



Generative AI Primer

This document contains proprietary information of the United Nations. Information contained herein is to be used solely for the purpose submitted, and no part of this document or its content shall be reproduced, published or disclosed to a third party without the express permission of the United Nations.

What is Generative AI?

Generative AI is a subfield of artificial intelligence (AI) and machine learning (ML) that involves the creation of original data or content, including images, video, text, code and 3D renderings. This subfield has been developing over several decades and is rapidly evolving, due to advances and availability in computational power, large datasets and significant improvements in machine learning algorithms. Generative AI models are based on deep learning algorithms that learn to recognize patterns and relationships from vast amounts of input data, which then generate new outputs that are similar in style and structure to the data they were trained on.

The ability of these models to self-formulate new and varied outputs represents a paradigm shift in the field of AI because they are not being explicitly programmed to follow pre-determined rules, or generate specific outputs, like other AI systems. This will likely lead to a change in how we interface with computers, and more broadly, in how we access, understand, and produce knowledge and information.

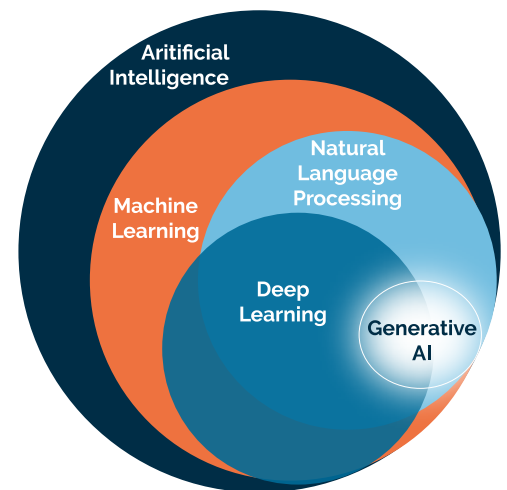


Figure 1: Subfields of artificial intelligence

Core Concepts

Building Blocks of Generative AI

- » **Supervised and semi-supervised learning** - A machine learning technique that helps algorithms learn to recognize patterns and make predictions based on categorized or labeled data. In the case of semisupervised learning, algorithms are trained on both labeled and unlabeled data to detect patterns and make predictions.
- » **Deep learning** - A machine learning technique that uses layers of neural networks to process data and make decisions.
- » **Neural networks** - An AI method that simulates the structure and function of the human brain. Neural networks process information through interconnected nodes that are organized in a layered structure. This computational model serves as the basis of deep learning and is used in various types of generative models.
- » **Generative Adversarial Network (GAN)** - A machine learning model that uses two neural networks—a generator and a discriminator—to produce new data that is similar to a given data set. GANs have become a popular approach for generative AI in various domains, such as image and video generation.
- » **Transformer** - A type of neural network that uses encoders and decoders to generate the best probability for the following word in a sentence. Transformers enable the development of powerful generative models.
- » **Large Language Model (LLM)** - A statistical AI model that is trained on massive amounts of text data and predicts the probability of sequences of words to produce human-like text responses.
- » **Natural Language Processing (NLP)** - A subfield of AI that is at the intersection of linguistics, computer science and machine learning. NLP enables computer programs to process and analyze large amounts of natural language data. It uses a range of computational methods and algorithms to allow machines, such as chatbots and voice assistants, to understand and mimic written or spoken human language.
- » **Generative Pre-trained Transformer (GPT)** - A type of LLM developed by the research lab OpenAI that uses deep learning and NLP techniques. GPT underlies the user-facing, general-purpose chatbot, ChatGPT, which produces human-like conversational responses in reaction to short user prompts.

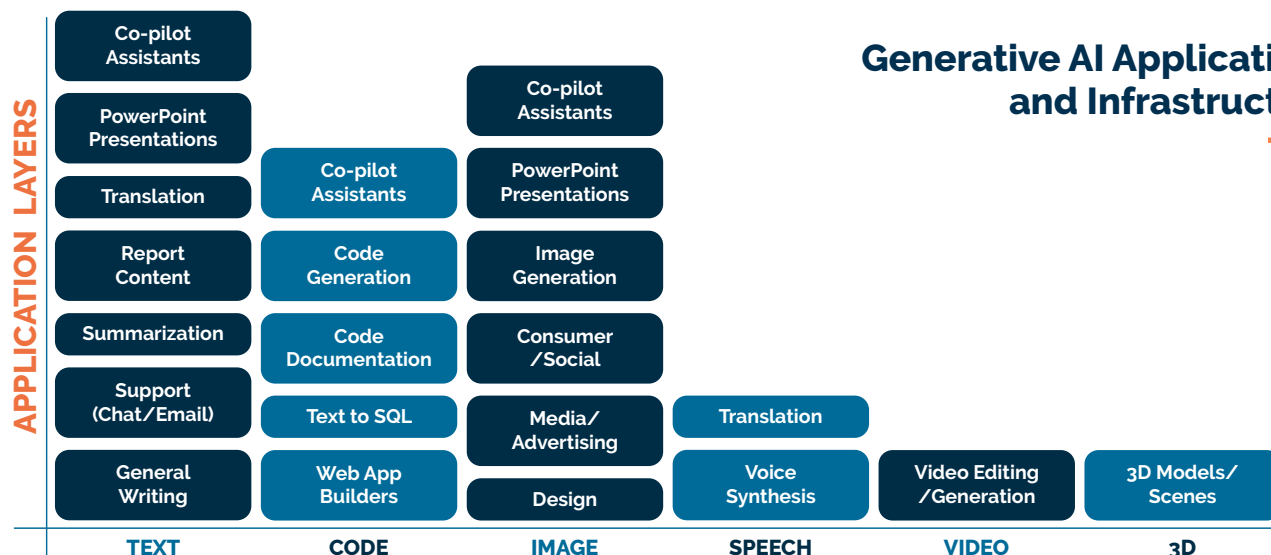


Figure 2: Generative AI applications (Source: Adapted to Huang S. and Grady P., 2022)

Value Proposition

Proponents of generative AI believe that this set of converging technologies is poised to revolutionize the economy, spur productivity and transform industries—from education, healthcare and finance to infrastructure development. According to new research, it is estimated that generative AI systems could increase annual global Gross Domestic Product (GDP) by 7 percent over a 10-year period (Briggs and Kodnani, 2023). Early data suggests that a massive transformation is already underway, as Big Tech companies have begun to quickly roll out and integrate new generative AI tools and features into their products, including search engines and office suite software. The intense competition in Silicon Valley to develop and deploy these tools, however, has prompted concerns among many regulators and ethical AI researchers. Some of these concerns include the risk of perpetuating bias and discrimination, spreading mis- and disinformation, and infringing on intellectual property rights. Discussions regarding generative AI's value proposition are full of debate and uncertainties.

Below, we explore contrasting views on the potential benefits of these technologies, highlighting three interwoven features at the core of its value proposition: efficiency, personalization, and creativity and innovation.

WHAT ADVOCATES SAY	WHAT SKEPTICS SAY	WHY THE UN SHOULD CARE
EFFICIENCY		
<p>There are many opportunities for businesses and organizations to maximize their potential using generative AI tools. One such benefit can include increased efficiency by automating tasks that involve complex reasoning, pattern recognition and large data sets. In the long term, this type of automation could reduce business costs and increase productivity. It could also accelerate the speed of iteration, allowing for faster learning and improvements, which can drive business performance.</p> <p>According to economists, foundation models could impact every sector of the economy and lead to significant economic growth. It is predicted that generative AI will likely create disruption across some industries and drive demand for new skills. This includes roles for prompt engineers and data practitioners that can integrate, fine-tune, and improve generative AI models into existing products and pipelines. It also creates greater demand for AI safety professionals to manage the AI systems' shortcomings and work to ensure their responsible use.</p>	<p>While generative AI systems can help an organization run more efficiently, training and operating these models is expensive and can be cost-prohibitive. This is due in part to the specialized hardware and significant amount of memory and storage space these systems require to support the high volume of calculations models typically produce.</p> <p>With continued advances in the field of AI, however, costs associated with generative AI models are expected to decrease over time, which could make them more accessible. Researchers estimate that millions of jobs across large economies could be exposed to some degree of automation. Certain white-collar positions are considered to be at greater risk of being altered or displaced by text generation tools such as ChatGPT. This includes jobs in tech (e.g., coders, computer programmers), media (e.g., advertising professionals, journalists) and finance (e.g., financial analysts and advisors), as well as educators and customer service agents.</p>	<p>By automating certain functions, generative AI systems can free up time and resources for more high-value tasks, such as policy development and advocacy.</p> <p>One key area where generative AI can be leveraged is in writing and research-related tasks. Generative models can be trained to generate text for various purposes, such as drafting grant proposals, or summarizing large documents.</p> <p>Generative AI can also assist with coding tasks by providing descriptive code documentation. This can help developers to understand complex code bases more quickly and easily, leading to more efficient and effective software development. In addition, generative AI can be integrated into software interfaces, allowing end-users to interact with their software using natural language. This can improve their experience and make software more accessible to non-technical end-users.</p> <p>Generative AI tools can facilitate near-real-time translation and transcription, which could enhance the delivery of critical services to underserved communities. For instance, the UN could use generative AI to provide real-time translation services to refugees or to transcribe speeches at international conferences.</p> <p>Generative AI models, however, lack an inherent understanding of the content they generate, and instead rely on predicting the most probable next words based on the patterns derived from a large corpus of textual data. Hence, they can be considered as personal assistants rather than authoritative decision-makers.</p>

WHAT ADVOCATES SAY

WHAT SKEPTICS SAY

WHY THE UN SHOULD CARE

PERSONALIZATION

Generative AI systems could reduce the barriers to entry for non-experts to engage in highly specialized work that was previously limited to people with relevant technical skills and knowledge. For example, by automating data analysis or facilitating access to information through user-friendly interfaces. Organizations will likely see a greater return on investment by using customized generative models that are fine-tuned with their own data. This can lead to more tailored results, which would better address the organization's specific needs. Personalization can also improve user experience and engagement.

Since generative AI models are trained on a vast amount of data, it can be difficult to explain how a system arrived at a particular result or response. This lack of explainability poses huge risks and could lead to unintended consequences. For instance, AI systems can reinforce patterns of systemic bias and discrimination if their training data is flawed, biased, or unrepresentative. Without explainable outputs, it could be challenging, or impossible, to pinpoint the source of a problem and develop a mitigation strategy. A lack of transparency could also make it difficult to trust the results of the generative model. This is particularly worrying in cases when automated decision-making may be used to determine outcomes in high-stakes contexts such as healthcare, social services and law enforcement.

As a multilingual organization with numerous specialized entities, one of the key advantages of generative AI for the UN is its ability to be trained on specialized vocabulary and terminology. Moreover, these models can be integrated into existing interfaces, which can help boost rapid information discovery and automate knowledge management.

Perhaps most importantly, generative AI can be applied in the context of the Sustainable Development Goals (SDGs). For example, generative AI can provide marginalized communities with improved access to critical services such as healthcare and education. Generative AI can help detect diseases early and provide personalized health recommendations based on an individual's medical history, promoting health and well-being (SDG 3). It can also facilitate the provision of quality education (SDG 4) through the creation of personalized learning experiences, making education accessible to those who may not have access to traditional learning opportunities.

To promote responsible use of generative AI, the UN could take steps to ensure that personalization features of generative AI do not result in negative consequences—such as perpetuating biases or exacerbating existing inequalities—especially for marginalized populations.

CREATIVITY & INNOVATION

Generative AI tools offer several opportunities to help augment human creativity. For example, by prompting discussion and generating new ideas, which could spark people's imagination and possibly help them overcome writer's block. This collaborative ideation tool could assist in spurring the creation of innovative products, services, business strategies and advocacy campaigns. One of the biggest draws of generative AI systems is their potential to change the nature of how cognitive work is performed.

Educators are also considering how generative AI could assist in creating engaging activities, including games and simulations, which could help students better understand abstract or other difficult to grasp concepts.

Some critics have raised concerns that generative AI systems that have been trained on copyrighted works, may infringe on the intellectual property rights of professional artists, writers and programmers. Several lawsuits have been filed against companies that have used copyrighted material in their training data without the permission of (or attribution to) its content creators.

Another common concern among critics, is students' use of highly proficient generative AI tools to complete writing assignments, as these programs can make it harder for professors and other academics to spot instances of plagiarism.

Additionally, generative AI systems cannot always be relied on for accurate information as they occasionally "hallucinate" or produce falsehoods. This occurs when a system fails to understand its prompts and confidently produces outputs that do not match the data it has been trained on. Researchers are concerned that generative AI models could make large-scale mis- and disinformation cheaper and easier to produce and disseminate. While there are some steps that can be taken to try to reduce instances of "hallucinations" (e.g., through reinforcement learning with human feedback and input), completely eliminating these falsehoods is a persistent challenge.

Generative AI can enable marginalized communities to tap into new and innovative resources and networks, which can help create jobs and generate economic opportunities (SDG 8). For instance, generative AI can help democratize access to education and training, which can equip people with the skills they need to succeed in the digital economy.

Leveraging generative AI can also help reduce inequalities (SDG 10). For instance, AI technologies can be used to identify and address disparities in access to education and healthcare services. AI-powered platforms can also help marginalized communities connect with potential employers and access training and development resources.

The UN should take proactive measures to encourage creativity and innovation within the bounds of ethical and legal principles by implementing policies that promote transparency, accountability and fair use of AI-generated content, especially from creative industries.

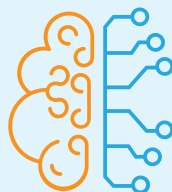
Maturity Assessment

- Hypothetical** – the technology is conceptually possible
- Experimental** – research and experiments are proving the technology
- Working Prototypes** – working examples are being built
- Diffusion** – the technology is being adopted
- Commercialization** – the technology is part of mainstream solutions

The United Nations Office of Information and Communications Technology (OICT) is developing an AI governance framework, as well as a matrix and guidance note, for the use of generative AI within the UN.

Interested in learning more about Generative AI?

In an upcoming thought piece, the Emerging Technologies Team (ETT) will further break down this technology's use cases and purported transformative potential for the UN. [Visit the ETT web page for information about this publication.](#)



About the Emerging Technologies Team

ETT expedites the adoption of frontier technologies across the UN Secretariat. It leverages emerging technologies to generate greater efficiencies and to enhance the Organization's ability to respond to an ever-evolving technological landscape, while providing appropriate safeguards through the careful identification and evaluation of adoption-related risks.

Bibliography

- » Alphonso, G. (2023) 'Generative AI: Education In The Age Of Innovation', Forbes, 3 March. Available at: <https://www.forbes.com/sites/forbestechcouncil/2023/03/03/generative-ai-education-in-the-age-of-innovation/?sh=3e9a0b324eca> (Accessed: 4 May 2023)
- » AWS (2023) 'What Is A Neural Network?', Amazon Web Services, Available at: <https://aws.amazon.com/what-is/neural-network/> (Accessed: 27 April 2023)
- » Azhar, A. (2023) 'What chatbots make cheap', 21 February. Available at: <https://www.exponentialview.co/p/what-chatbots-make-cheap> (Accessed: 27 April 2023)
- » Briggs, J. and Kodnani, D. (2023) 'Generative AI could raise global GDP by 7%', Goldman Sachs Research, 5 April. Available at: <https://www.goldmansachs.com/intelligence/pages/generative-ai-could-raise-global-gdp-by-7-percent.html> (Accessed 1 May 2023)
- » Chow, A. and Perrigo, B. (2023) 'The AI Arms Race Is Changing Everything', TIME, 17 February. Available at: <https://time.com/6255952/ai-impact-chatgpt-microsoft-google/> (Accessed: 2 May 2023).
- » Fazackerley, A. (2023) 'AI makes plagiarism harder to detect, argue academics – in paper written by chatbot', The Guardian, 19 March. Available at: <https://www.theguardian.com/technology/2023/mar/19/ai-makes-plagiarism-harder-to-detect-argue-academics-in-paper-written-by-chatbot> (Accessed: 4 May 2023)
- » Grant, N. and Weise, K. (2023) 'In A.I. Race, Microsoft and Google Choose Speed Over Caution', New York Times, 7 April. Available at: <https://www.nytimes.com/2023/04/07/technology/ai-chatbots-google-microsoft.html> (Accessed: 2 May 2023)
- » Gruetzemacher, R. (2022) 'The Power of Natural Language Processing', Harvard Business Review, 19 April. Available at: <https://hbr.org/2022/04/the-power-of-natural-language-processing> (Accessed: 27 April 2023)
- » Gurdeniz, E. and Hosanagar, K. (2023) 'Generative AI Won't Revolutionize Search — Yet', Harvard Business Review, 23 February. Available at: <https://hbr.org/2023/02/generative-ai-wont-revolutionize-search-yet> (Accessed 3 May 2023)
- » Hsu, T. and Thompson, S. (2023) 'Disinformation Researchers Raise Alarms About A.I. Chatbots', New York Times, 8 February. Available at: <https://www.nytimes.com/2023/02/08/technology/ai-chatbots-disinformation.html> (Accessed 2 May 2023)
- » Kak, A. and Myers West, S. (2023) 'AI Now 2023 Landscape: Confronting Tech Power', AI Now Institute, 11 April. Available at: <https://ainowinstitute.org/2023-landscape> (Accessed 26 April 2023)
- » Lehmann, E. (2023) 'ChatGPT can make life easier, here is for whom.', GIZ Data Lab, 15 March. Available at: <https://www.blog-datalab.com/home/generative-ai-in-international-development> (Accessed 3 May 2023)
- » Leswing, K. and Vanian, J. (2023) 'ChatGPT and generative AI are booming, but the costs can be extraordinary', CNBC, 13 March. Available at <https://www.cnbc.com/2023/03/13/chatgpt-and-generative-ai-are-booming-but-at-a-very-expensive-price.html> (Accessed: 26 April 2023)
- » Luccioni, S. (2023) 'The mounting human and environmental costs of generative AI', Ars Technica, 12 April. Available at: <https://arstechnica.com/gadgets/2023/04/generative-ai-is-cool-but-lets-not-forget-its-human-and-environmental-costs/> (Accessed: 1 May 2023)
- » Mok, A. and Zinkula, J. (2023) 'ChatGPT may be coming for our jobs. Here are the 10 roles that AI is most likely to replace.', Business Insider, 9 April. Available at: <https://www.businessinsider.com/chatgpt-jobs-at-risk-replacement-artificial-intelligence-ai-labor-trends-2023-02> (Accessed: 2 May 2023)
- » Ribeiro Neto, J.A. (2023) 'ChatGTP and the Generative AI Hallucinations', Medium, 15 March. Available at: <https://medium.com/chatgpt-learning/chatgtp-and-the-generative-ai-hallucinations-62feddc72369> (Accessed: 26 April)
- » Samuelson, Pamela, (2023) 'Generative AI meets copyright', Science, 13 July. Available at: <https://www.science.org/doi/10.1126/science.adj0656> (Accessed: 27 July 2023)
- » Singer, Gadi, (2023) 'Survival of the Fittest: Compact Generative AI Models Are the Future for Cost-Effective AI at Scale', 25 July. Available at: <https://towardsdatascience.com/survival-of-the-fittest-compact-generative-ai-models-are-the-future-for-cost-effective-ai-at-scale-6bbdc138f618> (Accessed: 27 July 2023)
- » Storius Magazine, (2023) 'Generative AI: The End of Human Creativity or the New Renaissance?', Storius Magazine, 14 April. Available at: <https://storiushmag.com/generative-ai-the-end-of-human-creativity-or-the-new-renaissance-754b627efdde> (Accessed: 2 May 2023)
- » Wiggers, K. (2023) 'The current legal cases against generative AI are just the beginning', TechCrunch, 27 January. Available at: <https://techcrunch.com/2023/01/27/the-current-legal-cases-against-generative-ai-are-just-the-beginning/> (Accessed: 4 May 2023)