

AI's Recent History

The Skinny on AI for Education, July 2023

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The Skinny on AI: What is ChatGPT and why does it matter to education? What might AI bring us in the future?

What's all the fuss about? AI in education is not new. A wide range of technology that applies AI has been used in Education for many years – see for example: Carnegie Learning, Alelo, Duolingo, all of which were created by academics who know a thing or two about teaching and learning. However when ChatGPT was released on November 30, 2022 it represented a watershed moment, because it made sophisticated AI technology freely available through an easy to use interface to millions of people - 1 million users in just 5 days and 100 million users in 2 months.

What is ChatGPT? ChatGPT is a chatbot created by a company called OpenAI that uses AI to generate text based answers in response to text based requests, also known as prompts. It is a form of AI called Generative AI (GenAI). Other examples of GenAI include DALL-E that can create new images from a textual description. ChatGPT is extremely useful, but it is important to remember that it is not intelligent in the same way as humans. ChatGPT has no understanding or knowledge. It merely collates bits of words together based on statistical probabilities to produce useful texts of all types and styles. It is an incredibly useful tool. But it is not knowledgeable or wise and has no concept of how any of the words that it produces relate to the real world. ChatGPT can be used through a web interface and the technology behind ChatGPT has been made available to other companies who can use it to build a range of products, for example Khanmigo. The technology will be integrated into other products, such as Microsoft Word and has already been integrated with search in the form of Bard.

Why is ChatGPT relevant to education? ChatGPT and other Large Language Models can produce content for teaching activities, textbooks, and a whole range of learning resources. It can provide personalized learning experiences by asking and answering individualised questions, providing explanations, and offering guidance tailored to each student's needs and pace of learning. It can help 24/7, helping students with additional explanations and practice problem-solving. It can offer conversational and vocabulary practice with instant feedback for language learning. ChatGPT can also assist students and teachers by summarizing texts, conducting research, and retrieving relevant information on various topics exploring different perspectives and ideas. However, it is not perfect and frequently fabricates information that simply is not true. It may produce biased answers which are grounded in information that has not been verified. It will claim that it knows things that it does not. For all these reasons, it requires constant human oversight. In addition, the information that is used to prompt an AI like ChatGPT is not secure and no private or personal information should be entered as part of a request for information.

Key Takeaway: *This technology is here to stay, it has significant implications for education and it is important that everyone involved in education engages with learning about the basics of AI.*

Notes for the future: Faster AI product development: If you read the extra explanation about ChatGPT at the end of this newsletter, you will see that ChatGPT stands for "Conversational Generative Pre-Training Transformer." The words Pre-trained transformer are important. Before these pre-trained models existed, people developing machine learning AI products would need to label millions of examples that would be used to train their machine learning algorithms. This labelling took a lot of

time and a lot of people (you can read a fascinating article about this process from The Verge). When labelling is no longer necessary the creation of new AI products becomes much faster - and so you can expect to see a lot more AI products arriving on the market and many of them are likely to be aimed at education.

Reading the brain: Researchers at the University of Osaka developed a new method to recreate visual experiences based on brain activity. This approach helps us understand how the brain perceives the world and as an educator, I find such advances extremely exciting. The researchers were able to use AI to reconstruct the images that had been viewed by 4 people from the scans of these people's brains that were taken while they were looking at the images. Obviously, this is cutting edge research and not yet a product. It also brings with it a lot of ethical questions, but imagine the potential of AI when you start to think beyond the constraints of ChatGPT!

Regulation and Ethics: The EU approach and what is happening elsewhere from the US to Australia

The EU AI Act: The European Parliament passed its version of the Artificial Intelligence (AI) Act, which sets the stage for the final debate on the bill between the European Commission, Council, and Parliament, which they hope to finish by the end of 2023. The Artificial Intelligence (AI) Act aims to impose stricter regulations on the use and development of AI. The proposed act aims to enhance rules regarding data quality, transparency, human oversight, and accountability in various sectors such as healthcare, education, finance, and energy. Important amendments were made in June 2023, including a ban on biometric surveillance and a requirement for generative AI systems to disclose AI-generated content.

However, more than 150 executives from European companies have expressed concerns in an open letter, stating that the draft legislation could harm Europe's competitiveness and technological sovereignty. They argue that the proposed regulations do not effectively address the challenges faced by businesses in the EU.

Australia: Australia is taking steps to establish a regulatory framework for artificial intelligence (AI). The government is conducting a comprehensive review of AI, focusing on high-risk areas like facial recognition, with the aim of shaping new regulations. The Department of Industry, Science and Resources has released a discussion paper called "Safe and Responsible AI in Australia" to gather feedback and propose a risk management framework. The government is seeking input from various stakeholders to strengthen governance settings in response to rapid digital development.. The government recognizes that a combination of measures will likely be incorporated into the final regulatory framework. This initiative aligns with the global trend of recognizing the need for AI regulation to address ethical concerns and promote responsible AI practices.

United States of America: Senate Majority Leader Chuck Schumer is also keen on educating people about AI and has introduced a bipartisan proposal for AI legislation. Schumer recognizes the challenges of AI, such as job displacement and misinformation, but also highlights its benefits. The proposal includes the SAFE Innovation Framework for AI Policy, focusing on security, accountability, foundations, explainability, and innovation. Schumer also calls for a new legislative process, featuring AI Insight Forums to discuss key issues. Bipartisanship is emphasized, with four senators from both parties leading the effort. Schumer acknowledges the ambitious nature of regulating AI and the need for balance. Final legislation is expected in months, and this issue remains a priority for Congress.

United Nations: The debate about the challenges arising from the development of frontier technologies, such as artificial intelligence, is not new. The United Nations in its Session 34 Report highlighted the risks and recognized that the actors introducing these technologies are not states and have not demonstrated their ability to regulate or protect citizens from their negative impacts. The lack of regulatory measures and ethical provisions by the companies developing these technologies has given rise to social engineering tactics and threats to social and global security, such as voice imitation and deep fakes. (read more here: <https://observatory.tec.mx/edu-news/beyond-chatgpt-toward-regulating-artificial-intelligence/>)

UNESCO: In November 2021, UNESCO published its first Recommendation on the Ethics of Artificial Intelligence, aiming to align international efforts in the development of AI. The recommendation, adopted by 193 member countries, provides tools for public decision-makers to evaluate their capacity to implement AI in public policy and assess the impacts of AI systems through ethical impact assessments. With respect to education, there is a strong emphasis on providing AI literacy education to the general public, promoting the acquisition of skills for AI education, raising awareness about AI developments, and promoting research initiatives on responsible and ethical AI use in education and online teaching. However, while the recommendation outlines these goals, it does not provide specific guidance on the next steps educational systems and institutions should take to implement them.

Policy and Debate: Calls for evidence, University AI literacy principles and a UK taskforce

The UK Department of Education: The DfE has issued a call for evidence on the use of generative artificial intelligence (AI) in education. They have opened an online survey where teachers, headteachers, governors, school support staff, and various other education stakeholders can provide their input. The consultation period closes on August 23, 2023.

The Russell Group: The Russell Group of 24 UK universities has established a set of principles to ensure that students and staff are equipped with AI literacy skills and can effectively utilize the opportunities offered by technological advancements in teaching and learning. The five principles include supporting students and staff in becoming AI-literate, equipping staff to assist students in effectively using generative AI tools, integrating the ethical use of generative AI into teaching and assessment, upholding academic rigor and integrity, and fostering collaborative sharing of best practices as AI technology evolves in education.

UK Government: The UK government created an AI taskforce to look at foundation models after calls were made for a sovereign UK large language model. Foundation models are at the heart of ChatGPT and other GenAI applications. They are sophisticated computer programs that are trained on vast amounts of data to understand and generate human-like text. The model learns by analysing patterns and relationships in the data it is trained on. The more it learns, the better it becomes at understanding and generating coherent and relevant responses.

News: The battle for AI regulation and the importance of teachers in the classroom

The battle for regulation of AI: This fight has only just begun and will unfold over the coming months with areas of legislation not necessarily considered directly education focussed likely to have an impact on safer AI for education. OpenAI – the maker of ChatGPT is sued in the US over allegedly ‘scraping’ data without users’ consent to train its models. The claimants state that this constitutes copyright infringement, and invasion of privacy.

Sam Altman’s change of heart: Beware ‘turkeys voting for Christmas’. Sam Altman may have publicly called for AI regulation, but in 2022, OpenAI, along with Microsoft and Google, opposed classifying their general purpose AI systems as “high risk” under the proposed AI Act. They argued that stringent legal requirements should apply to companies using AI for high-risk applications, rather than those building general AI systems like GPT-3 and Dall-E 2.

Professor Stuart Russell’s comments about the end of traditional classroom teaching: Prof Russell, an expert in AI, believes that personalized AI tutors, like ChatGPT, have the potential to revolutionize education by delivering tailored instruction to every household with a smartphone. Such comments are worrying, because they suggest that an AI that understands and knows nothing, but is good at stringing together bits and pieces of words into a coherent, although often inaccurate, whole are suitable replacements for teachers. These comments also very much miss judge the richness of the human interactions that make up the teaching and learning process. Certainly, AI can augment a human teacher and can even become their superpower, but AI is not capable of the repertoire of human interaction that is fundamental to teaching. Russell refers to studies indicating that one-on-one teaching is significantly more effective than traditional classroom learning, and I can only assume that he is referring to studies

of human one to one teaching, which of course is the gold standard. AI tutoring systems, have been shown to have the potential to be effective in improving students' learning, although the results across the board are somewhat mixed and are only comparable when the AI individualised tutor is compared to a human teacher teaching a whole class. So, there is a long way to go before AI tutors can reproduce the quality human teaching interactions, let alone the vital social interactions that are the bedrock of society. To be fair Prof Russell does believe that human involvement will remain essential, and that controlling AI systems remains a significant challenge, points with which we agree wholeheartedly. But don't expect teachers to be replaced by bots any time soon!

Further Reading: Discover more about the technology behind ChatGPT and AI in Education more generally

What is the technology behind ChatGPT? ChatGPT is a form of Generative Artificial Intelligence (GenAI) called a Large Language Model (LLM). Large Language Models (LLMs) use deep neural networks (DNNs), which are machine learning technologies designed to recognize patterns in data, learn from these patterns, and make predictions or decisions based on these patterns. Neural networks become more powerful and accurate at identifying patterns when they are deeper and have many layers, so the fact that ChatGPT uses a deep neural network is important. The word "ChatGPT" is an acronym that stands for "Conversational Generative Pre-Training Transformer." The term "Generative" signifies that the AI that can generate new text as opposed to copying or transcribing. The term "Pre-Trained" indicates that the AI has been exposed to huge amounts of data examples from which it learns or is trained. This training enables faster and more accurate results compared to starting from scratch for each user request. The word "Transformer" refers to the machine learning architecture being used. Transformer models emerged as a significant breakthrough in 2018. This architecture enables ChatGPT to process sequences of words or tokens (parts of words) and learn the relationships between them. The key innovation of the transformer model is the 'attention mechanism', which allows the model to focus on different parts of the input sequence when making predictions. For example, as humans when reading we may come across a word, we find difficult to understand and as a result we might go back and read the sentence again, or even the entire paragraph again, to better understand the context of the word. This is similar to the way a transformer model works: it attempts to "read" the context of the words by paying attention to different parts of the input sequence.

In terms of the GenAI tools that are available, the situation is evolving. Microsoft, in its quest to dethrone Google, has embedded ChatGPT within Bing Search, with further plans to integrate the technology into Windows applications and chatbot services. Not to be outdone, Google has launched its own AI chatbot, Bard, although it has faced some setbacks due to inaccurate information shared during its debut. META, meanwhile, has embarked on a grand endeavor to explore the integration of AI-powered tools into popular messaging apps, such as WhatsApp, Messenger, and Instagram. In addition, they have created a novel AI language generator, LLaMA, aimed at researchers. Interestingly, in China, where the regulatory environment is more restrictive, tech companies are treading carefully with their AI chatbot plans. While Baidu has launched Ernie Bot and opened it for trial to an initial group of users, Alibaba is working on a ChatGPT-style technology that could be integrated into its cloud computing products. As always, the battle for supremacy in the world of AI continues to unfold, with each company striving to outdo the other in a race to technological dominance.

A wider perspective on AI in Education and reactions from Educators: AI is and has been used in education in several ways, ranging from creating personalized learning experiences to enhancing teacher training and support. One of the most significant uses of AI in education is in creating personalized learning experiences for students. For example, AI-powered systems can analyse student responses to questions and adapt learning materials to meet individual students' needs. These systems can also help teachers identify gaps in students' understanding and provide targeted feedback to help students improve their learning outcomes. There have been a wide range of studies on the effectiveness of adaptive tutoring systems. Overall, adaptive tutoring systems, such as those offered by Carnegie Learning, Century Tech and others have the potential to be effective in improving students' learning, although the results across the board are somewhat mixed. The only clear conclusion is that the effectiveness of adaptive tutoring systems depends on a range of factors, such as the quality of the instructional materials, the design of the system, and the context in which it is used. The popular

language learning app, Duolingo is an example of an adaptive AI system that is used by millions of people and similarly evidence is mainly positive, indicating for example that Duolingo learners improve their reading proficiency in a manner that is comparable with students taking university language courses. An important feature of Duolingo is that it is free and accessible, in a similar manner to ChatGPT.

Another area where AI is being used in education is in enhancing teacher training and support. AI-powered tools, such as TeachFX and Edthena, can provide teachers with real-time feedback on their teaching practices and help them identify areas where they can improve. Additionally, AI can be used to develop and deliver professional development opportunities for teachers, providing them with ongoing support to enhance their teaching skills and practices. TeachFX analyses classroom conversations and provides feedback on things like student engagement, teacher talk time, and wait time. This can help teachers identify areas where they can improve their teaching practices and promote more equitable classroom environments. There is evidence that TeachFX has been positively received and has potential to support teachers to improve their practice. Edthena enables teachers to upload videos of their classroom instruction that are analysed using AI technology. Teachers then receive feedback from instructional coaches in real-time providing teachers with insights into their teaching practices. Studies by universities using Edthena in teacher training have provided encouragement that it can increase the quantity and quality of teaching feedback opportunities.

AI is also being used in education to automate administrative tasks, such as grading and attendance tracking. This can free up teachers' time to focus on teaching and provide them with more opportunities to engage with students and support their learning. For example, tools like Gradescope have been found to save teacher time and target assignments and student study efforts more efficiently.