

FROM ARCHYTAS TO CHATGPT:

The AI Evolution

2025



ChatGPT, Gemini, DeepSeek and other AI chatbots have become part of daily life for hundreds of millions of people worldwide. The origins of AI technology date back thousands of years – the greatest minds throughout the history were fascinated by entities that could replicate human intelligence. In this paper, we are looking at the benefits and downsides of the AI age through the lens of AI's history.

A GLANCE AT THE PAST

Artificial intelligence refers to the development of computer systems that can perform tasks that would typically require human intelligence. The concept of AI has been around for centuries – though the term itself was born in the mid-20th century, there were philosophical and scientific concepts that anticipated some of the key ideas and debates surrounding AI in Ancient Greece and Rome. One example is the concept of automata, mechanical devices designed to imitate or replicate human actions. The ancient Greeks and Romans were fascinated by automata. They created different types of machines, including self-moving statues and even a “mechanical robot-bird”¹ that could imitate the behaviour of a pigeon². Apart from serving as a model for Plato’s philosopher king, the inventor of automata, Archytas of Tarentum (the ancient name for today’s Taras, Italy), was a well-admired mathematician of his age. One of his greatest inventions was the mechanical dog. According to legend, the mechanical dog was allegedly powered by steam and could move its legs and tail, bark, and even lift its leg to urinate. The details of how the mechanical dog actually worked are lost to history, but it is believed to have used a series of pulleys, gears, and valves to achieve its movements. The device

was likely intended as a demonstration of Archytas’ ingenuity and mechanical skill, as well as a tribute to the power and beauty of the natural world.

One of the most significant ancient philosophers, Aristotle, also had his thoughts on automata. Aristotle believed that the machines could never truly replicate the complexity and diversity of living organisms³. In his view, living things had a unique quality called psyche that could not be replicated by mechanical devices. Aristotle argued that psyche was the principle of life and growth in living things, and that it could not be reduced to mere mechanical processes. While he recognised that machines could imitate or replicate some aspects of human behaviour, he believed they lacked the self-awareness, creativity, and intentionality that characterised living organisms. Nevertheless, Aristotle was fascinated by automata and their ability to simulate or replicate natural processes. He wrote extensively⁴ about the design and construction of machines, and his ideas (especially those expressed in his work “Mechanics”) influenced many philosophers and scientists who were interested in creating intelligent machines.

Aristotle

Greek philosopher,
384–322 BC

After the Antics

While Europe was entering the Dark Ages, the Middle East saw the rebirth of ancient ideas and philosophy, a period that is commonly described by historians as the Islamic Golden Age. One of the most influential figures in this tradition was the scholar and inventor Al-Jazari, who wrote “The Book of Knowledge of Ingenious Mechanical Devices”. The book contains detailed descriptions and illustrations of more than fifty mechanical devices, many of which were designed to imitate human or animal behavior. Many of his inventions served as a direct influence on Leonardo da Vinci’s projects. His most famous invention, “The Musical Boat”, could play music using a system of bells, drums, and other instruments. Al-Jazari also created a humanoid automaton — “Drinking Slave” — which could pour wine and offer it to guests, as well as several other automata that could perform various tasks⁵.

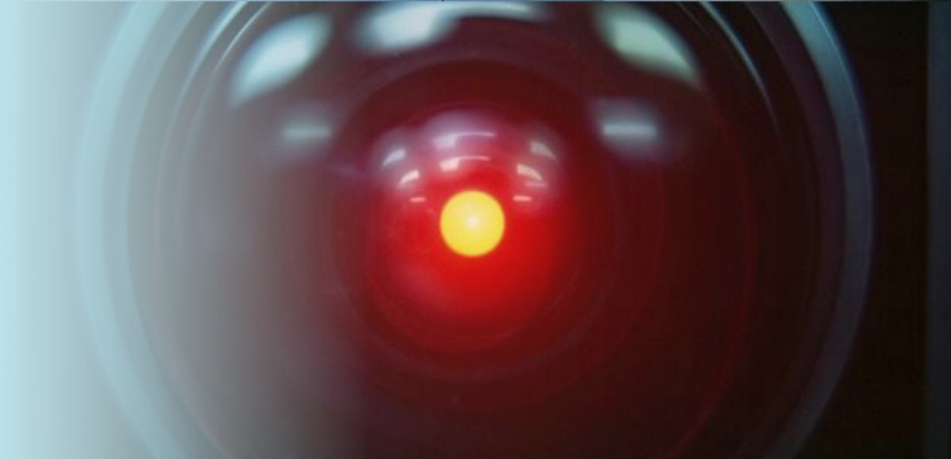
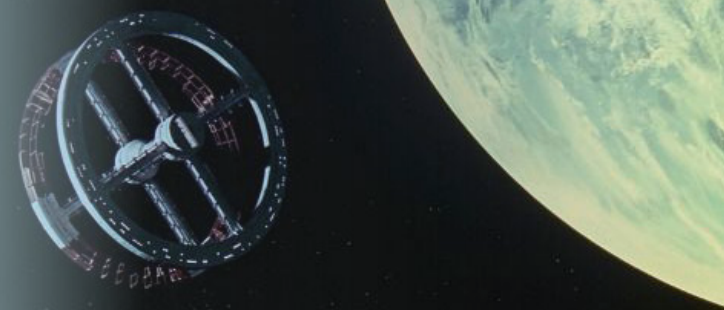
Another important figure in the medieval Arabic tradition of automata was the scholar and polymath Ibn al-Haytham, also known as Alhazen. A pioneer in the field of optics, his work on the behaviour of light influenced later developments in the study of lenses and mirrors. His other works dived into the possibility of creating intelligent machines and speculated about the potential uses of artificial intelligence⁶. While the ideas of medieval Arabic scholars on automata and artificial intelligence are not as known in the West as those of Greek and Roman philosophers today, they played an essential role in the development of technology and engineering in the Islamic world. Many of their ideas and inventions were later adapted and improved upon by European inventors during the Renaissance and Enlightenment periods.

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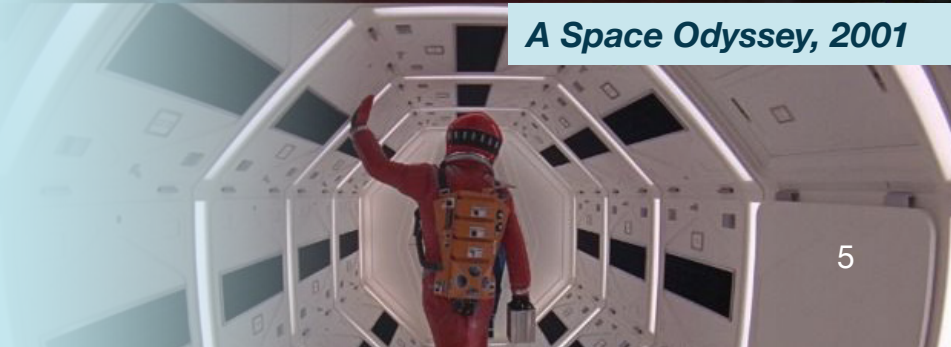
The German philosopher **Gottfried Wilhelm Leibniz** believed that machines could be used to perform complex logical operations and even proposed creating of a universal language that could be used to communicate with intelligent machines⁹.”

The interest in machines that could replicate human behaviour in Europe was later driven by advances in mechanical engineering and clockmaking, which allowed inventors to create increasingly complex and sophisticated machines. One of the most famous examples of a Renaissance automaton is the “Mechanical Turk,” the chess-playing machine made by the Hungarian inventor Wolfgang von Kempelen in 1769. The Mechanical Turk was designed to look like a Turkish man seated at a chessboard and was able to play chess against human opponents using a system of levers and pulleys hidden inside the machine. Although it was later revealed that the Mechanical Turk was controlled by a human operator, it was still seen as a remarkable feat of engineering and automation⁷. Enlightenment saw a period of growing interest in the possibility of creating machines that could reason and think like humans. The French philosopher and mathematician René Descartes wrote about the possibility of creating “thinking machines” that could perform complex calculations and reason deductively⁸. The German philosopher Gottfried Wilhelm Leibniz speculated about the potential of artificial intelligence and is often credited with inventing the first mechanical calculator, called the “Stepped Reckoner.” Leibniz believed that machines could be used to perform complex logical operations and even proposed creating of a universal language that could be used to communicate with intelligent machines⁹.

In the recent history, one of the most significant achievements in the world of technology became the discovery of programmable computers. The first electronic computers were built during the Second World War and were primarily used for military applications and scientific calculations. The researchers and developers soon began to explore the possibility of using these machines to simulate human thought and intelligence. One of the earliest pioneers in the field was the British mathematician and computer scientist Alan Turing, who proposed the concept of a universal machine that could perform any calculation that could be performed by a human. Turing also developed the idea of the Turing test, which involved evaluating a machine’s ability to mimic human conversation and behaviour. In the sixties and seventies, there was a surge of interest in artificial intelligence research, and many researchers believed that it was only a matter of time before machines would surpass human intelligence. Popular culture was also full of ideas about how the 21st century will already be a fully robotic era with enormous achievements in the IT sector (e.g. 2001 – A Space Odyssey). It was later proven that such speculations were unrealistic; the AI was mainly beset by problems such as limited memory capacity and difficulty in handling and analysing complex real-world information.



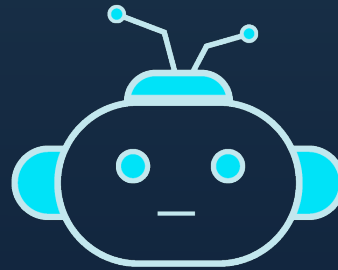
A Space Odyssey, 2001





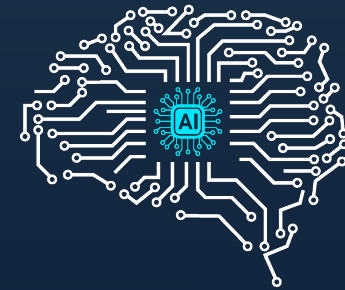
Neural Networks

1950 - 1970



Machine Learning

1980 - 2010



Deep Learning

Today



The Modern Developments

Another critical development during the post-WWII period was the emergence of the field of cognitive science, starting in the 1950s, which brought together researchers from psychology, neuroscience, and computer science to study the nature of human cognition and the possibility of creating intelligent machines. One of the key insights that emerged from cognitive science research was the idea of

symbolic AI (rule-based AI), which proposed that intelligent machines could be created by programming them to manipulate symbols and represent knowledge in a formalised way. This approach was based on the idea that human cognition involves the manipulation of mental symbols, and that a similar process could be replicated in machines. Connectionist AI (neural networks) emerged as a competing approach

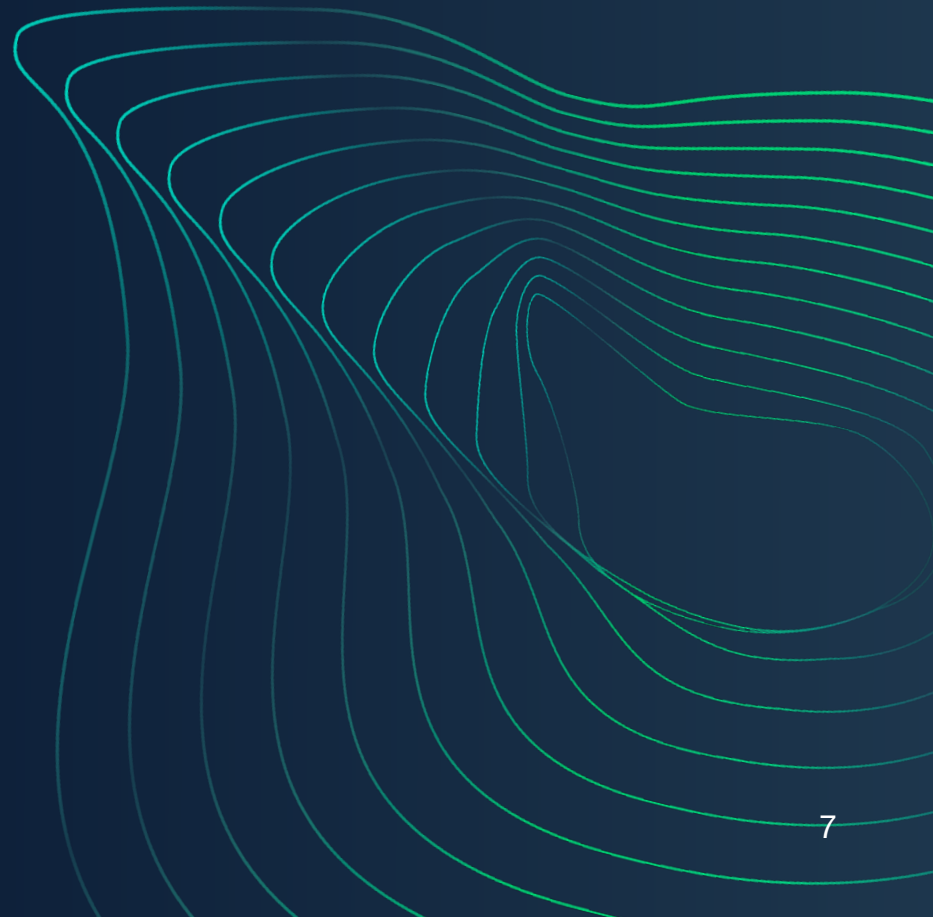
to symbolic AI in the 1980s. It was based on the idea of modelling the structure and function of the brain using networks of interconnected nodes, called neurons, to process information in parallel. This approach was inspired by research in neuroscience that suggested that the brain's ability to learn and adapt was based on the way that information was processed by interconnected networks of neurons¹⁰.

WHAT CAN WE EXPECT FROM AI IN THE 21ST CENTURY?

The development of AI technology has progressed rapidly over the past few decades, with the widespread availability of high-speed computing power and the emergence of big data and machine learning techniques.

Artificial intelligence is currently being used not only for voice recognition and natural language processing, but for various complex tasks, from medical monitoring to driving cars without human interference. Apart from ChatGPT, real-life examples of “early” AI include Siri and Alexa, which use natural language processing to understand and respond to spoken commands, and Google’s AlphaGo program (which defeated a

world champion at the game of Go using machine learning and deep neural networks). More than 25 years ago, IBM’s Deep Blue computer defeated world chess champion Garry Kasparov in a six-game match, marking the first time a computer had beaten a human world champion at chess¹¹, while today systems like Stockfish are virtually unbeatable by even the most capable chess masters.



Mens Sana in Corpore Sano

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The use of AI can drive the
costs of healthcare services
down drastically.”

The healthcare revolution has basically already begun. This might be the most important sector on the list – healthcare is an industry where we have seen a sharp increase in costs across the decades (and that is disregarding the COVID-19 crisis, which amplified the effect). The use of AI can drive the costs of healthcare services down drastically. First, AI technology can automate all the subsidiary routine tasks related to healthcare that are currently performed by humans, such as scheduling appointments, processing insurance claims and handling miscellaneous administrative tasks. This drives the cost of labour down and, subsequently, makes the product or service cheaper for the end user. Second, AI was shown to be a reliable tool for predictive analytics and preventive care. This would lower the demand for costly trial-and-error treatments and enable the patients to discover their health conditions in the early stages, allowing the patients to make lifestyle changes and receive preventive treatments, eliminating the need for expensive medical interventions and treatments at the later stages. AI-powered monitoring systems

can also help patients receive care from home, so they don't need to pay for hospital stays. A number of virtual health assistants already provide medical advice, diagnose symptoms, and help patients with their medications. This can reduce unnecessary medical appointments for minor issues, which further shortens the waiting lists – a process that could be very useful for countries with universal healthcare.

Apart from decreasing prices, AI can also improve the quality of medical services. AI can assist radiologists in medical screening and interpreting medical images more accurately and quickly, leading to earlier detection and diagnosis of diseases. For example, Google's DeepMind has developed an AI system that can diagnose eye diseases by analysing retinal scans and accurately predicted the 3D structure of proteins, a major breakthrough in biology. Some companies are using AI to help radiologists identify and classify breast cancer lesions. Some AI products can also help accelerate the process of drug discovery by predicting which molecules are likely to be effective in treating specific

diseases. BenevolentAI¹² is the prime example of using AI to analyse vast amounts of data to identify new drug candidates, while Atomwise¹³ uses AI to design drugs by simulating the interaction between molecules and proteins.

AI is already used for the analysis of electronic health records (EHRs) to identify patterns and make predictions about outcomes, thus enabling a more personalised care. The Mayo Clinic and MedAware use AIs to analyse EHRs for the identification of patients' risks of complications and prevention of unwanted drug effects¹⁴. Artificial intelligence can also help the surgeons “in action”: performing and assisting in complex surgeries by providing real-time feedback and improving precision. For instance, Intuitive Surgical's da Vinci Surgical System, uses AI to assist surgeons in performing minimally invasive surgeries with greater precision and control¹⁵. Da Vinci system has influenced many newer MedTech breakthroughs like Medtronic's Hugo RAS system and CMR Surgical's Versius.

EdTech

The sector of education might be the next place where we could see visible improvements thanks to artificial intelligence. One of the biggest problems of current educational systems in most parts of the world is the one-size-fits-all approach. How can this be combated? Artificial Intelligence can help provide personalised learning experiences tailored to each student's individual needs, interests, and learning styles. By analysing data on student performance and behaviour, AI algorithms can identify areas where students may be struggling and provide customised feedback, resources, and support

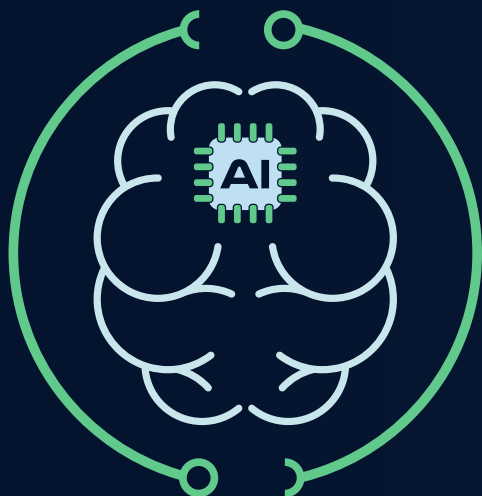
needed to help them succeed. AI-powered tutoring systems can also help students learn more effectively by adapting to their individual needs and providing instant feedback. These systems can help students learn at their own pace and reduce the need for relatively expensive one-on-one tutoring sessions.

But it's not only the students that could benefit from the adaptive technology. AI can also be used to automate grading and assessment tasks, freeing up teachers' time for other activities. AI algorithms can analyse student work and provide instant feedback on performance,

allowing teachers to focus on more meaningful aspects of teaching and learning. Just like it's already been discussed in the topic of healthcare, AI can be used to automate a number of different administrative tasks here as well. In this case, it would include scheduling classes, managing student records, and handling routine communications. It goes without saying that such approach can help different educational institutions work more efficiently, reducing labour costs and making education less expensive and more accessible to the society at large.

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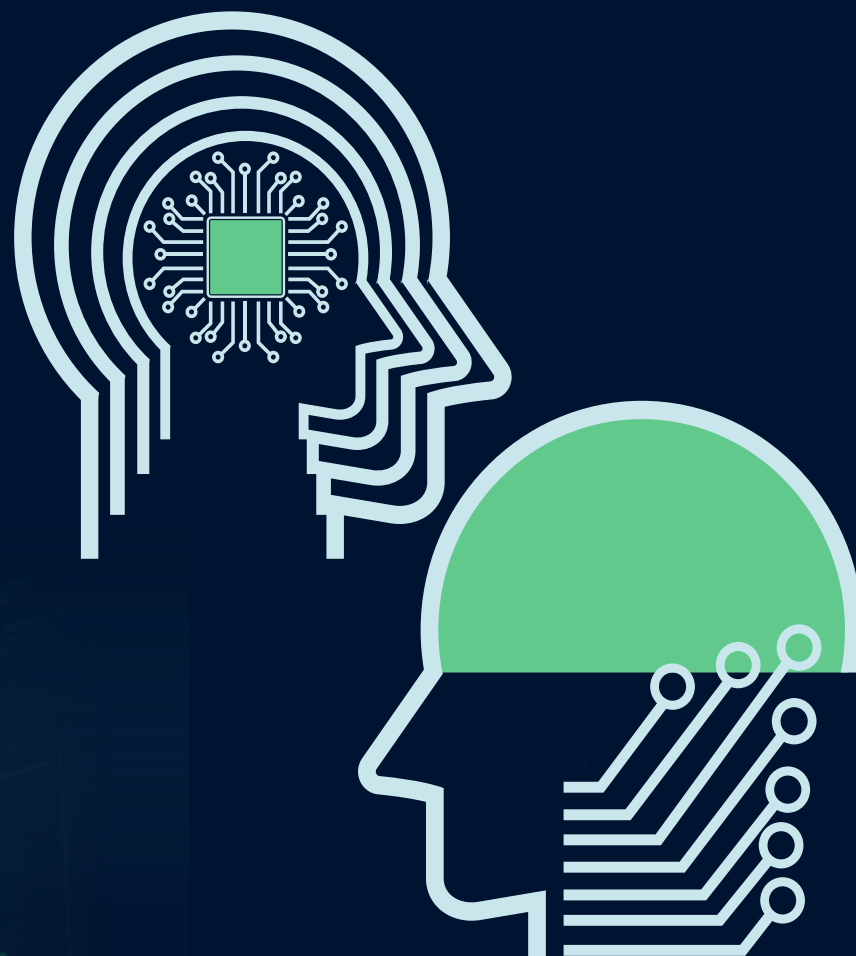


FinTech

Artificial intelligence could completely change the world of business and finance as we know it today. FinTech is already a growing market, with an increasing number of financial institutions using complex algorithms for tasks that used to be performed by humans. In the last couple of years, we have seen the “quants” becoming more and more popular. “The rocket scientists of Wall Street”, as they are commonly called, already use a number of AI-powered programs for high-frequency trading and analysis of data – helping investors make more informed decisions and improve their overall performance on the market. AI also has a vast potential for the detection and prevention of fraudulent behaviour in financial transactions: by analysing large amounts of data and detecting patterns that may indicate

fraudulent activity, algorithms can help financial institutions protect themselves (and their customers) from losses.

AI could be used to optimise supply chain operations in the future by predicting demand patterns and optimising logistics to reduce costs and improve efficiency. Recent failures of financial institutions such as SVB and Credit Suisse show that financial institutions continue to bear the costs of ineffective risk management and hedging strategies. AI can be used to identify and manage risks in various industries, including the banking and insurance business. By analysing data and identifying potential risks, AI can help companies make more informed decisions and mitigate potential losses.



Transportation

Self-driving cars are a “hot” industry nowadays. Companies like Waymo and Tesla are investing heavily in the development of self-driving cars, intending to make transportation safer and more efficient. Waymo’s autonomous vehicles have already logged millions of miles on public roads in the US, while Tesla’s Autopilot system has been available in its cars for several years. While there are reports of system errors at early stages of implementation, there are reasons to feel optimistic that self-driving cars will get even better with time. Even though this has been a widely discussed topic when it comes to transportation and AI, it’s not only the private sector that is collecting the fruits of modern technology. Los Angeles, London, Barcelona, Dubai and many other metropolises are experimenting with using AI to optimise traffic flow by adjusting traffic signals in real time based on traffic patterns. In Singapore, the city’s traffic management system uses AI algorithms

to predict traffic demand and optimise the timing of traffic lights, resulting in smoother traffic flow and reduced congestion¹⁶.

Transportation companies like Delta Airlines are using AI to predict maintenance needs for their aircraft, helping to prevent breakdowns and improve reliability¹⁷. By analysing data on factors such as engine performance and weather patterns, a company can identify potential issues before they become significant problems. Other companies, like FedEx and Amazon, are using AI to their advantage to optimise routes and logistics. This lowers the delivery times and costs, as the programs take into account information like weather, traffic and delivery priorities to find the most efficient paths from point A to point B. DHL has also developed an AI-powered forecasting tool that can predict demand for certain products, helping the management plan for inventory and delivery needs more accurately¹⁸.

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AgriTech

Artificial intelligence is slowly transforming farming from traditional to modern practice. This trend is usually referred to as Smart Farming or Precision Agriculture.

One of AI's most important uses is its capability to predict and analyse crop yield, using software like FarmVibes.AI. Those allow farmers to forecast harvest by analysing various data regarding soil health or historical yields. This feature reduces risk and improves profitability, which is why it is becoming increasingly used even in smaller farms.

AI-powered systems like CropX are also making resource management more efficient. By using all the data available, algorithms provide up-to-date information about soil moisture and nutrient levels. This allows for variable rate application of water and other substances, which further ensures each plant receives exactly what it needs, thereby reducing waste and lowering input costs.

Another major application is pest and disease detection. Similarly to being used in human healthcare, computer vision models can analyse crop imagery to spot plant stress, disease, or insect infestation early - often days before a human would notice. This

early detection enables targeted, localized treatment instead of broad-spectrum chemical application, leading to better crop yields. In addition to other factors, it's not only cars that are getting more and more innovative because of AI. Automation using AI-driven autonomous tractors and other mechanical devices addresses labour shortages while increasing efficiency in planting and harvesting, ensuring optimal use of every piece of land. For example, John Deere's See&Spray system can distinguish between a crop plant and a weed while the machine is moving and spraying herbicide exclusively on the invasive species.



Defence

A US Army general recently told the media that he sometimes uses ChatGPT to help him make military decisions. The role of AI, however, goes beyond that. One of the most interesting developments in today's military industry are autonomous systems, such as Unmanned Aerial Vehicles, commonly referred to as UAVs. These machines operate with little to none human input and are able to act independently. This means that during combat, these systems will be able to accomplish tasks on their own and therefore minimize possible damage for humans. Undoubtedly, they are often more precise than humans.

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Apart from military autonomous systems used in the actual combat, AI is having a bigger role behind the scenes as well. The US military has set up a program called “Project Maven” that uses AI to analyse big amounts of data from different sources like satellite images to identify possible military targets. Other militaries in the world have also been investing in similar projects that are focused on “algorithmic warfare”. In addition to that, modern militaries around the world use AI-powered systems inside their machines or vehicles to predict when the parts of the system are likely to fail. Similarly to predicting possible health complications with humans, artificial intelligence is

used to preemptively signalise if there is something wrong with, for example, an aircraft engine. This prevents system breakdowns or machine malfunctions and saves money and time for the military.

One of the relatively new concerns is cybersecurity. The artificial intelligence software can be very useful in detecting attacks on the military network systems and alarming the personnel if someone is trying to infiltrate inside the network – however, it can be argued that the hostile actors trying to attack the military systems can also benefit from AIs in terms of planning and executing the operation.



Entertainment

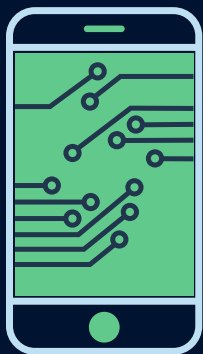
Whenever someone opens Netflix or Spotify, there is a long list of recommendations based on the previous behaviour of the user. Artificial intelligence is excellent at analysing the consumption patterns and recommending media that could be interesting to the client. The advertising works in a similar fashion – the targeted ads are reaching those people that are most likely to interact with it.

On a more operational level, AI is increasingly used in entertainment production. Apart from AI-generated

texts, music or scripts that are flooding the market, many video editors and sound engineers use AI software. These systems can be used for advanced audio mastering and mixing or for applying complex visual effects to films. Similarly, the video-gaming industry uses AI to produce codes needed for the development of games or for helping developers debug the parts of the game. AI is also used to analyse the behaviour of the player to adjust various parameters of the game in real time, most notably the game difficulty.

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Unfriendly AI

Yes, we could talk about benefits for hours and hours, but are there any potential downsides to the AI expansion? Certainly. A particularly contentious issue is job displacement. The biggest concern about AI is that it could lead to job losses as machines become better at performing tasks traditionally done by humans. Returning to the example of self-driving cars, we can see an entire profession potentially disappearing in the near future — namely, drivers. The same could be said for medical counsellors, which could be replaced by chatbots. That being said, it is highly unlikely that drivers and medical counsellors will be fully replaced by AI. Another issue that should be taken into account is security and privacy online. As AI becomes more ubiquitous, there are concerns about the security and privacy of personal information. Hackers could potentially use AI to launch more sophisticated attacks, while companies could use AI to collect and analyse vast amounts of data about individuals without their knowledge or consent.

Data mismanagement is already a pressing problem for some organizations, and AI has the potential to make the problem even graver. Another concern is the potential for AI to be used in malicious ways, such as to develop autonomous weapons systems or launch large-scale propaganda campaigns. As benevolent as some deepfakes used for comical purposes are, AI content creation opens a whole another dimension of possible misuse and spreading of fake news. And last but not least, there are also ethical concerns about the use of AI, particularly in fields like healthcare and criminal justice. Some worry that AI could be used to deny healthcare or insurance to certain individuals based on predicted health outcomes, or that it could perpetuate biases in criminal sentencing. Moreover, there is a big number of young people using AI chatbots for mental health issues instead of talking to therapists, which can result in suboptimal outcomes and damage the said mental health of teenagers in the long run.



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AI AS THE FORCE OF GOOD

There is no doubt that AI is a tool for the advancement of human knowledge and well-being. Human beings are capable of achieving great things, and AI can be used to augment that ability. AI can help humans to make better decisions, solve complex problems, and improve the efficiency of various industries. However, the usage of AI needs to be responsible. AI should be used to enhance human life, not replace it. The ultimate goal of AI should be to serve human beings, not to dominate them – as long as AI is fulfilling its purpose by making our lives easier, it should be fully embraced and welcomed in our

society. The evidence proves that private individuals and companies are much better off when they are able to develop and use AI technology as they see fit. The development, deployment, and operation of AI systems shall be governed by existing legal frameworks concerning individual rights and non-discrimination. Regulatory bodies must establish enforceable mechanisms to ensure that individuals are protected from potential harm caused by AI applications. The use of AI is subject to the same legal and ethical standards applicable to human conduct.

THE **LEGAL** LANDSCAPE

The legal status of AI varies across different countries and jurisdictions, although a number of countries still don't have laws that are directed at artificial intelligence. The European Union has already was the front-runner of AI regulation, adopting a comprehensive framework for regulating AI - the European AI Act. The Act establishes clear rules and guidelines for the development and use of AI, including requirements for transparency, accountability, and human oversight. In the United States, there are currently no specific laws or

regulations governing the development and use of AI, although there are various guidelines and ethical frameworks that have been proposed by industry groups, NGOs and academic organization. On the opposite side of the globe, the Chinese government has made it their goal for the country to become a world leader in AI by 2030¹⁹. Chinese companies like Huawei have been spending huge amounts of money in the previous decades investing in research and development.

The EU Regulatory Framework

The Artificial Intelligence Act was the legal revolution on the global stage. Although the regulation has already celebrated its first anniversary since the (partial) implementation, it is still early to evaluate its effectiveness and the impact it has on the tech industry.

However, the Act introduces some ground rules for the AI software. Unless the AI is used exclusively in the military or for national security purposes, software is subjugated to risk evaluation. This means that every AI system is evaluated and placed on a tier within the so-called risk pyramid. The general purpose behind this approach is that the AI applications have different obligations that correspond to their potential to cause harm.

On the top of the pyramid are unacceptable risk AI systems. These include AI used for “social scoring” by governments, like systems that grant or deny public services based on behaviour. Real-time biometric identification in public spaces is also prohibited in most part, with only a few exceptions for graver crimes. Right below them are high-risk systems, which, while being generally allowed, come with a number of obligations. This category

includes AI used in critical infrastructure, like managing electricity grids, or in essential public services, such as evaluating credit ratings. These systems must meet requirements for data quality, accuracy, human oversight, transparency, and cybersecurity. Companies deploying high-risk AI also need to conduct fundamental rights impact assessments to make sure they don't harm vulnerable groups disproportionately.

Further down the pyramid, the next category includes limited risk systems. These mostly involve transparency obligations, such as stating that an image has been AI-generated. At the bottom of the pyramid are minimal risk AI that face the lowest number of restrictions as they pose little to no threat for humans, although the member states have the discretion to impose additional obligations.

The Road Ahead

Regulating newly emerging technologies will continue to be challenging, as the direction of their development remains uncertain. The release of GPT-5 was a crucial step towards reaching Artificial General Intelligence that could allegedly make AI undistinguishable from a human. The developments of the coming years and decades remain uncertain. However, as long as AI is used in compliance with the highest industry and legal standards, it can be a powerful ally, with enormous potential to improve the world.



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Written by:
Marko Savić
Communications Intern

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www.bkagency.co
contact@bkagency.co