephen Hawking warned us in 2014 through an interview with the British Broadcasting Corporation – "The development of full artificial intelligence could spell the end of the human race. It would take off its own and redesign itself at an ever-increasing rate. Limited by slow evolution, humans couldn't compete or would be superseded."

As we travel from AI to AGI, we explore new possibilities and challenge our understanding of intelligence. As aligner software has taken away a much more significant portion of our treatment planning strategies, future AGI assistants might be able to help us with patient management and treatment procedures. This might reduce the role of operators and assistants altogether, all through connecting at the 'human' level itself. Let time decide what's in the basket for us, the orthodontists.

Vinod Krishnan
Editor-in-Chief

E-mail address: editorjwfo@wfo.org

References

- [1] From the website - <https://ia.samaltman.com/> - Accessed 07.01.2025
- [2] From the website - <https://www.investopedia.com/artificial-general-intelligence-7563858> - Accessed 07.01.2025
- [3] Goertzel B. Artificial general intelligence: concept, state of the art, and future prospects. *Journal of Artificial General Intelligence* 2014;5(1):1.
- [4] Chollet F. On the measure of intelligence. arXiv preprint arXiv:1911.01547. 2019 Nov 5.
- [5] From the website - <https://www.downtoearth.org.in/science-technology/an-ai-system-has-reached-human-level-on-a-test-for-general-intelligence-heres-what-that-means> - Accessed - 07.01.2025