Generative AI: just a zip file of the web?

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What is generative AI?

Generative AI (GenAI) refers to artificial intelligence (AI) models that can generate new content, including videos, images, text as well as code. GenAI models include ChatGPT but also DALL•E and Bard.

The broad variety of applications, paired with the fact that users do not need to master complex technical skills before using GenAI tools, led to a skyrocketing interest in this technology. It took only roughly two months for ChatGPT to reach 100 million users: a staggering growth compared to the time it took other platforms such as TikTok (nine months) and Instagram (30 months) to reach the same milestone.

How do GenAI models learn?

We humans learn in many ways. We memorize capital cities and multiplication tables. Similarly, we memorize and apply rules, such as that the perimeter of a triangle is the sum of the length of all sides, and that bishops move diagonally on a chess board. On the other hand, another way to distill useful information from our experience is to develop an understanding of what is plausible and what is not. In other words, we learn, consciously and unconsciously, by learning probability distributions. For example, we learn that, on average, men in Switzerland are around 1.80m tall; that a 2m man is a lofty individual, and that we should expect only a limited number of people to match such a height. Unless we're obviously looking at NBA players.

GenAI models also use examples to learn probability distributions. For example, ChatGPT's approach to learning is staggeringly simple: it is a model trained with the sole task of finding the most-likely next word in a sequence. Similarly, GenAI models like DALL-E that translate text prompts into digital images learn what is common across samples and what samples have in common. By extrapolating patterns, they don't have to remember all the individual dogs they have seen to have an idea of what a dog might look like.

Simply put, GenAI is ultimately an algorithm for data compression. By compressing data, GenAI can distill vast knowledge from an incredible amount of data.

What are the limitations of GenAI?

Biases

While compressing data, GenAI might reiterate biases in the data. For example, if the AI has seen lots of examples of white, male doctors, it might build an archetypical picture of doctors that is white and male.

Logical and mathematical reasoning

GenAI models do not memorize abstract mathematical concepts and strictly apply rules but aim to achieve pattern recognition. As a result, models like ChatGPT might sometimes perform trivial mathematics wrong. When engaged in chess playing, GenAI models were found to cheat by performing illegal moves.

GenAI models also struggle with reasoning. ChatGPT is a language model trained to forecast the most likely next word. While logical capabilities surprisingly emerge from this training process, ChatGPT does not (yet) have the ability to formalize a problem and solve it by rigorously applying mathematical concepts and logic the same way as AI specifically designed to prove mathematical theorems and perform symbolic mathematical operations.

Hallucinations and fact checking

Furthermore, there are risks associated with the current inability of GenAI algorithms to distinguish between concepts acquired through data compression (an idea of dog derived from hundreds of dog examples) and memorized concepts (a very specific dog or basketball player).

GenAI is in fact incapable of making a distinction between a book written by Hemingway and a made-up book that mimics Hemingway's prose. This inability leads GenAI to fabricate totally credible people, events and books, and talk about them with confidence. AI experts refer to this as hallucinating. Similarly, GenAI algorithms may just leak examples of text or visual arts that they have memorized, leading to plagiarism. The risk of copyright infringement is very high.

Is GenAI creating something truly new?

GenAI algorithms are often described as algorithms capable of creating new content. If we look at GenAI algorithms as simple data compression algorithms, we can better understand the limitations of their creative process. Ted Chiang from the New Yorker[1] correctly states that ChatGPT is a blurry JPEG[2] of the web, and that "a blurry copy of unoriginal work isn't a good way to create original work".
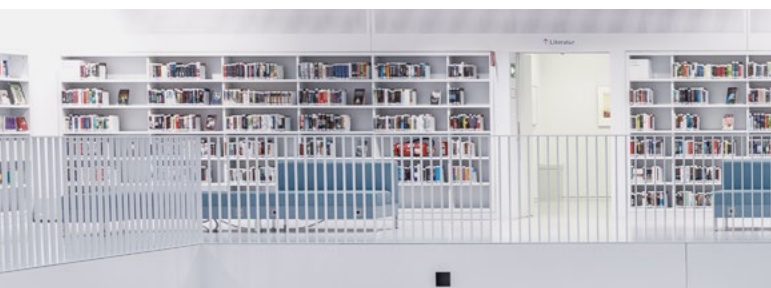
Is your company targeting the right problems with GenAI?

GenAI models can be used in a broad range of applications. It is however crucial to understand the limitations of GenAI and the need to mitigate the risks arising from the use of GenAI algorithms:

- Biases can only be mitigated with the help of subject matter experts who clearly define the requirements on the output of GenAI models. It is particularly important to identify the protected classes for whom fairness should be safeguarded (e.g. gender, race), and how fairness and inclusivity should be measured.
- While GenAI can aid in the review and development of code as well as in finding a solution to logical and technical problems, the correctness of the logical and mathematical reasoning cannot be taken for granted.
- Although GenAI can successfully automate the generation of mundane appointment cancellation emails, the content generated by GenAI systems should always be fact checked. The risk of hallucinations as well as the risk that the algorithms might leak sensitive data or unwillingly reproduce content already present in the training data can only be mitigated by a human in the loop.
- Only experienced creatives and designers can verify whether the content generated by GenAI models is in line with your corporate brand, vision and tone of voice. ChatGPT's communication style, by averaging through examples while trying to forecast the most likely next word in a sequence, might lack personality and bite. Gartner expects that 30% of outbound marketing messages will be developed with the assistance of GenAI. How will you be able to stand out from the crowd if you blindly rely on the output of a GenAI algorithm?

[1] https://www.newyorker.com/tech/annals-of-technology/chatgpt-is-a-blurry-jpeg-of-the-web
[2] Image compression algorithm

every 10-fold improvement[4]. And costs are already astonishing even for organizations with deep pockets: the cost of training AI models is already in the order of several million dollars. It will therefore be extremely important to filter out the hype and work closely with AI experts in the analysis and review of the latest research and developments.

Bulletproof your business model without panicking

Bloomberg Intelligence estimates the GenAI market size to exceed $1.3 trillion over the next decade by growing at a 42% CAGR[3]. Other think tanks and research organizations agree that GenAI adoption will continue growing at a staggering rate. It is therefore the task of senior executives to anticipate disruption in their business model. It might be too late to act only after AI-based products, services and solutions have already been rolled out in your industry. Thanks to the cloud and online viral marketing, AI can be easily scaled to reach and serve million of users in a matter of days.

At the same time, it might not yet be time to panic. Incremental improvements in the accuracy, reliability and creativity of GenAI algorithms will become more and more difficult and expensive. Exponentially more expensive. It has already been noted that marginal improvements in the accuracy of machine learning algorithms might come at a staggering cost: a 10,000-fold increase in computation for

What should the board be asking its management team?

- What areas are at risk of disruption by GenAI?
- How can GenAI be leveraged by our organization?
- How do we ensure the availability of GenAI capabilities and access to talent?
- How do we ensure that the limitations of GenAI are understood?
- How are the risks associated to the use of GenAI mitigated?
- How does your company ensure that GenAI solutions comply with your organization's ethical and moral standards?

[3] https://technode.global/2023/06/07/generative-ai-to-become-a-1-3t-market-by-2032-research-finds/
[4] https://spectrum.ieee.org/deep-learning-computational-cost

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