



TECHNOLOGY TRENDS - A REVIEW OF 2022 AND THE OUTLOOK AND BEYOND

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The development of technology and its impact on our personal and business lives never ceases to amaze.

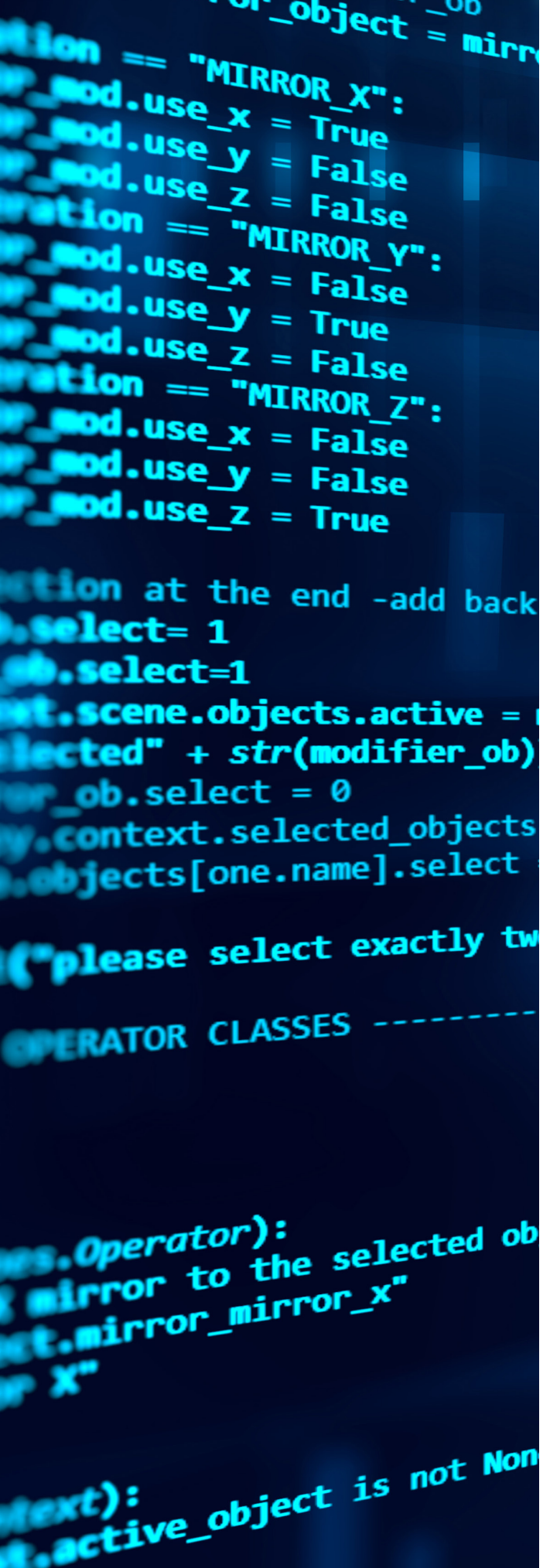
From the first transistor in the 1940s to personal computers in the 1970s, the Internet in the 1990s (following its predecessor, ARPANet in the 1960s), to the smartphone in the early 2000s, virtually every aspect of modern life has been affected by these innovations in electronics and software development. 2022 was another year of great innovation and, perhaps more significantly, public awareness of such innovations.

But how do you distinguish between hype and the technological advances that will improve and often disrupt businesses?

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A few years ago, it was the metaverse and Web 3.0 when companies hired Chief Metaverse Officers. And yes, there has been some innovation there – a Colombian court recently held a hearing on the metaverse, allowing the parties to appear over VR or video using avatars. On the other hand, Microsoft disbanded its industrial metaverse team last month. How about cryptocurrencies and non-fungible tokens? How many people told you that crypto was the future? Well, FTX and some keener attention from regulators have certainly put a dampener on that.

Cryptocurrency values took a big hit in 2022 – the crypto market cap reached an all-time high of \$3,009 billion on Nov 10, 2021, but on the same date in 2022, it was valued at \$727.58 billion – a 75% drop in value. A recent paper from Paul Momtaz from UCLA about the once-faddish Initial Coin Offerings (ICOs) found that 40% of all ICOs destroyed investor value on the first day of trading. In addition, he found that not only did issuers systematically overplay their *tokens* prospects, but exaggerated claims raised more money in less time than accurate ones. That’s not to say that either of these technologies will not have an impact in the future. What is clear is that they were overhyped, and many businesses and consumers lost money because of the hype.

2022 was the year of Artificial Intelligence (AI) and Machine Learning (ML). In reality, AI and ML have been used in the last 30 years. They are prominent in current technology solutions such as search engines, personal shopping, fraud prevention, voice assistants, maps, facial recognition, personalized learning, and autonomous vehicles. But 2022 was the year that AI and ML took center stage. Blake Lemoine, a former engineer at Google, declared that Google’s Large Language Model, called LaMDA, was sentient.

Blake claimed that the program can communicate its fears and feelings like a human, based on LaMDA’s answers to his questions. Google quickly fired Lemoine for choosing to “persistently violate clear employment and data security policies that include the need to safeguard product information.”

Large Language Models (LLMs) are a subset of AI trained on vast quantities of text data to produce human-like responses to dialogue or other natural language inputs.

In order to produce these natural language responses, LLMs make use of deep learning models, which use multi-layered neural networks to process, analyze, and make predictions with complex data. Public availability of LLMs and generative AI programs such as DALL-E 2 (text to image), Stable Diffusion (text to image), and ChatGPT (text to text) made AI more accessible to not only enterprise users but also to consumers.

Stable Diffusion (by StabilityAI) accrued nearly 34,000 stars on GitHub, a measure of the open-source software's popularity among developers. DALL-E 2 (developed by OpenAI) is the 2nd iteration of DALL-E. It takes sentences and creates corresponding original, often stunning, images. This has been great fun for consumers, but artists and creators are concerned that these models are not only erasing a need for them but also stealing their artwork. These programs use the artist's methods of generating images, so some artists may have a case for copyright infringement if the artwork generated by Dall-E 2 shows a strong similarity to their work.

The biggest AI app to debut in 2022 was the latest (3rd) version of ChatGPT, a very sophisticated AI-based text generator, also from OpenAI. OpenAI was founded by Sam Altman, who is its CEO, and who was the former president of Y Combinator. We asked ChatGPT this question- "explain how ChatGPT works" – this was its response (verbatim):

"ChatGPT is a variant of the GPT (Generative Pre-trained Transformer) language model that has been fine-tuned specifically for the task of generating human-like text in a conversational context. It uses a combination of machine learning techniques, including deep learning and unsupervised learning, to generate text that is coherent and flows naturally, as if it were written by a human. To fine-tune ChatGPT for chatbot applications, the model is trained on a large dataset of conversation transcripts. This dataset is used to learn the patterns and structures of human conversation, and the model is then able to generate text that is coherent and follows these patterns. ChatGPT works by processing a sequence of input words and using this input to predict the next word in the sequence. This prediction is based on the model's understanding of the context and content of the conversation, as well as its knowledge of the patterns and structures of human conversation. The model can then generate a response to the input by selecting the most likely next word in the sequence, and continuing to generate text in this way until it reaches the desired length."

You can use this app to write a poem, tell a story, or even write an essay or term paper on any subject – it could significantly impact all types of written communication in the future. Over 100 million people have asked it to write resumes, odes to their lovers, and even to rewrite IKEA furniture instructions in iambic pentameter.



A Bloomberg editorial posted in the Washington Post asks, “Is ChatGPT the start of the AI Revolution?” In a December 2022 article published in the British Medical Journal, which has not yet been peer-reviewed (and is therefore considered pre-print), researchers at Cold Spring Harbor Laboratory and Yale claim that ChatGPT got greater than 50% accuracy on the United States Medical Licensing Exam (USMLE). Paradoxically, ChatGPT outperformed PubMedGPT, a counterpart LLM with a similar neural structure but trained exclusively on biomedical domain literature. ChatGPT accesses data throughout the Internet – GPT-3 has 175 billion parameters and was trained on 570 gigabytes of text. For comparison, its predecessor, GPT-2, was over 100 times smaller at 1.5 billion parameters.

On Tuesday, March 14, OpenAI announced the launch of the newest version of GPT, GPT-4. As well as improving accuracy, GPT-4 has the ability to respond to images as well as text. Below is an example.

GPT-4



What are a couple of meals I can make with this?

Based on the items visible in the fridge, here are a couple of meal ideas:

- 1) Yogurt parfait: Layer yogurt, strawberries, and blueberries in a bowl or jar. Top with honey or nuts for added texture and flavor.
- 2) Carrot and hummus wrap: Spread hummus on a tortilla or wrap. Top with shredded carrots and any other desired veggies. Roll up and enjoy!

OpenAI is delaying the release of the image-description feature due to fears of abuse, but a company called *Be My Eyes* is already using GPT-4 to build services that could give a more detailed idea of the images encountered on the internet or snapped in the real world.

On Feb 7, 2023, Microsoft announced that the new version of Bing, its much maligned search engine, will be powered by ChatGPT technology. In addition to the traditional results – a list of hyperlinks to websites driven by SEO and SEM, it will give detailed chat-like answers to search queries. This could radically change the way search queries are answered and the way users consume the results. “AI will fundamentally change every software category, starting with the largest category of all — search,” Microsoft chair and CEO Satya Nadella said in the launch statement. Microsoft has invested \$10 billion in OpenAI.

To test it out, we recently asked Bing this question:

“I am planning a trip for our anniversary in September. What are some places we can go to that are within a 3-hour flight from London Heathrow?”

This was the response:

“There are many great destinations within a 3-hour flight from London Heathrow that would be perfect for an anniversary trip in September. Here are a few suggestions:

*1. **Paris, France** – Paris is a classic romantic destination and is just a short flight away from London Heathrow. You can explore the city’s famous landmarks like the Eiffel Tower and the Louvre Museum, enjoy some delicious French cuisine, and take a romantic stroll along the Seine River.*

*2. **Barcelona, Spain** – Barcelona is another popular destination for couples, with its beautiful architecture, stunning beaches, and delicious food. You can visit famous landmarks like La Sagrada Familia and Park Guell, and enjoy some tapas and wine in one of the city’s many charming bars and restaurants.*

*3. **Amsterdam, Netherlands** – Amsterdam is a picturesque city with a rich history and culture. You can explore the city’s famous canals, visit museums like the Van Gogh Museum and the Rijksmuseum, and enjoy some traditional Dutch treats like stroopwafels and bitterballen.*

*4. **Rome, Italy** – Rome is a city that is steeped in history and culture, and is home to some of the most famous landmarks in the world, such as the Colosseum, the Pantheon, and the Vatican. You can explore the city’s many museums and galleries, indulge in some delicious Italian cuisine, and take a romantic stroll through the city’s charming streets and piazzas.*

*5. **Edinburgh, Scotland** – If you’d like to stay a little closer to home, Edinburgh is a great option. This beautiful city is just a short flight from London Heathrow and offers a rich history, stunning architecture, and plenty of romantic spots to explore, like Edinburgh Castle and the Royal Botanic Garden.*

I hope these suggestions help you plan your anniversary trip!”

The Bing response also had the traditional hyperlinks to travel pages on the Internet, but there is no question that the chat response changed the way we would do further research on travel destinations.



Hi!
How can I help you.



Search is considered the *Front Page* of the Internet and is dominated by Google, which has 92% of the world’s market share compared to Bing’s 2%. Search is also Google’s biggest revenue stream; thanks to all the ads it places all over search results. As mentioned earlier Google is developing its own LLM, but has been cautious about releasing it, as it can generate false, toxic, and biased information. LaMDA is available to only a limited number of people through an experimental app, AI Test Kitchen. But the Bing OpenAI announcement generated a Code Red at Google, who immediately announced its own conversational AI tool called *Bard*.

But what of the future beyond the hype? Activity in Technology, Media, and Telecommunications (TMT) is necessitated by long-term structural growth drivers—digitalization isn’t going away, and businesses need to innovate and reconfigure in response to dynamic markets. The metaverse now incorporates computer-generated, networked eXtended Reality (XR – an acronym that embraces all aspects of Augmented Reality, Mixed Reality and Virtual Reality).

It is expected to impact multiple industries, including gaming, remote work practices and conferencing, virtual learning, e-commerce, and social media. XR pioneer Avi Bar-Zeev, a co-creator of Google Earth and HoloLens, recently wrote, “VR fundamentally strips away the most common constraints of reality: location and travel, physics, even sometimes time, where hours can often seem like minutes, and we can travel to the historical past or imagined futures.” Investments in the metaverse are not restricted to Facebook, whose parent company became eponymous with the name, but also Google, Microsoft, Nvidia, and Apple. Amazon is now using a form of AR technology that allows you to virtually try on clothing and shoes and visualize furniture placed in a specific location in your home.

AI and ML will continue propagating in applications for large enterprises, small and medium-sized businesses (SMEs), and consumers. In addition, the use of Blockchain technology continues to grow in multiple industries, including financial services, supply chain, gaming, real estate, and even the sharing of medical records – expect that trend to continue in 2023 and beyond. And, as economic and geopolitical instability spills into 2023, experts predict that this year will be a consequential one for Cybersecurity.



Finally, as organizations continued to migrate workloads from traditional channels to digital formats, the resultant demand accelerated in the Cloud-Computing market and is expected to further grow in 2023 and beyond. In addition, many businesses have adopted the work-from-home practice, thus increasing the demand for Software-as-a-Service (SaaS) – based solutions. And the rise in streaming and Video-On-Demand (VoD) consumption has increased the need for Infrastructure as a Service (IaaS), such as Amazon’s AWS or IBM’s Azure, to meet consumer demands.

So, hold on to your hats. The winds of change in technology are expected to blow as hard in 2023 and beyond.

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Paren is the Principal of the M&A and Capital Markets group at KROST. In addition, he heads the technology market vertical for the firm. He comes with over 20 years of experience in mergers and acquisitions as well as equity and debt financings. Paren successfully completed over 200 M&A and Capital Markets transactions worth over \$1 billion, acting as both a buy-side and sell-side advisor. [» Full Bio](#)