Generative AI - A Technology With Endless Possibilities.

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Byline: Jayesh Shah

Generative AI is artificial intelligence that focuses on creating new content as opposed to just analysing existing data. It is based on algorithms that enable computers to create content from previously available content. What we have seen so far is the ability of machines to analyse data, find patterns and use them to draw inferences and make predictions. With Generative AI, machines are starting to create new artefacts and they are getting better at it by the day. These algorithms can produce a variety of novel content such as images, video, music, speech, text, software code and product designs.

As per Gartner, Generative AI is expected to change, among other things, digital product development. It will increase the quality, performance, and accessibility of digital products while reducing their time to market. This is among the many commercial benefits of Generative AI, apart from its sheer magical quality. Gartner predicts that

"by 2025, Generative AI will be producing 10 per cent of all data (now it's less than one per cent) with 20 per cent of all test data for consumer-facing use cases.

"by 2025, 30 per cent of outbound messages from large organisations will be synthetically generated.

"by 2025, Generative AI will be used by 50 per cent of drug discovery and development initiatives.

"by 2027, 30 per cent of manufacturers will use Generative AI to enhance their product development effectiveness.

How does it work

Generative AI is a field of machine learning that uses models, both unsupervised and semi-supervised. These algorithms enable computers to use existing text, images, code and audio/video files to create new content by analysing and clustering unlabeled datasets to discover hidden patterns in data without the need for human intervention. To be able to perform these tasks, machines need to be trained on very large volumes of data so they can learn what works and what doesn't. The idea is to enable them to identify and discern patterns which will lead to creation of new content. Different models work in different ways.

As of now, there are two predominant models -

"GANs (Generative Adversarial Network) - used for creation of visual artefacts. GANs were invented by Ian Goodfellow and his colleagues in 2014 at the University of Montreal. Simply put, it is an algorithm that pits two neural networks against each other. The generator network creates fake samples while the discriminator network has to decide whether it is fake or real. Whichever network fails is updated for better results in the future. A GAN is considered successful when it can fool not only the discriminator network with its fake, but also humans. In this case, of course, the discriminator is updated and the fine-tuning process continues.

"Transformer Based models - such as Generative Pre-Trained (GPT) language models, are used to create textual content. Language models are created by collecting a large dataset of existing text that is tokenised into words or phrases. The next step is to train and finetune the algorithm using this data. Finally, the model is tested by generating sample text. As a process, the model is refined continuously until the desired quality of the result is achieved.

ChatGPT is the best-known example of a GPT model that is designed to generate responses to a given input by users. It is like a personal AI assistant. ChatGPT is free to use as of now and can be tried by anyone. One doesn't need to be a techie to do so. The important thing to note is that it is not a search engine and responds to queries in a conversational mode, based on the training it has

received. The figure below denotes its capabilities and limitations.

*Some Use Cases of Generative AI

Image Generation - creation of new, realistic images from a dataset of existing images and or text.

Image-to-image translation - conversion of one image into another, be it style transfer, sketch-to-image or image-to-sketch.

Image & Video resolution enhancement.

Audio/Video Generation - useful for voice overs, new music creation, gameplay, etc.

Text-to-speech - this is done using GANs, wherein the discriminator network functions as a trainer for modulation, intonation, etc.

Text Generation - useful for commercials, news headlines, dialogues, movie sub-titles.

Code Generation - useful in software development to produce code without manual intervention.

Generative AI applications can be beneficial in healthcare, media, education, engineering design. They also have application in the creative field for artists and musicians.

Concerns around the technology

As with any other new technology advancement, there are concerns around the ethical aspect of its usage and the impact that it could create on jobs. Besides this, there is the issue of governance. There is no clear governance model that has emerged and lawmakers around the world are grappling with this issue. Recently, New York City's Department of Education announced a ban on ChatGPT because of fears that it would not only lead to student cheating, but also impede development of critical thinking and problem-solving skills. Then there is the question of copyright and intellectual property violation since new artifacts can be created from old ones without permission and there can be no recourse for the original creators.

Another challenge that will affect day-to-day life is the ability of the technology to generate fake news and disinformation or inappropriate/misleading content. For example, days after the war in Ukraine started, sometime in March 2022, a fake video of President Volodymyr Zelenskyy asking his people to surrender was broadcast. Meta's Galactica, a language model trained on 120 billion parameters from 48 million science articles and supposed to help in accessing scientific information started producing incorrect results often and had to be taken down in three days.

*The Way Forward

Despite the concerns, there is no denying the fact that Generative AI is a game changer and is here to stay. The chart below, from the article - Generative AI: A Creative New World by Sonya Huang and Pat Grady of Sequoia Capital, depicts the timeline for how the technology has progressed up until 2022 and possibilities for 2023 and beyond.

Generative AI is a fascinating technology and given the right direction and backing, it has the potential to do wonders for humankind in ways not even thought of as yet. That said, there is an urgent need for tech companies and policy makers to come together and create a robust governance model that will endure any malicious attempts by rogue elements. The goal should be to achieve a fine balance between controlled adoption and decentralised distribution that can lead to faster innovation.

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