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AI-Generated Content and Applications in Web3

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Research and Insights

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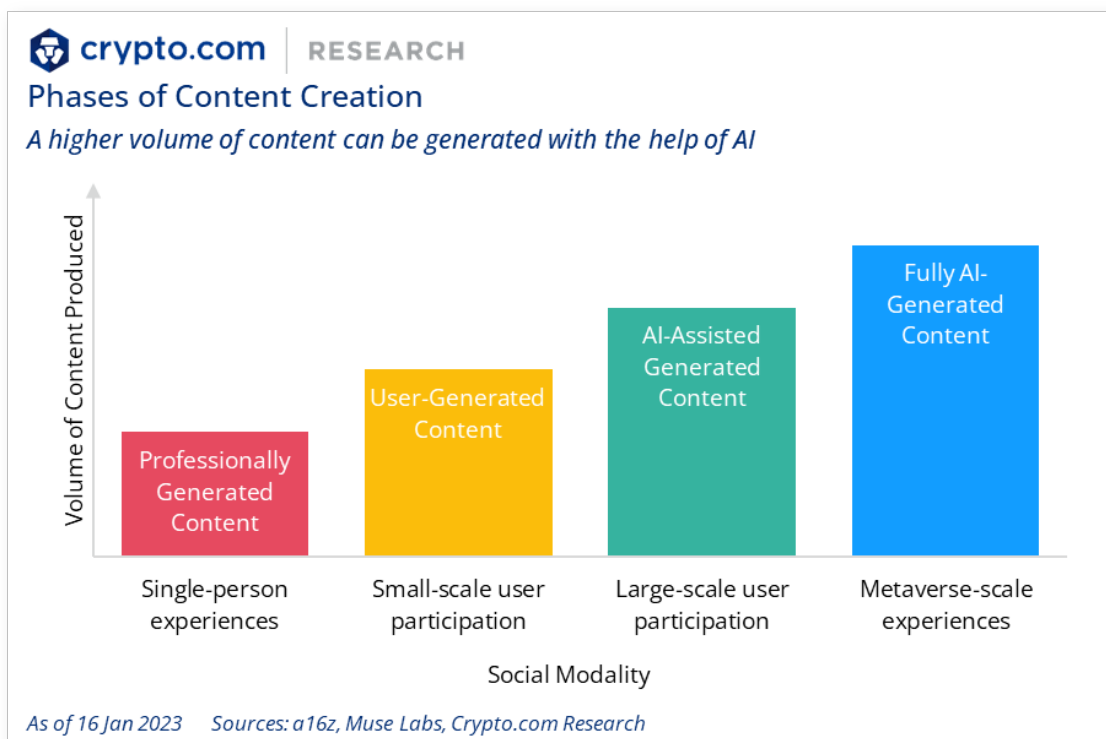
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Executive Summary

- **Artificial Intelligence-Generated Content (AIGC)** has taken the world by storm recently, with applications like **ChatGPT** and **DALL-E** able to produce impressive and realistic text and images, respectively.

- **AIGC is widely regarded as the next stage of content generation**, after **PGC (Professionally Generated Content)**, and **UGC (User-Generated Content)**. PGC is typically created by brands that hire creative professionals like graphic designers and animators, while UGC is created by end users and uploaded to social media sites like YouTube, Facebook, or Twitter.

- Various industry experts have begun to analyse the potential applications of AIGC in Web3. Possible future developments include the deployment of digital collectibles in gaming, brands developing NFT-based engagement strategies, and new models of collective value creation in NFT projects.

  - AI can be used to generate images and videos, which then can be minted into NFTs. **These AI-generated NFTs are also known as Generative Art NFTs**. In general, the artist will first input a set of rules, such as a range of colours and patterns, as well as parameters like the number of iterations and degree of randomness.

  - One of the features of ChatGPT is the ability to write code and find bugs in code. **One possible application of this in Web3 is applying ChatGPT to write and debug smart contracts**. For example, ChatGPT can be prompted to write a "ChatGPT solidity smart contract" with the purpose of using the GPT-3 natural language processing model to generate responses to given prompts.

- Computing power and data are both growing exponentially. These trends are favourable for the outlook of AIGC. As the amount of training data and computational power increases, it will be possible to train more powerful AI models that can produce better AI-generated content.

1. Introduction

Artificial Intelligence-Generated Content (AIGC) has taken the world by storm recently, with applications like **ChatGPT** and **DALL-E** able to produce impressive and realistic text and images, respectively.

AIGC is widely regarded as the next stage of content generation, after **PGC (Professionally Generated Content)**, and **UGC (User-Generated Content)**. PGC is typically created by brands that hire creative professionals like graphic designers and animators, while UGC is created by end users and uploaded to social media sites like YouTube, Facebook, or Twitter.
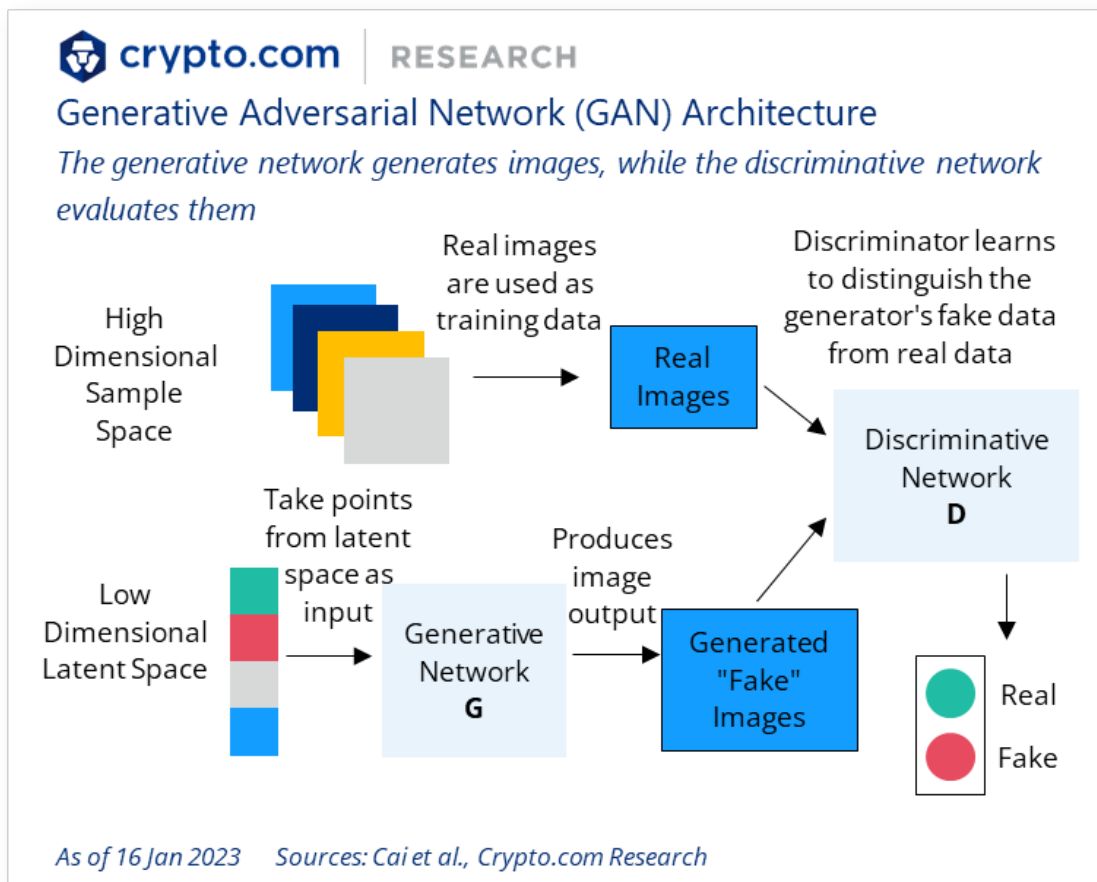
Examples of PGC include logos, videos, and advertisements created by companies, while examples of UGC include content created by individual bloggers, YouTubers, and TikTokers. There is also an intermediate category (between AIGC and UGC) known as **AI-Assisted Generated Content** (AAGC), where AI aids humans to generate content in a semi-automated manner.

As a result of the high efficiency and productivity of computers, AIGC is naturally able to generate a much higher volume of content, unlike PGC and UGC, which are still limited by human labour. As a possible consequence, the higher volume of spontaneously created content can then lead to larger-scale social experiences
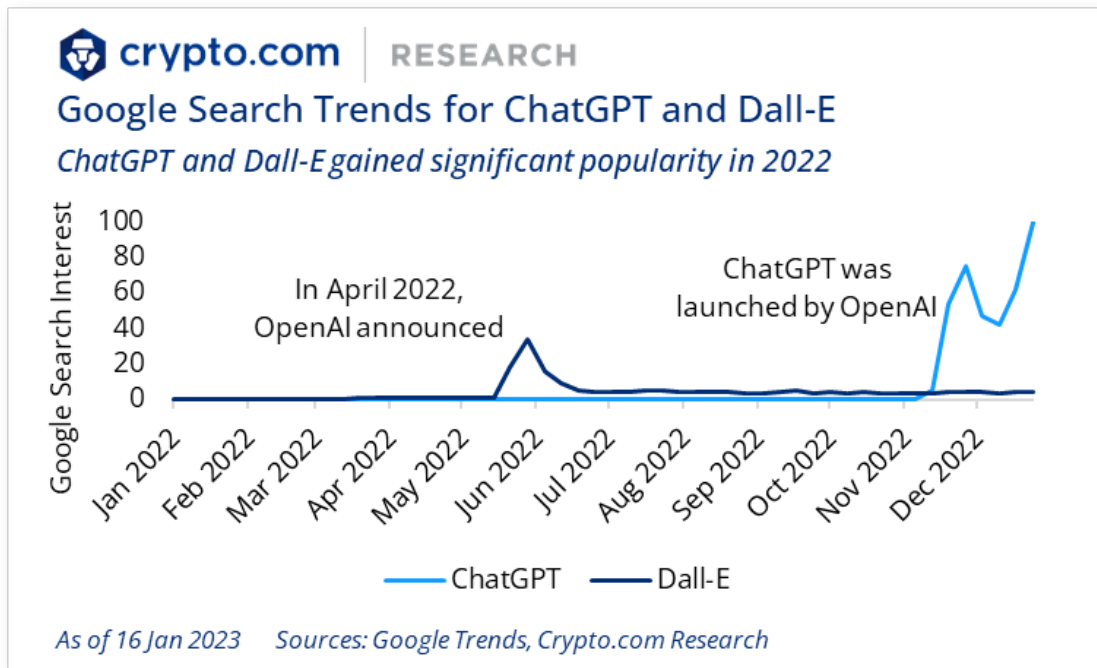
because of increased possibilities when users interact with the multitude of content.

As AI has developed rapidly in recent years, it can now generate various types of content, ranging from text, images, videos to music. Some relevant branches of AI that help to generate such content are Natural Language Processing (NLP), which researches how computers process and analyse text, and Generative Adversarial Networks (GANs), which aims to generate new data (e.g. images, and videos) with similar characteristics to the training data set.

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Generative Adversarial Network (GAN) Architecture
The generative network generates images, while the discriminative network evaluates them

Real images are used as training data

Discriminator learns to distinguish the generator's fake data from real data

High Dimensional Sample Space

Real Images

Discriminative Network **D**

Take points from latent space as input

Low Dimensional Latent Space

Generative Network **G**

Produces image output

Generated "Fake" Images

Real

Fake

As of 16 Jan 2023   Sources: Cai et al., Crypto.com Research

Two representative projects of AIGC that have gained significant attention are **ChatGPT** and **Dall-E**. Both projects experienced increased Google search interest since their launch and have been prominently featured in social media.

ChatGPT is a chatbot that can give detailed and realistic responses to questions across wide domains of knowledge. Launched by OpenAI in November 2022, it is trained using supervised and reinforcement learning techniques. Other than answering questions, ChatGPT can also write code in various programming languages and compose music.

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Google Search Trends for ChatGPT and Dall-E

ChatGPT and Dall-E gained significant popularity in 2022

In April 2022, OpenAI announced

ChatGPT was launched by OpenAI

——ChatGPT ——Dall-E

As of 16 Jan 2023   Sources: Google Trends, Crypto.com Research

The latest version of DALL-E, DALL-E 2, was announced in April 2022. **DALL-E and DALL-E 2 are deep learning models that can generate images based on natural language prompts from users**. Compared to DALL-E, DALL-E 2 can generate higher resolution images that are more realistic and combine various styles. For example, the prompt "Bitcoin in the style of Van Gogh" leads DALL-E 2 to produce the image below.

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DALL-E 2 by OpenAI

DALL-E 2 can generate images according to various styles

Natural Language (Text)

"Bitcoin in the style of Van Gogh"

DALL-E 2

As of 31 Jan 2023   Sources: DALL-E 2, Crypto.com Research

2. How AI Can Help in Web3

In this chapter, we explore how AI can potentially help, integrate with, and improve projects in Web3. As AIGC and Web3 are both very new, we are still just seeing the tip of the iceberg of their synergy.

2.1 Text AI and Its Impact on Web3

In the field of text generation (e.g. ChatGPT), AI can help with tasks such as education, gaming narratives, and story design. For example, Web3 protocols can use AI to create educational material such as quizzes and infographics to better educate the public. Blockchain gaming projects can use AI to generate gaming narrative ideas and storyboards. The possibilities are endless and are only limited by the developers' imagination.
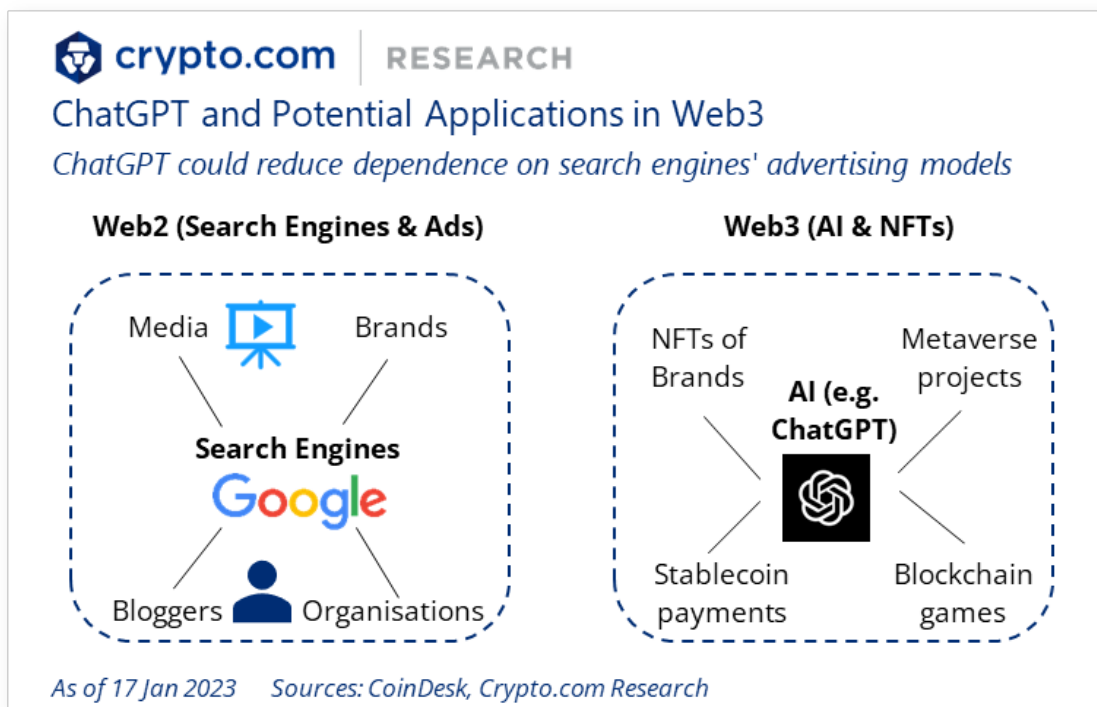
Various industry experts have begun to analyse the potential applications of AIGC in Web3. Firstly, since ChatGPT can answer general questions on a wide array of topics, it is possible that it could replace search engines such as Google to some extent in the future. Web2 in its current form is heavily dependent on search engines and search-related advertising. Media, brands, bloggers, and organisations have to engage in Google search engine optimisation and purchase online advertisements to promote their products.

When AI technologies like ChatGPT overturn the Web2 advertising model, it could open up future opportunities in Web3. For example, brands and media companies could use NFTs to reach their customers and audiences to generate revenue. **Brands such as Nike, Starbucks, Dolce & Gabbana, and TIME Magazine have already launched NFT projects and entered the Web3 economy.** Subsequently, this can potentially help to catalyse future developments in metaverses and blockchain gaming.

2.2 Image and Video AI in Web3

AI can be used to generate images and videos, which then can be minted into NFTs. **These AI-generated NFTs are also known as Generative Art NFTs.** Typically, the artist will first input a set of rules, such as a range of colours and patterns, and parameters like the number of iterations and degree of randomness. Subsequently, the computer will generate the artwork within this specified framework.

Generative Art NFTs   crypto.com | **RESEARCH**

Collection	Description	Floor Price	Max Supply	Sample
Autoglyphs	• Released by CryptoPunks creator Larva Labs • Created by code running on the Ethereum blockchain	345 ETH	512	
Fidenza	• Created by visual artist Tyler Hobbs • Utilises a versatile algorithm that produces a wide variety of curves and blocks	87 ETH	999	
Ringers	• Created by artist Dmitri Cherniak • The artworks are generated by JavaScript and depict various ways of wrapping a string around a set of pegs	54 ETH	1,000	

Chromie Squiggle	• Created by Erick Calderon (Snowfro) on the Art Blocks platform • Consists of randomly generated squiggles in nine different style schemes	16.24 ETH	10,000	
Lost Poets	• Created by digital artist Pak • It is both an NFT collection and a strategy game	0.049 ETH	65,536	

As of 18 Jan 2023   Sources: OpenSea, CoinDesk, NFT Evening, Crypto.com Research

AI-generated images or videos can also potentially be used in blockchain gaming to create special effects, as well as virtual products in the metaverse. For example, **Mirror World** is a GameFi project that utilises virtual AI-driven "Mirrors" that act as assets for characters in the game. The Mirror assets are fully interoperable in each game, which ensures that holders will be able to use them in new challenges as they go live. Mirror World also launched an interactive NFT collection, which included NFTs compatible with the platform's games.

Delysium is an AAA blockchain game with an AI-powered metaverse. The game features an Experience Editor platform powered by an in-house generative AI layer that enables users to create their own generated content. **One of the innovative aspects of Delysium is the "AI Metabeing" technology.** AI Metabeings in Delysium are built with neural systems consisting of Conversational, Behavioral, and Natural Language Processing (NLP) modules.

Interestingly, AI Metabeings in the game can enjoy private property rights, hold assets, and participate in the economy and various game modes just like human players. With the AI MetaBeings distributed in locations around Delysium, players can experience a realistic and dynamically generated gaming experience.

Source: *Delysium*

Another application of AI is found in Alethea AI's **CharacterGPT** project. **CharacterGPT is a multimodal AI system that is able to generate interactive AI characters from a text description.** In other words, CharacterGPT enables Text-to-Character creation. The interactive characters can have distinct appearances, voices, personalities, and identities based on different natural language descriptions.

Subsequently, the character can be tokenised on the blockchain, and its owner can also customise its personality, train its intelligence, as well as trade and use it across various other dApps on Alethea AI's AI Protocol. The proposed use cases of the interactive characters include Digital Twins (virtual models designed to reflect a physical object), Digital Guides (e.g. a guide for people to explore a tourist attraction), Digital Companions (a program with a distinct personality and able to interact with humans), Virtual Assistants (able to perform tasks according to commands, such as Apple's Siri), and AI NPCs (non-player characters in a game that are not controlled by a human player).

The general trend of text-to-3D becoming more efficient could also help shape future metaverses. For example, there are breakthroughs in text-to-3D synthesis methods that use pretrained 2D text-to-image diffusion models. An advantage of this approach is that no 3D training data is required. **A new OpenAI tool named Point-E is also able to turn text descriptions into 3D models.** One of the key advantages of Point-E is that it is faster and runs efficiently on a single GPU, compared to its competitor DreamFusion by Google which runs on a machine with four of Google's custom TPU v4 AI processors.

2.3 Other Applications of AI in Web3

One of the features of ChatGPT is the ability to write code and find bugs in code. **A possible application of this in Web3 is applying ChatGPT to write and debug smart contracts.** Although this is still in the very early stage, there have been some examples of such use cases emerging.

For example, ChatGPT can be prompted to write a "ChatGPT solidity smart contract" with the purpose of using the GPT-3 natural language processing model to generate responses to given prompts. **Subsequently, dApps can potentially integrate GPT-3 functionality to provide users with more engaging conversational responses.**

In addition, users have attempted to use ChatGPT to audit smart contracts and find vulnerabilities in them. At this preliminary stage, the conclusion is that ChatGPT is useful for preliminary checks, but cannot replace an experienced human's audit since it can sometimes make erroneous suggestions.

3. Outlook

The outlook for AIGC is promising. While the technology behind AIGC, such as deep learning and neural networks, dates back to the 1950s, it is only in recent years that computing power has improved to make deep learning possible and efficient.

According to Moore's Law in computing, the number of transistors on a microchip doubles approximately every two years, whereas its cost is halved over the same timeframe. **In short, the speed and capabilities of computers are expected to increase every two years while becoming more affordable.** At the same time, the amount of data in the world is growing exponentially, projected to reach 175 zetabytes (175 trillion gigabytes) by 2025.

The above trends are highly favourable for AI and AIGC, since AI techniques such as deep learning work more effectively with higher computing power and large amounts of data. For example, ChatGPT is classified as a Large Language Model (LLM), as it is trained on a vast quantity of text data and has 175 billion parameters. In general, as the amount of training data and computational power increases, it would be possible to train more powerful AI models that can produce better AI-generated content.

That said, there are also some challenges for AIGC. **One challenge could be pushback against AI-generated content by consumers and organisations.** For example, Getty Images, a major stock photo website and platform, has disallowed the upload and sale of illustrations generated using AI art tools including DALL-E. The reason cited is copyright concerns since it has been observed that some of the AI-generated images reproduced copyrighted content such as watermarks.

Another challenge for AIGC is quality concerns. For example, AI researcher and Stanford professor Andrew Ng produced an example where ChatGPT erroneously explains how an abacus is faster than a GPU. Hence, even state-of-the-art AIGC has yet to reach a sufficient level of accuracy.

Some people also argue that AIGC is the death of artistry. For example, in September 2022, the AI-generated artwork "Théâtre D'opéra Spatial" by Jason Allen won the first prize in the digital category at the Colorado State Fair. This has generated backlash from some artists. Defenders of AIGC make the point that using AI is no different from using Photoshop or other digital image-manipulation tools, and human creativity is still essential to think of the appropriate prompts to generate an art masterpiece.

AIGC is still a nascent emerging technology, and it will be exciting to observe how it develops over the next few years. It is already clear that AIGC is superior to

humans in terms of the quantity of content produced. In the optimistic scenario, AIGC could also possibly produce content that is of higher quality than the average human writer, artist, or developer.

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Outlook for AI-Generated Content
In the near future, AI may be able to produce content superior to humans

	Past (before 2020)	Present	Future (2025 and beyond)
Text	• Spam detection • Translation	• Basic copy writing • 1st drafts	• Final drafts better than writers
Images	• Basic image generation	• Art • Logos • Mock-ups	• Final drafts better than artists
Video / Gaming	• Primitive video generation	• 3D / video models • 1st drafts	• Personalised games and movies
Code	• 1-line auto-complete	• Multi-line generation	• Final drafts better than developers

As of 25 Jan 2023   Sources: Sequoia Capital, Crypto.com Research

4. Conclusion

The recent hype around AI-generated content is not without reason, since AI tools like ChatGPT and DALL-E have proven that they can effectively generate content that is much more realistic and detailed than previous models.

Web3 and AIGC have good potential to be effectively combined. For example, AI-generated images can be naturally applied to NFTs. The code-writing and debugging features of ChatGPT can also be applied to smart contracts. In addition, AI tools like ChatGPT have the potential to disrupt the Web2 ecosystem, which is centred on search engines and the advertising revenue model, bringing new opportunities that can be filled by Web3 applications.

Famous physicist Stephen Hawking once said, "computers can, in theory, emulate human intelligence — and exceed it". In the realm of AI-generated content, we are beginning to see this phenomenon in action, with computers starting to be able to produce text and images that are on par with or even better than that produced by the average human. Since AIGC and Web3 are both very new, we are still just seeing the tip of the iceberg of their synergy, and it will be exciting to observe future developments in the years ahead.

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