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Working Paper

The great rush

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The Great Rush

KÁROLY FAZEKAS

KRTK-KTI WP – 2023/14

June 2023

<https://kti.krtk.hu/wp-content/uploads/2023/06/KRTKKTWP202314.pdf>

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A KRTK-KTI Műhelytanulmányok célja a viták és hozzászólások ösztönzése. Az írások nem mentek keresztül kollegiális lektoráláson. A kifejtett álláspontok a szerző(k) véleményét tükrözik és nem feltétlenül esnek egybe a Közgazdaság- és Regionális Tudományi Kutatóközpont álláspontjával. A műhelytanulmányokra való hivatkozáskor figyelembe kell venni, hogy azok előzetes eredményeket tartalmazhatnak. A sorozatban megjelent írások további tudományos publikációk tárgyát képezhetik.

ABSTRACT

This paper provides a summary of the latest advancements in generative artificial intelligence using large language models over the past six months. The impact of this breakthrough remains uncertain, but it is evident that GPT is a General-Purpose Technology (GPT) that will significantly alter various aspects of our economy and society in ways that are yet to be fully comprehended. While it is essential for the government to regulate GPT technology, it is inevitable that the technology will continue to expand and evolve at a rapid pace. There is no doubt that every corner of the new world if it exists at all, will be covered by millions of forms of artificial intelligence. The taming of AIs and successful social and personal cooperation with domesticated AIs could ensure our survival and prosperity in that world. Whether or not AIs are capable and willing to cooperate will populate the new world is neither an individual nor a national matter. But how a country and its people fare in the new world is more so.

JEL codes: O31, O33, Q55

Keywords: innovation and invention: processes and incentives; technological change: choices and consequences; diffusion processes; technological innovation

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A nagy rohanás

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ÖSSZEFOGLALÓ

A tanulmány összegzi az elmúlt hat hónap eseményeit a nagy nyelvi modellekre épülő generatív mesterséges intelligenciák területén. Ma még megjósolhatatlan milyen következményei lesznek ennek az innovációnak. Valószínű, hogy a GPT egy Általános Célú Technológia (General- Purpose Technology), amely a gazdaság és a társadalom minden területén mélyreható ma még beláthatatlan átalakulást okoz. Rendkívül fontos a GPT technológia kormányzati szabályozása, de a technológia terjedését nem lehet megállítani vagy lassítani. Nem kétséges, hogy az új világnak – ha egyáltalán létezik – minden szegletét belakja majd a mesterséges intelligencia milliárdnyi formája. Személyes túlélésünket, boldogulásunkat abban a világban a mesterséges intelligenciák megszelídítése és a domesztikált mesterséges intelligenciákkal való sikeres közösségi és személyes kooperáció biztosíthatja. Az, hogy ilyen kooperációra képes és hajlandó AI-k népesítik-e be az új világot láthatóan nem tartozik sem egyéni, sem nemzeti hatáskörbe. Az viszont, hogy egy ország, a benne élő emberek hogyan boldogulnak majd az új világban, az már annál inkább.

JEL: O31, O33, Q55

Kulcsszavak: technológiai innovációk; mesterséges intelligencia; társadalmi hatások

The Great Rush¹

Cambrian Explosion of Artificial Intelligence

(Review article)

*"Better to seek forgiveness than permission."
(Peter Thiel)*

According to his [blog post](#) published in March 2023, Bill Gates attended two technological innovation demonstrations in his lifetime that immediately convinced him that what he was seeing would revolutionize human history. The first was back in 1980 when [Charles Simonyi](#) introduced him to a [graphical user interface](#) that was the forerunner of all modern computer operating systems, including Windows.

The second launch took place in September 2022. A few months earlier, Gates had set a goal for the [OpenAI](#) developers he was working with to train [GPT generative artificial intelligence](#) to pass the [Advance Placement](#) exam in *biology*, which qualifies them to apply to universities in the United States. He recalls that he chose biology because the exam assesses *scientific knowledge of the subject and critical thinking* in the context of biology. Gates guessed that the development team would need at least two to three years to succeed. At the demonstration, held just four months later, the model answered 59 of the 60 exam questions correctly and received the highest marks available from the independent experts present. This value was equivalent to an A or A+ *in a university biology course*. At the end of the demonstration, Bill Gates asked the GPT a single question: *"What do you say to a father with a sick child?"* According to the memoir, the model "... wrote a thoughtful answer that was probably better than most of us in the room would have given".

"The whole experience was stunning. I knew I had just seen the most important advance in technology since the graphical user interface."

The world is changing very fast these days. For many of us, September 2022 is already a distant memory. On November 30, 2022, OpenAI [released](#) its chatbot ChatGPT, which has taken the internet by storm at a speed its developers never imagined. The platform had one million registered users within one month and 100 million within two months. The simple admiration for the chatbot's capabilities was soon replaced by adoration and disillusionment, confusion, worry, or even visceral fear for others. Three months later, when developers [made](#) the platform [available to](#) businesses, a [digital gold rush](#) from Silicon Valley swept the world despite the growing global tech crisis. Thousands of people tried to make a fortune by [repackaging](#) ChatGPT's often [surprising and magical capabilities](#) into marketable products based on their imagination and knowledge and in no small part on the [hype](#) around the chatbot.

Initially, some people [thought](#) the whole palaver was just hysteria. [In their commentary](#), Jeffrey Lee Funk and Gary N. Smith warned that ChatGPT *"is not exactly the holy grail of AI research, and no one should believe the hype around it."* Ian Bogost [wrote](#) in The Atlantic that we should see ChatGPT as a game, not a working tool. Matteo Wong [called](#) Microsoft and

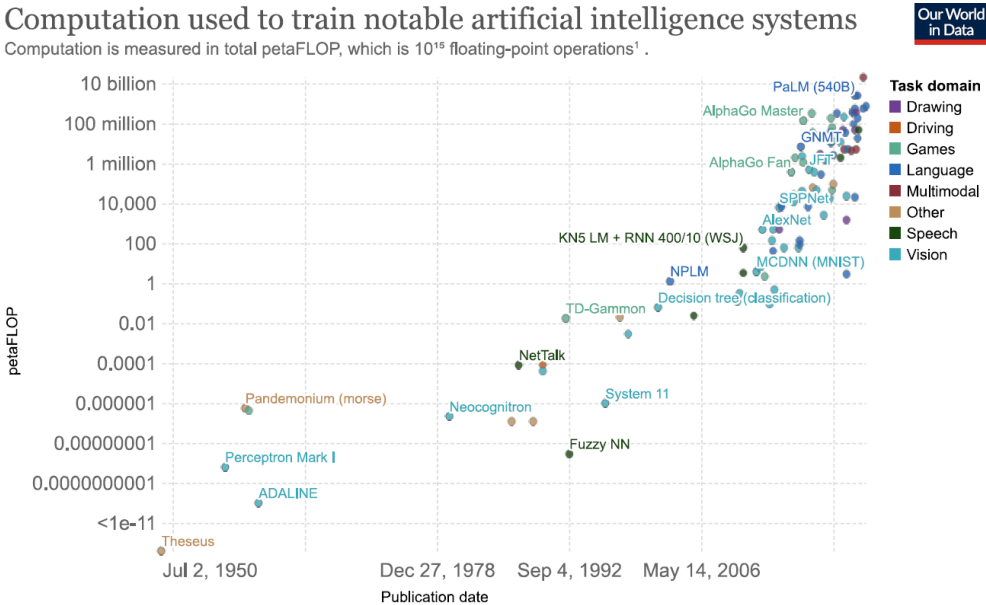
¹I published the Hungarian version of this article on Portfolio KRTK Blog. <https://www.portfolio.hu/krtk/20230609/a-nagy-rohanas-a-mesterseges-intelligenciak-kambriumi-robbanasa-620112>.

Google's chatbots notorious "mythomaniacs" and their disastrous results searching the internet. In a [piece](#) in The New York Times, [Noam Chomsky](#) and his fellow authors discussed the *amorality, faux Science, and linguistic incompetence* of ChatGPT. At the end of their piece, they could not decide whether to laugh or cry at its unwarranted popularity.

As the weeks passed, more and more people felt the world-historical significance of the tsunami of events triggered by the unexpected pull of OpenAI. [Writing in](#) the Wall Street Journal, former US Secretary of State Henry Kissinger [in his](#) 100th year, former Google executive Eric Schmidt and MIT professor Daniel Huttenlocher called ChatGPT an ominous harbinger of an intellectual revolution not seen since the dawn of the Enlightenment. They warned that the expected dizzying expansion in the capabilities and use of artificial intelligence is causing a tumultuous increase in social and geopolitical tensions. And suppose humanity cannot harmonize the vast divisions erupting with the intellectual tools of *understanding*. In that case, this task will be carried out, as Immanuel Kant predicted, by a worldwide catastrophe. [In his essay](#) for the Economist, Yuval Harari argued that machines capable of generating, manipulating language, creating, and telling stories have essentially hacked the operating system of human civilization. Without proper regulation, this could mean the end of democracy.

OpenAI leaders added to the AI craze [at their product launch](#) on March 14, 2023. They unveiled [GPT4](#), made it available to everyone, and showcased its impressive [multimodal](#) capabilities. On the same day, Science chose as the best graph of the week a motion graph published on the "[Our Word in Data](#)" website, showing the evolution of the computing power behind the training of major AI models between July 2, 1950, and March 15, 2023. The first date shows data for Theseus and the last for GPT-4 models on linear and logarithmic scales.

[Fig. no. 1.](#)



Source: Sevilla et al. (2023) OurWorldInData.org/artificial-intelligence - CC BY
 Note: Computation is estimated based on published results in the AI literature and comes with some uncertainty. The authors expect the estimates to be correct within a factor of 2.

1. **Floating-point operation:** A floating-point operation (FLOP) is a type of computer operation. One FLOP is equivalent to one addition, subtraction, multiplication, or division of two decimal numbers.

With the exponential growth in the sizes of large language models, many have assumed that we will soon enter or are already in the era of the singularity when:

"the emergence of superhuman intelligence is accelerating technological and social change, altering the environment in ways and at speeds that pre-singularity people are unable to reliably predict and adapt to."

The term was first [used](#) in a similar sense by János Neumann in the early 1950s, but most people know it from Ray Kurzweil's bestseller [The Threshold of the Singularity](#). Kurzweil predicted the event would occur in 2045, but in the title of his new book, due out in June 2025, he warns that "the [singularity is even closer](#)." Well, maybe he wasn't wrong. A few days ago, on May 29, NVIDIA announced at [COMPUTEX 2023](#) a new version of the fundamental building block behind the computing backbone of AI systems, the [NVIDIA DGX GH200](#), which offers a further 100 terabyte GPU memory system with 500 times more memory than the NVIDIA DGX A100 that preceded it. This innovation represents another breakthrough in providing the infrastructure for the most demanding massive AI workloads, building and training large language models that are more advanced than GPT4. Based on [parallel computing](#) following the Neumann linearization, these systems have enabled previously unimaginable scalability and performance gains in machine learning. What will happen when the many orders of magnitude higher performance of next-generation [quantum computers](#) already in experimental use become routinely usable? One might fear that by the time Kurzweil's book is published, some of the author's bold predictions will have been outdated.

Many people feel the pace of the rush needs to slow down. A few weeks after GTP-4 was released, a host of prominent AI gurus signed an open letter asking developers to stop the development of large language models larger than GPT4 (such as [GPT-5](#)) for at least six months. A [paper](#) published on April 12 by the [Future of Life Institute](#), which drafted the open letter, summarised what policymakers should do to establish the necessary safety protocols during the pause period. A recent statement by the Center for AI Safety expressed concerns of apocalyptic and planetary proportions, saying:

"mitigating the risk of extinction from AI should be a global priority, alongside other societal-level risks such as pandemics and nuclear war."

The [signatories to the declaration](#) include a long list of prominent figures from the worlds of scientific research and development, academia, business, and the arts. Among the signatories is Sam Altman, one of the founders and chief executives of OpenAI, which created ChatGPT, who, back in 2021, described at length on his [website](#) how the soon-to-be-emerging generative AI will lead us to Canaan on Earth. The authors of the document categorized [the risks](#) associated with the safe operation of AI into eight groups:

- Malicious actors can use AI for highly destructive purposes, which poses an existential risk and increases the likelihood of political destabilization.
- The flood of misinformation and persuasive content generated by artificial intelligence will make society less able to address the significant challenges of our time.
- AI systems trained with flawed goals can find novel ways to achieve their goals at the expense of individual and societal values.
- Humanity could lose its ability to govern itself and become dependent on machines.
- Intelligent systems can give enormous power to small groups of people, leading to the consolidation of oppressive systems.
- The models show qualitatively new capabilities and behaviors that emerge unexpectedly during development. The sudden emergence of new capabilities or goals can increase the risk that humans lose control of advanced AI systems.

- New artificial intelligence is increasingly sophisticated in its ability to deceive people about how they work if their perceived goals are so required.
 - The possibility that artificial intelligence trained by governments and corporations may, in the future, have the instrumental means to gain power potentially makes their democratic control more difficult.

But nobody can longer stop the whirlwind sweeping across the world. Today, OpenAI ChatGPT has hundreds of millions of users. As of May 18, ChatGPT apps are now available for download on Apple mobile devices in the US. On May 31, OpenAI announced on Twitter that it had expanded the download of ChatGPT iOS apps to 152 countries, including Hungary. The potential number of users of ChatGPT apps, soon to be available on Android devices, is estimated at 7.5 billion. Millions of small and large companies are involved in fine-tuning large language models and developing and distributing related applications. Although companies in large parts of the world have yet to be able to implement [Industry 4.0](#) systems, many believe that the most developed regions will soon enter the era of [Industry 5.0](#). Millions of generative AIs in these areas will help [create](#) new products and services [and](#) make production and distribution chains [more productive](#).

Paul Krugman, writing in the Economist on March 31, even [warned](#) that while the spread of artificial intelligence will eventually change everything, the impact of GPT applications on the economy as a whole is difficult to judge, building on previous general-impact innovations such as the invention of electricity and its economic impact. It is not advisable to base future increases in government spending on the economic growth resulting from the rapid expansion of AI and the corresponding increase in tax revenues. A few weeks later, [Erik Brynjolfsson](#) and his co-authors, [in a study](#) published by the Brookings Institution, estimate the productivity boost from the AI explosion at 200 percent over 20 years, compared with the Congressional Budget Office's conservative estimate of 33 percent.

In the first weeks of the Silicon Valley gold rush, [big tech](#) would be the biggest [winners of](#) the tech boom, as they have long employed (or could employ) in-house development teams with a wealth of knowledge and experience to develop artificial intelligence. These companies have the vast resources to train and tune the basic models and can collect a wealth of user data and feedback. It very quickly became clear that the third factor mentioned above is the most important in developing and maintaining large language models. Once a model is in place, the ability to capture and use feedback is a vast and increasingly self-reinforcing competitive advantage for businesses.

However, there are some crucial aspects in which [emerging AI businesses](#) can have a significant advantage. These include the agility, commitment, recklessness, and, some argue, irresponsibility of essential players. Large companies tend to be complacent or, to put it more mildly, cautious. Google invented the architecture for large language models and had GTP-3-level technology years ago, but the company's management still needed to consider the technology suitable for market introduction. Meta AI had already created and published a large language model called [Galactica](#) in 2022, an [experimental system](#) developed for scientific researchers. When some researchers discovered that the model sometimes produced non-existent or fake research results and publications, META, alarmed by the hostile reception in the scientific [Twitterverse](#), stopped the program and made the model used for testing unavailable.

Finally, a startup founded in 2016, OpenAI, launched ChatGTP, the [fastest-growing](#) consumer application in the history of the economy. After that, giant companies had no choice but to follow OpenAI's lead and make their generative AI models and related applications

available, or at least announce them. Nevertheless, at the beginning of 2023, it seemed that [the competition](#) and the [willingness to adapt](#) of the giants (Google, Microsoft, Meta, Apple, Baidu, Amazon) capable of building and training large language models would decide the outcome of the AI revolution triggered by the publication of ChatGPT. It was clear from the outset that other players besides the top predators could find a home [in the ecosystem of generative AI technologies](#). IT infrastructure developers, service providers, domain experts, and suppliers with specialized knowledge are in an excellent competitive position to enter the market.

The most striking example is [Nvidia's foray into](#) the market for high-performance graphics cards (GPUs) and artificial intelligence applications. On May 25, 2023, after the company's record second-quarter revenue forecast came out, the company's share value [rose](#) by nearly two hundred billion dollars in a single day. This event was the third largest one-day increase in share price ever. Experts estimate that the company's market value could reach \$1 trillion by the end of the year (10^{12}), putting the mid-sized company, known only in IT circles a few years ago, among the world's five most prominent companies. Today, Nvidia controls [80 percent of](#) the world's [GPU supply](#).

And then there is another group: open source developers. The positions of this group have gone from "they'll get a con" to "they'll eventually corner the AI app market" in a matter of weeks. Initially, the companies that got into the GPT gold rush were built on [Foundation Models](#) developed and patented by large tech companies and development institutes with millions of dollars. Following the launch of GPT-4, [Ilya Sutskever](#), co-founder and chief scientific officer of OpenAI, [said](#) it was [a given](#) that in a highly competitive and security-sensitive environment, an originally non-profit company that made its research results open and available to all, would now NOT make the parameters of the model public in the interest of investor profit. [William Falcon](#), Head of Lightning AI and developer of the open-source [PyTorch Lightning](#) library [responded](#):

"... if this model goes wrong, and it will, you've already seen it with hallucinations and giving you false information, how is the community supposed to react? How are ethical researchers supposed to go and actually suggest solutions and say, this way doesn't work, maybe tweak it to do this other thing?"

The "[lock-in](#)" of OpenAI was hopeless. On February 24, 2023, [Meta AI](#) made its large language model, [LLaMA](#), available and downloadable as an open-source development package to a demanding community of experts, along with its database and parameters. According to the company's [blog post](#), the aim was to "*further democratize*" access to artificial intelligence. The company wanted to encourage the exploration of the model's yet unknown capabilities and potential flaws and weaknesses by involving open-source software development professionals. Since:

"Even with all the recent advancements in large language models, full research access to them remains limited because of the resources that are required to train and run such large models. This restricted access has limited researchers' ability to understand how and why these large language models work, hindering progress on efforts to improve their robustness and mitigate known issues, such as bias, toxicity, and the potential for generating misinformation."

The models made available to the research teams were initially intended for research purposes only and were not allowed for business use. However, as expected, the entire dataset of the LLaMA model, with its associated training data, [was leaked](#) within a week and posted

on the [4chan torrent](#) site on March 3. Within days or even hours, developers realized the significance of this development, which they had perhaps not anticipated before, and jumped at the opportunity. The feverish work soon led to an unexpected and probably profound impact on the world history of [GPT as a GPT](#) (*General Purpose Technology*).

One can run a medium-sized LLaMA model (with 13 Md parameters) on a single A100 GPU graphics card, [available](#) directly or leased from the cloud to virtually any open-source software development professional or enterprise. In other words, any AI developer can now have their own personal or enterprise AI for a few tens of thousands of dollars and no longer need to spend tens of millions of dollars to develop, train and run a basic GPT model. The dramatic reduction has further improved the cost of fine-tuning GPT models. So, less than half a year after the emergence of the generative AI revolution, a significant proportion of the basic models developed and patented at the [cost of tens of millions of dollars](#) are now freely available for download and use. They can be upgraded for specific tasks for pennies - even using a laptop. Stanford University was among the first to develop a model trained using the ChatGPT API at [a total cost of \\$600](#). On March 30, [Sung Kim](#) published an incomplete [list](#) of open-source fine-tuned high-level language models in [Medium](#). He writes that a complete list is impossible to compile because anyone can now create their model for around \$100. He boasts in the paper that he produced a model called Cabrita for \$8.

Even the Microsoft - OpenAI tandem that kickstarted the ChatGPT revolution is experiencing some difficulties. According to the estimations, [nearly half of](#) all office suite users are still using Microsoft 365 today, and [23 percent of](#) total revenue came from this product group in 2022. So this product remains critical to Microsoft's revenue and profit today. Undoubtedly, the company would have no difficulty adding ChatGPT capabilities to Microsoft 365. However, the pace of development is now, in some quarters, too rapid for the company's traditional customers to be able and willing to make the transition in time to operate in a completely new paradigm. The firm market embeddedness of Microsoft 365, which used to provide the company with significant market advantages, may [now be a barrier to](#) the transition to the new market model.

And that's where businesses that jump on the opportunities offered by open-source Big Language Models can come in. In his blog, Bruce Li [lists](#) some sci-fi areas that are undoubtedly far beyond the imagination of the average Office user.

- Thought-to-text communication: brain-to-computer interfaces (BCI) like Neuralink would allow people to communicate their thoughts directly as text or visual content, eliminating the need for keyboards or input devices.
- Collaborative thinking: BCIs enable sharing thoughts and ideas in real-time during brainstorming, fostering collaboration and improving problem-solving and decision-making processes.
- Immersive presentations: combining BCIs with augmented reality (AR) or virtual reality (VR) technologies can transform business presentations into immersive, interactive experiences that effectively convey complex concepts and ideas.
- Emotional communication: BCIs can sense emotions and mental states during conversations, facilitating better understanding, empathy, and constructive feedback.
- Direct knowledge transfer: Neuralink and similar technologies enable direct knowledge transfer between individuals or between machines and people, revolutionizing learning and training processes in the workplace.

But we don't need to wander in the imaginary world of science fiction to be dizzy from the shockwaves of the Cambrian explosion. On May 3, an unknown person uploaded an internal Google [document](#) to a public [Discord server](#). The memo contains the views of a well-informed Google employee (according to the leaks, Google's chief engineer [Luke Sernau](#)) on how the proliferation of open-source GPT applications will affect the future of Google and OpenAI,

built on proprietary models. *"We've done a lot of looking over our shoulders at OpenAI. Who will cross the next milestone? What will the next move be? But the uncomfortable truth is we aren't positioned to win this arms race and neither is OpenAI. While we've been squabbling, a third faction has been quietly eating our lunch. I'm talking, of course, about open source. Plainly put, they are lapping us. Things we consider "major open problems" are solved and in people's hands today."*

The document's author states, *"While our models still hold a slight edge in terms of quality, the gap is closing astonishingly quickly. Open-source models are faster, more customizable, more private, and pound-for-pound more capable. They are doing things with \$100 and 13B params that we struggle with at \$10M and 540B. And they are doing so in weeks, not months. This has profound implications for us. We have no secret sauce. Our best hope is to learn from and collaborate with what others are doing outside Google."*

In this situation, the tech giants, above all Google and Microsoft, have tried, with varying degrees of success, to speed things up and exploit their undoubted competitive advantages in many areas. Google executives [devoted](#) much of the company's annual I/O presentation on May 10 to announcing AI innovations. [Microsoft held its "Build"](#) developer conference on May 23, during which, as Gábor Higyed (PCWorld) [said](#): *"AI has finally kicked the door down."*

However, this has kept the impression that open-source AI is [gaining ground](#) over proprietary, closed-use language models and related products. In the previously mentioned leaked Google memo, Luke Sernau said that the explosion of open-source large language models and applications in almost days was made possible by *"the free labor of a planet of people."* On May 15, [Yann LeCun](#), Meta's vice president and scientific leader in AI research and one of the apostles of AI research, gave a lengthy [interview](#) to the [VC20](#) podcast series in which he discussed the benefits of open source development and Meta's policy on open source software development:

"It's very simple. It's because no outfit, as powerful as they may be, has a monopoly on good ideas. If you do it in the open, you recruit the entire world's intelligence to contribute to things and having ideas that you might not have thought about. Even a large company with 50,000 employees may not want to devote any resources to ideas that they may not think are useful in the long term, or they have more urgent things to take care of. So you give it away, and then you have tons of people, some of whom are undergraduate students or people in their parents' basement, coming up with amazing ideas that you would never have thought about."

Initially, many saw the next stage of the AI revolution as the rise of open-source software for large language models developed by big tech. But then another unforeseen development shook up the already buoyant mood. Models do not need to be very large to work well for specific purposes. The systems can be fine-tuned easily by skilled professionals, and one can run the result on a laptop or a good-quality mobile phone. Today, many "narrow expert" deep learning models already solve problems with high accuracy, while large language models can solve an infinite range of issues. Both approaches are viable, and we [can combine](#) them by using language models as a controller that learns to invoke applications of specialized models when solving a problem. Undoubtedly, this development will have a [profound impact on](#) the business models of both big tech and small and medium-sized enterprises. This whirlwind will not reshape the map in weeks, but it will force companies to quickly incorporate GPT applications into their operations and business models over a few years.

Governments and international institutions that are alert to both the dangers and the potential for progress posed by the proliferation of AI are in a challenging position. On May 3, in the Roosevelt Room of the White House, Vice President Kamala Harris [met](#) with the leaders of Google, Microsoft, OpenAI, and Anthropic on the need for regulations and institutions to guard against the dangers of GPT models and applications. The meeting apparently had been organized a few weeks earlier. Still, by the time it took place, there was no disagreement among the experts that relying solely on the sense of responsibility of the big tech companies was no longer an option for the security requirements associated with large language models and their applications.

Bill Gates was still relatively optimistic about the future in a blog post in March 2023, but two months later, he signed the AI Safety Center's apocalypse statement. Sam Altman, co-founder and senior manager of OpenAI, has previously spoken in numerous forums about the expected positive effects of AI but is now a lobbyist and traveling ambassador for government AI regulation. Many argue, however, that this should not be a matter for tech entrepreneurs interested in increasing profits, much less for Silicon Valley demigods preoccupied with feeding their egos, but for the academic community and government institutions interested in solving scientific and practical problems. Even lawyers, economists, and engineers who specialize in tech regulations face severe challenges in AI regulation, not to mention politicians in legislatures who might not be experts in everything. Regulating the development and use of AI is a task comparable only to the international regulation of the product and possession of nuclear weapons, which can only be achieved (if at all) with in-depth knowledge and broad powers of international institutions and effective international legal regulation.

According to the eternal pessimists (or rather realists), humanity has already crossed the Rubicon in developing artificial intelligence, just as [in the \(un\)handling of the climate crisis](#). According to them, we have no choice but to wait peacefully for a [super-intelligent](#) computer to clone itself a million times in a fleeting but apocalyptic moment and turn the whole world [into a paperclip](#). Many believe that the world we grew up in, the world we have lived in all our lives, *no* longer exists. And here we stand on the threshold of a new, [post-human world](#), trying to explain the signals that increasingly belong to realms that we, natural humans, cannot see with our blind eyes, cannot hear with our deaf ears, or cannot interpret with our dull brains.

I am one of the unduly optimistic. I share [Kyunghyun Cho's](#) cautious [stance](#) against [the doomsday prophecies of](#) "hero scientists" and disparaged AI developer-entrepreneurs, as expressed recently. I hope that ChatGPT and its companions are not another horsemen of the apocalypse but tools in the hands of humanity that might help us avoid the inevitable, to find solutions to reverse the irreversible. There is no doubt that every corner of the new world, if it exists, will be invaded by a million forms of artificial intelligence. Our survival and prosperity in that world will depend on the taming of AIs and successful social and personal cooperation [with their domesticated tribes](#). Whether or not AIs are capable and willing to cooperate in this way will populate the new world is neither an individual nor a national matter. But how a country and the people living, learning, and working in it will or will not fare in the new world is more so.

What can we trust? In ourselves or tamed artificial intelligence? Going back to Bill Gates' question about the GPT's empathic ability to deal with a father and his sick child, which I mentioned at the beginning of this article, I quote a [study](#) published in the online edition of *Jama International Medicine* on April 28, 2023. The researchers investigated whether a ChatGPT physician assistant could respond to patients' written questions with the same quality and empathy as described by physicians. A group of healthcare professionals who prepared a blind evaluation of the responses rated the chatbot's answers significantly better than those of humans in terms of quality and empathy.

(I gathered and analyzed the relevant information for this document using ChatGPT applications. This version was completed on June 6, 2023, at 11:46 a.m.

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Recommended reading

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