A GUIDE TO ARTIFICIAL INTELLIGENCE IN HEALTHCARE
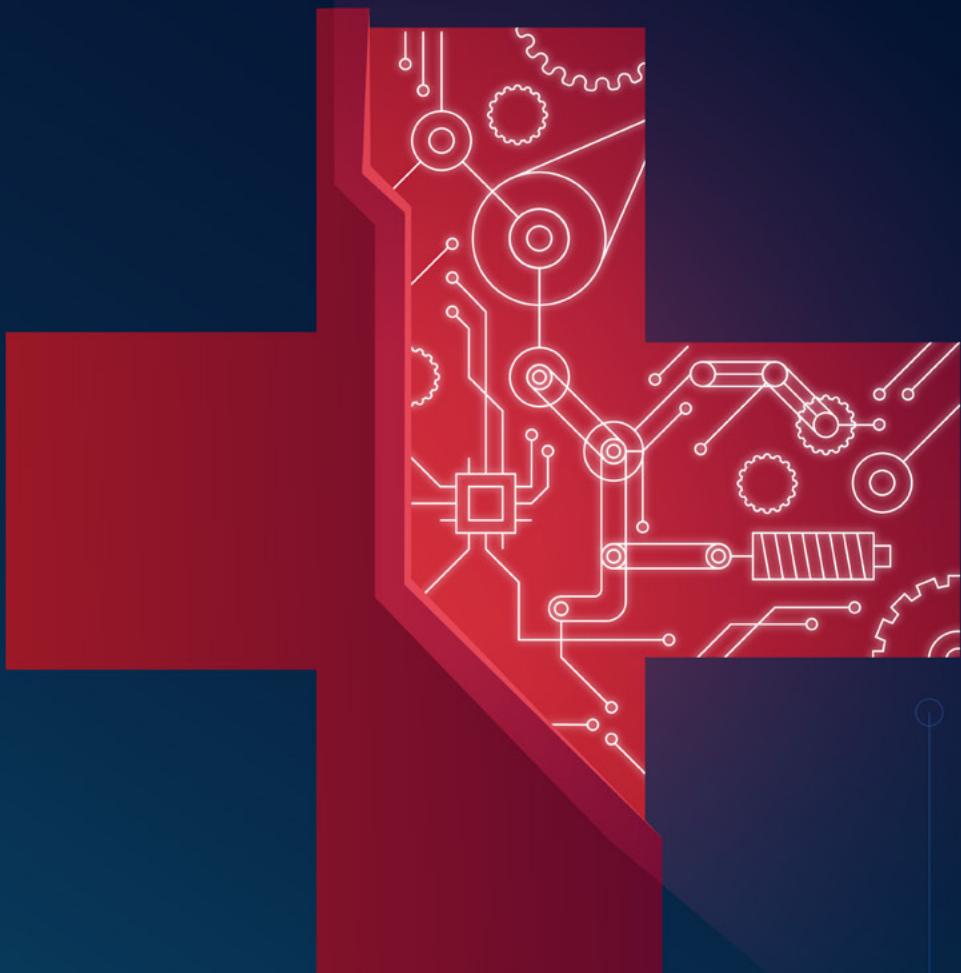

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CONTENTS

THE BASICS
OF ARTIFICIAL INTELLIGENCE

Artificial intelligence:
a reference point for innovation

2023 was the year of artificial intelligence in our medical futuristic world. Although we've been predicting for years that AI will transform healthcare, this revolution, which felt like a vague promise for years, suddenly became a reality.
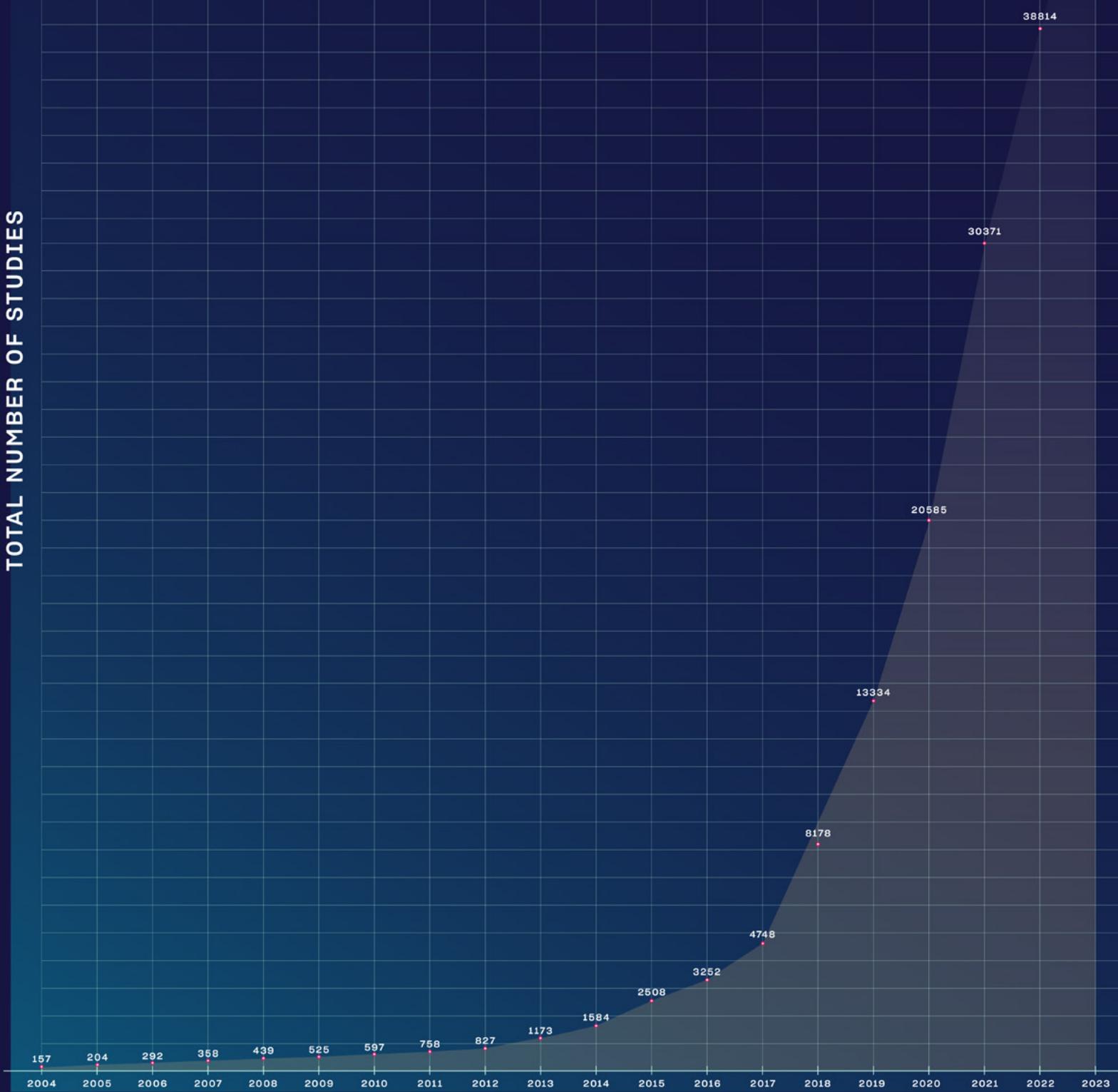
And this was not brought by a groundbreaking new technology. To determine why generative AI became such a big hit in the past year, we need to look for the explanation around public access. After all, AI (and AI in medicine) isn't exactly new.

In the last couple of years, artificial intelligence (AI) has evolved from a futuristic promise into an unavoidable reference point for innovation emerging from technology companies. But it was only a matter of time before the strategic importance of AI was recognized by fields other than the tech industry.

Indeed, this "AI fever" has spilled over from the tech industry and into politics, with governments around the world heeding its potential. This has even led to the visible AI race between countries; in particular between China and the West. But it has also led to more international collaboration through intergovernmental agreements and political steps to ensure the responsible development and use of AI. Like the Global Partnership on Artificial Intelligence (GPAI), jointly created by 15 governments and the European Union in 2020. Today, GPAI's 29 members are Argentina, Australia. Belgium, Brazil, Canada, Czech-Republic, Denmark, France , Germany, India , Ireland, Israel, Italy, Japan, South-Korea, Mexico, Netherlands, New-Zealand, Poland, Senegal, Serbia, Singapore, Slovenia, Spain, Sweden, Turkey, United Kingdom, United-States, European Union.

MACHINE AND DEEP LEARNING STUDIES ON PUBMED.COM

TOTAL NUMBER OF STUDIES

43230

38814

30371

20585

13334

8178

4748

3252

2508

1584

1173

827

758

597

525

439

358

292

204

157

| 2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023

As such, large language models, deep learning, machine learning, smart algorithms and other terms pertaining to AI have become commonplace in virtually every sphere of society. In short, the technology started to reshape the world as we know it.

Nowadays, the technology makes regular headlines for its application in various sectors from finance to education; and it's also making waves in the life science field. For instance, the number of life science studies published around AI rose from 1,600 in 2010 to 7,300 in 2020 and to almost 25.000 in the past one year. And those algorithms are not confined to labs but are also used in practice, such as the hundreds of startups using AI in drug discovery alone. AI became the ultimate buzzword in the startup sector and healthcare is one of the major targets of innovations. With such growing interest, analysts forecast the global market size for AI in healthcare to skyrocket to $187.95 billion in 2030.

However, with everyone's eyes turned to the AI field, the hype factor comes into play, with news reports as well as for-profit companies inflating the potential of AI This has led to misrepresented news such as the story about how Facebook shut down an AI experiment because chatbots "developed their own language." This is just one of the swarm of similar articles aggravating fears about AI becoming conscious and annihilating the human race.

In the past year, figures like Tristan Harris spread fear, Harari claimed that this is even worse than nuclear war, major tech companies and moguls called for a six-month moratorium on the development of large language models (though it's clear that nations such as China won't halt their progress), countries banned it, and Silicon Valley has split into fractions. Other than raking in advertisement revenues, such *clickbait-y* articles also work to drive interest away from the AI field, which holds the potential to enhance healthcare in myriad ways from eliminating alarm fatigue to revolutionizing clinical documentation.

As such, it becomes ever-important to understand the possibilities and limits of AI by first getting a firm grasp of what constitutes as an AI. For this purpose, we issued this e-book as a comprehensive guide focusing on AI in healthcare.
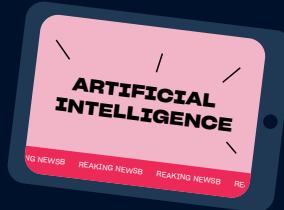
Fears and expectations about AI

"Artificial intelligence is generating breathtaking capacities and alarming possibilities," said Antonio Guterres, the UN's Secretary-General, during the United Nation's 75th anniversary. Since AI came into the public narrative in recent years, the technology has mostly been treated according to those two extremes that Guterres talked about: the source of ultimate evil aiming for the destruction of mankind or the means to solve every trouble on Earth. The UN's Secretary-General even added in his speech that *"lethal autonomous weapons — machines with the power to kill on their own, without human judgment and accountability — are bringing us into unacceptable moral and political territory."*

Other prominent figures echoed similar sentiments. The late Stephen Hawking famously said that *"the development of full artificial intelligence could spell the end of the human race".* In 2020, Elon Musk said in an interview with the New York Times that after working with AI at Tesla himself, he can confidently say that we're on a path where such algorithms will vastly outsmart humans. In a more recent interview he predicted this to happen as soon as next year.

Musk added that his "top concern" is the Google-owned AI lab DeepMind. *"Just the nature of the AI that they're building is one that crushes all humans at all games,"* he said. *"I mean, it's basically the plotline* in War Games."

War Games and other science-fiction stories also swing sentiments about AI towards the negative extreme. These artistic interpretations go full on the robots-usurping-humans depiction such as Terminator's *Skynet* being hell-bent on exterminating us or humanity getting enslaved in *The Matrix*. To prevent such doomsday scenarios from materialising, Elon Musk and others support organisations like the Future of Life Institute that work to keep AI safe and beneficial for humankind.

However, Max Tegmark, co-founder of Future of Life Institute, writes in his [book](#) *Life 3.0* that the notion of humans programming a machine to hate humans is rather preposterous and is fuelled by Hollywood's fascination with dystopian tropes. But he also cautions against believing that AI will transform our life into a sort of sci-fi utopia. Tegmark takes a more centrist approach between those two poles, writing that we should create a path between those two extremes, enjoying the benefits of AI while building safeguards around it.

The other, positive end of the spectrum

But these dystopian depictions have made way for tales that lean on the more positive extreme. For example, the movie *Interstellar* presented an efficient symbiotic relationship between humans and AI; while *Her* explored what happens when humans fall in love with artificial intelligence.

In addition to works of fiction, similar trends can be seen in non-fiction work. For instance, the [AI Index](#) initiative from Stanford University [previously noted](#) that the media have become more positive about AI in recent years. The latest report even noted how many models released in 2023 received positive social media sentiment.
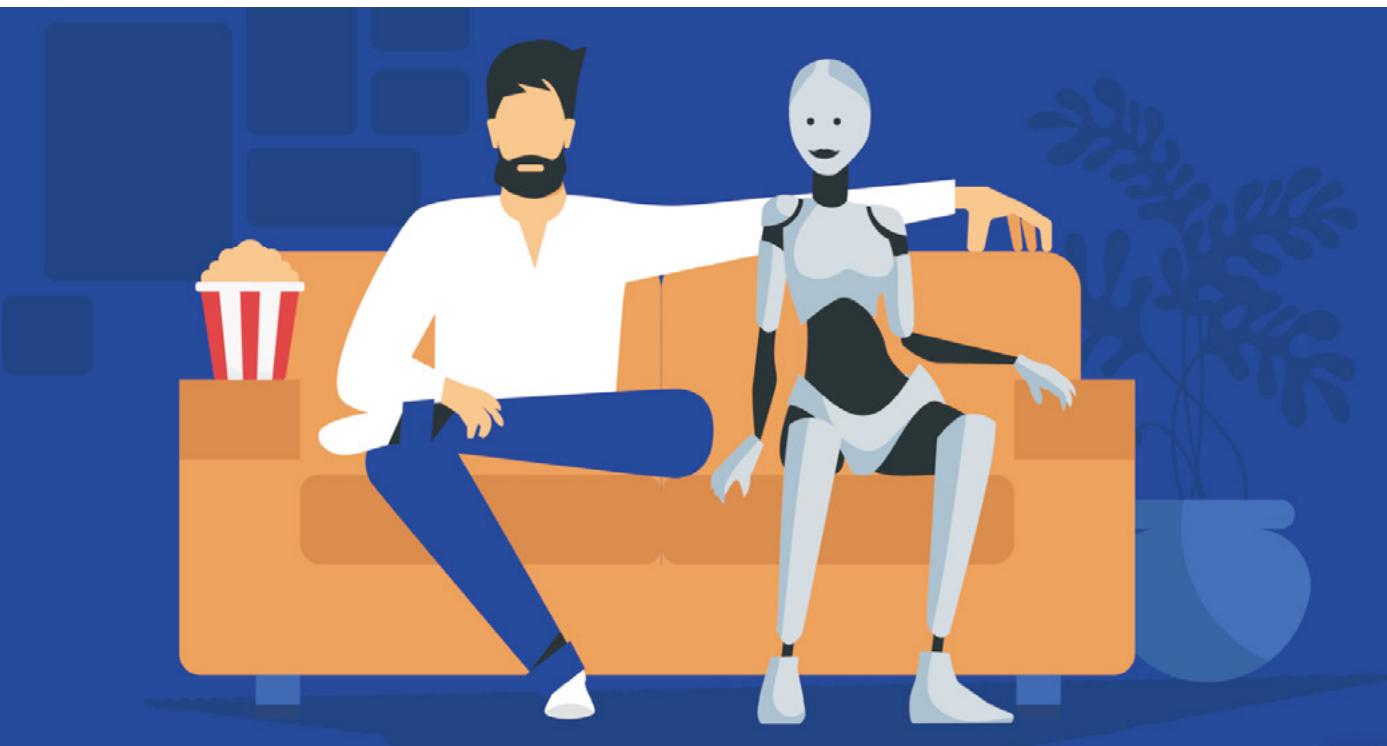
This shift towards a more positive stance could be explained by a wider recognition of AI's potential to positively disrupt industries as well as to handle specific tasks better than humans. In healthcare, such disruption can come in the form of chatbots [helping in triaging](#) or as [virtual assistants](#) for radiologists aiding in decision-making.

As the plan of AI researchers worldwide is to stop before developing artificial general intelligence, we think that Elon Musk's decade-old fear that we might be "[summoning the demon](#)" with AI development is way too exaggerated.

The quest for balanced views on AI begins

Nevertheless, even positive attitudes about AI might be inflated. The [Gartner Hype Cycle](#) can give an indication about this. Represented as a graph, this cycle represents technologies' maturity and adoption and helps in discerning hype from what's commercially viable. In the [Gartner Hype Cycle for Emerging Technologies](#), Generative AI is are positioned on the "Peak of Inflated Expectations" or even before, meaning that there are still a couple of years before they reach the "Plateau of Productivity", where mainstream adoption starts to take off.

As such, we should take a more balanced view on the technology, somewhat akin to Max Tegmark's position. To recalibrate our expectations when it comes to [AI in healthcare](#), we should better understand its risks and potentials. The applications of AI in healthcare [are still scattered](#) but they are coming. You might already be using them when using a [skin checking app](#) or a [smart sleep alarm](#). AI is able to [beat radiologists](#) when identifying cancerous lesions in medical images, or nurses in identifying condition-specific [disallowed over-the-counter medications](#) and resident doctors in [a number of specialties](#).
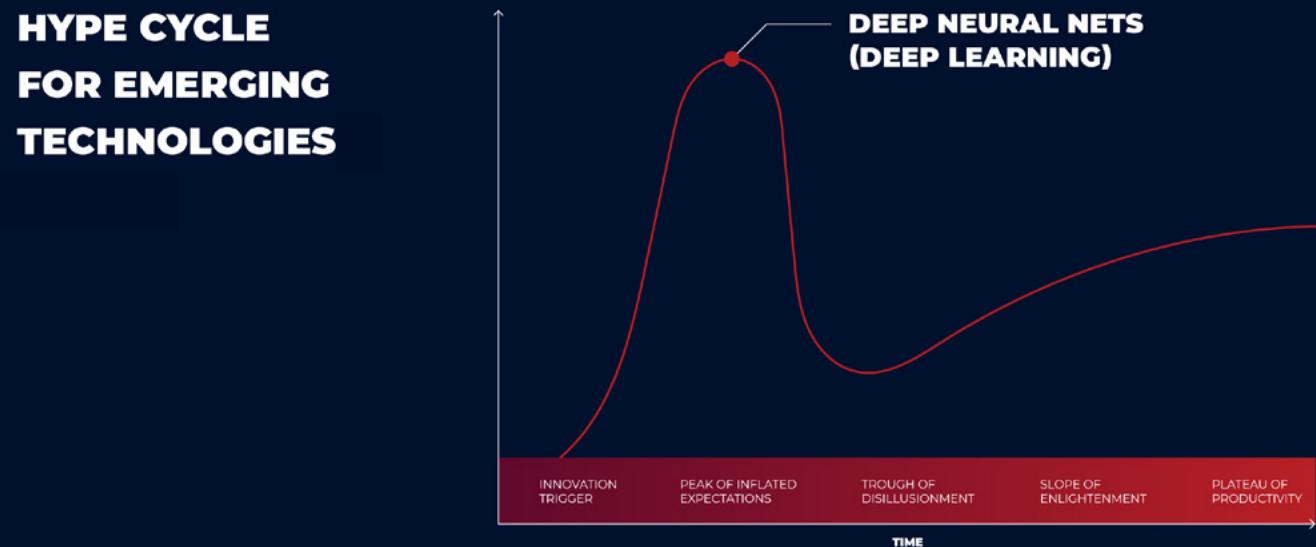
With such advances in AI, Sun Microsystems' co-founder [Vinod Khosla even forecasted](#) that algorithms would replace 80% of doctors. But such claims are taking things too far. Instead, it's more accurate to say that those doctors who don't use AI will be replaced by those who do so. To visualise how this can be the case, let's take a look at the traditional board game of chess.

In 1997, IBM's supercomputer Deep Blue [beat Garry Kasparov](#), the world's best chess player at the time. Experts thought that this would spell the doom of the board game; after all, who would want to play a game where an unbeatable AI that only gets better after each game reigns supreme. But the number of chess enthusiasts did not falter. On the contrary, it kept growing, with [one early study](#) approximating the number of chess players to the same as that of regular Facebook members. In 2020, Netflix series *The Queen's Gambit* [reignited interest](#) in the game; even though the best chess players are arguably algorithms, namely [Alpha Zero](#), [Stockfish](#), [Komodo](#), [Leela Chess Zero](#), and [Fat Fritz](#) dominate the rating lists.

Humans are still far behind in chess, but chess players have made peace with it and have embraced the technology. By studying AI's innovative tactics, [chess players can get new insights](#) that help them improve their own strategies. Chess coaches use the technology to train their students. Even spectators can get real-time evaluation with the help of AI to understand grandmasters' way of thinking. Fun fact: modern chess engines are so powerful that you cannot allow them to play games from the initial position, otherwise they will draw every game. Thus to see how they perform in challenging situations, it is best to give them preset opening lines to play challenging matches. Typically these lines have an advantage large enough to permit chances at a victory, without guaranteeing it. For example, to see how they do in tense positions of [a hundred 2024 Candidate games](#).

As such, chess has taken a new dimension with artificial intelligence, where the latter dominates the discipline but still helps humans improve at the game. However, **a person who ventures into the world of chess without the assistance of AI will not fare very well in the competitive scene.**

A similar scenario is likely to unfold in the field of medicine, with a cooperation that merges humans' creativity and empathy with AI's predictive prowess. Rather than a competition, the technology should be seen as that amplifies human performance. But to achieve a cooperation between those two players in healthcare, we must embark on a quest to better understand what we are dealing with.