Zbigniew Gajewski

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How artificial intelligence will change our lives in 5 years

Report Partners:

CENTRE FOR INTERNATIONAL RELATIONS

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INTRODUCTION

The dissemination of artificial intelligence will be such a leap that we will quickly forget what it was like before - predicts futurologist Kevin Kelly, founder of the American magazine "Wired".

I also have no doubts that all the scenarios described here will definitely happen. Why? Because the underlying technologies already exist. Some are still at the stage of laboratory tests, others could already be used, but they are too expensive and unprofitable for users.

However, the spread of the 5G Internet, the Internet of Things and the development of cloud computing services will foster the proliferation of AI-based applications, while reducing their costs. So there will be a snowball effect.

We can only argue about the scale of changes that will be made by AI in various areas. The degree of their revolutionary nature and universality depends on several factors, the most important of which is our mentality. The technological revolution in recent years is happening so fast that we are not catching up to it. But when we see that in every place we come into contact with AI systems: at home, at work, on TV, in a smartphone, in a cinema, in a fitness studio, in a clinic and in a hospital, artificial intelligence helps people and makes life easier, we will try to like.

We will have no other choice anyway. It will not be possible to embrace this huge amount of information and technological change ... without artificial intelligence. Yes, the changes brought about by its rapid development will help us to control it. In addition, over the next 5 years, voice-based, natural language interfaces to AI systems will become commonplace. This will also greatly help us accept them.

So let's see what it might look like in different areas.

Chapter I

EVERYONE CAN HAVE OWN
ARTIFICIAL INTELLIGENCE
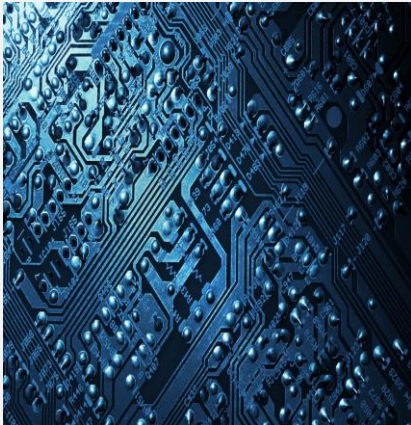
How is it today?

Everyone can have a digital assistant today as long as they have a smartphone. There is Siri in I-phones, Google Now in Android smartphones. At the end of 2019, Deloitte experts announced that over a third, or almost 520 million of all smartphones sold in the world this year, will have artificial intelligence chips. We have Microsoft Cortana in every Windows 10 PC. If we have uploaded Google applications, the Google Assistant can support us. Alexa Amazon has become the assistant of the whole family in many homes around the world. These are just some examples. Every large technology company has ambitions to offer individual clients its own version of the digital assistant. Of course, these programs are supported by artificial intelligence, they learn faster and faster, and therefore they already arouse our interest.

Digital assistants make an even greater career in business. Chatbots are almost everywhere today and can successfully pretend to be human. We use their services without even knowing it. Meanwhile, by the end of next year, 85 percent. interaction of companies with customers is to take place without human participation. This is announced by chatbotslife.com. Its authors also inform that annually customers all over the world submit 265 billion inquiries, requests and complaints[1]. Servicing them costs business USD 1.3 billion, and chatbots reduce these costs by as much as 30%.

How do we use our digital assistants today? In Poland, many users of digital equipment have not even heard of them. Others, although they have such knowledge, use the assistant

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[1] https://chatbotslife.com/chatbot-2019-trends-and-stats-with-insider-reports-fb71697deee4

rarely or not at all. We have no such habits or needs. But the American e-marketer portal estimates[2] that already last year 1/3 of Americans used virtual assistants at least once a month, and this indicator will grow every year.

Today's "assistants" generally offer the same to all users of the same equipment. You can adapt some services to your needs, but we still use the mass program. In 5 years everything will be different.

In 5 years and beyond

The paths for the development of artificial intelligence identified so far logically lead to the creation of personal digital assistants, whose capabilities will exceed the current ones by several classes. Each of us will be able to have an extensive AI application for private and professional use.

Its physical form is not yet decided. Most likely, in the organization of everyday life, we will be helped much more by smart smartphones or smartwatches, but next to them there will be several other ways of communicating with personal artificial intelligence. For the most courageous, and probably also wealthy, a chip implanted in the brain area will be available, which will be the transmitter of wishes formulated in thoughts. Via a smartphone, computer or directly, they will be transferred to a data center supporting this technology.

Older people will probably choose a humanoid robot. He can talk in their natural language, and even - sensing the owner's poor mood - will talk to him on his own initiative and offer to play checkers or scrabble, play his favorite music or make a video call with family and friends. He can also notify the emergency services when he hears a broken window pane or

"The advancement of digital voice assistants such as Amazon Alexa, Apple's Siri and the Google Assistant is leading to a fundamental change that will impact any business. Customers, partners, employees - each person - will expect cooperation with brands from every industry through voice interfaces"

Peter Schwartz, senior vice president of strategic planning for Salesforce

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[2] https://www.emarketer.com/content/voice-assistant-use-reaches-critical-mass

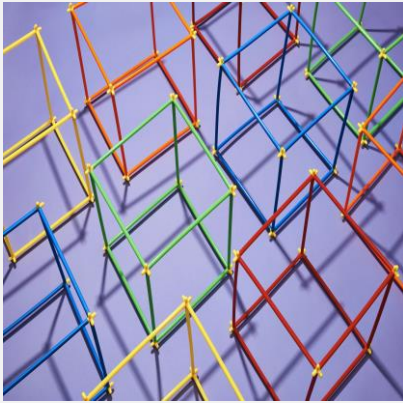a fall of a man, as long as he does not register the sounds of his rising.

In the family version, it can be a device like today's Alexa, which will stand on the dresser, alertly waiting for questions or commands from members of the home community.

Regardless of the form, such a digital assistant will work for us as a high-class concierge, whose services are offered to VIP customers by some banks or the most expensive car assistance packages. He will buy theater tickets, plan his vacation in detail and pay for all related services, and order flowers for his sister's birthday. He will make an appointment with a doctor and present him with the results of monitoring your blood pressure, heart rate and blood sugar levels. Then she will make sure that you are taking your medications.

Once a day, he will report on the inspection of home appliances and ask for approval of the purchase of products for the refrigerator and consent to order a service engineer for a dishwasher, which will otherwise break in 3 days. In the morning, while bathing, he will summarize the most important news. While eating breakfast, you will discuss with him tasks for today, including the list of meetings and errands.

And at work? It will upload to the projector and display the multimedia presentation you gave it to finish the project. Co-workers will praise its multimedia form, brilliant conclusions and tasteful graphics. After the meeting, the assistant will summarize the discussion in a matter-of-fact manner and send notes to its participants, and on LinkedIn will publish an article discussing the conclusions you reached. Then he will remind you of the next tasks and will suggest that you have an emergency meeting with your colleague, which is not on the schedule today, or have it during lunch, because his assistant signaled that the matter is urgent.

Virtual assistant will also be your easily accessible knowledge base. You will ask by voice, and he will immediately find an

In my opinion, the virtual assistant will show the greatest value as an educational system. It will be the best teacher in the world. Both for children and adults. First, he will do a series of different tests for you and find out what your abilities, teaching predispositions are and the best time to do so. He will also adapt the program, methods and pace of learning to these arrangements.

Today, we most often meet chatbots serving clients. They reduce the costs of this service by 1/3, but they are not yet technologies that fundamentally change the business. The true potential of AI lies in its ability to learn faster than humans, transform data into information, and then into knowledge, and apply it to support human decisions and automate business processes.

answer to each, literally every question and present it briefly and generally or as long as you like in detail. It translates information from any language in real time. She will answer you in a nice anonymous female or male voice, or the voice of your favorite teacher from popular nature films. He will also explain to you matters he knows require additional information. It will save it all on your laptop if necessary.

Of course, most of these tasks can be performed by an assistant human, but certainly not so quickly. But the virtual assistant of the future will know even more. Much more.

In my opinion, it will show the greatest value as an educational system. It will be the best teacher in the world. Both for children and adults. First, he will do a series of different tests for you and find out what your abilities, teaching aptitude are and the best time to do so. And he will adapt the program, methods and pace of learning to these arrangements. He will read important content to you on the way to work or propose a few 15-minute lessons a day in front of a computer or TV screen, with pictures, diagrams or videos.

If you are primarily a visual learner, you will see carefully selected images with augmented reality glasses. If you have a good memory, you will be able to learn 100 new English words at once or do it at a slower pace.

Such artificial intelligence-based educational systems are already present in education. The Aleks system[3] created by ALEKS Corporation, a world leader in this field, helps millions of pupils and students. Integrating this type of solution with a virtual assistant is a simple, technical matter.

Personally, I believe that this method will work especially in adult education, because we are faced with the need to learn the world to come, almost from scratch.

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[3] https://www.aleks.com/highered

SCIENCE WILL CROSS THE LIMITS OF KNOWLEDGE

How is it today?

Only from February to May 2020, the number of scientific papers published on COVID-19 increased from 29,000. to over 138,000, and by the end of the year there are to be over a million. How to find what is most important or needed in this thicket? The World Health Organization faced this challenge, which is why it commissioned a quick analysis of over 170 recent scientific studies from around the world on the effectiveness of social distancing and face masks in fighting the pandemic (the analysis shows that their use reduces the risk of infection by more than 80%).

The review, cited around the world, was created thanks to, inter alia, Evidence Prime, a Polish-Canadian company dealing with artificial intelligence, based in Krakow. The company affiliated with the Canadian McMaster university created the LaSeR system - Living Systematic Reviews, which was used to quickly verify the scientific work used in the analysis[4].

This example shows that even today artificial intelligence can synthesize even the most scattered scientific achievements in the world, which creates revolutionary perspectives for scientists and humanity. Many universities have already set up research groups that address the machine learning techniques needed to automate learning.

In May 2020, one of the most advanced in creating AI applications, belonging to Elon Musk, OpenAI introduced GPT-3[5] - Generative Pre-Transformer, a new version of its program for writing texts and talking to people. The program was trained on a trillion words from websites, all Wikipedia

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[4] https://evidenceprime.com/laser/
[5] https://www.gwern.net/GPT-3

content, and thousands of books describing the current state of human knowledge in many fields. And its possibilities are amazing.

GPT-3 "understands" the context between words and sentences, so it creates new sentences, paragraphs and entire texts on a given topic. He can be asked any question, e.g. medical. Instead of a website, we will get an exact answer along with a description of the biological mechanism behind it. We can ask him to talk to any historical figure and we are about to interview King Louis XVI.

The properties of GPT-3 can be easily adapted to science. Kirk Ouimet, one of the authors of medium.com, September 17. presented his dialogue with GPT-3 on what happened before the Big Bang on this website[6]. Elsewhere, when asked which year people are 90 percent likely to create general AI, the program lists the year 2029[7].

In addition, GPT-3 writes poems, novels, song lyrics and composes music to them, also creates graphics. In total, it is today the most developed artificial intelligence program in the world, and it took OpenAI only two years to strengthen its capabilities by 116 times compared to the previous version.

Scientists have been using artificial intelligence for several years, especially in research that needs to process large amounts of data. For example, IBM is making the IBM RXN[8] available to all interested parties - its interactive tool to predict the results or recreate the course of millions of chemical reactions and synthesize any molecules. This is the first free web service for simulating chemical reactions.

In turn, the Iris company, established by an international team of AI researchers, offers the scientific community a special

Buckminster Fuller, the 20th century American visionary and inventor, argued that by 1900 human knowledge had doubled approximately every 100 years. Already from 1945, there was a double increase every 25 years. Today, on average, human knowledge grows by 100 percent. every 13 months.

According to IBM, the rise of the Internet of Things will soon lead to knowledge doubling every 12 hours.

6 https://medium.com/ai-in-plain-english/artificial-intelligence-explains-what-happened-before-the-big-bang-e4a9e7fefbab
7 https://medium.com/ai-in-plain-english/artificial-intelligence-explains-what-happened-before-the-big-bang-e4a9e7fefbab
8 https://rxn.res.ibm.com/

assistant, which is a combination of many tools[9]. They allow you to explore knowledge in any discipline, including summarizing articles or searching over 70 million scientific documents according to many different criteria. For example, you can paste your own research paper into the Iris search engine and in a moment get a map of research on the subject from around the world.

The aim of the creators of this platform is to soon create an easy and accessible navigation through the entire world science, because for now Iris.ai only searches the results of open access research.

The great challenge today is to control the enormous scientific and technological achievements of mankind. The number of new discoveries and solutions is growing rapidly. Even the most brilliant man, a research team, a university, and even the strongest countries cannot grasp it. But artificial intelligence can handle it.

In 5 years and beyond

There is no doubt that the number of AI systems to analyze, summarize, and draw conclusions from a growing body of research will grow rapidly. And this will accelerate the advancement of science to such an extent that IBM's forecast of doubling human knowledge every 12 hours will become reality. Importantly, AI itself will not only help accelerate scientific discoveries, but will also record them and deliver conclusions to interested research centers around the world.

By 2025, I predict that AI will be as ubiquitous in conducting experiments as computers are used today to control research instruments and record data. Moreover, sophisticated AI systems will help scientists make decisions about which research topics to develop first.

It will also be possible to monitor the achievements of partners or competitors working on the other side of the globe, and this will force scientists to collaborate or abandon their research topics because others have already achieved more. There will also be systems for translating the language of science into a more popular one, understandable to scientists from other disciplines, which will give a new impulse to interdisciplinary

[9] https://iris.ai/features/#explore-tool

There will also be systems that translate the language of science into a more popular one, understandable to scientists from other disciplines, which may give a new impulse to interdisciplinary research. They have a huge potential, because today the obstacle is the ever deeper and narrower specialization of all fields of science.

research. They have enormous potential, because today the obstacle is the ever deeper and narrower specialization of all fields of science. The laity will also benefit from the easy availability of scientific knowledge, if they wish, of course.

All this together gives hope that mankind will be able to use the achievements of science to solve its biggest problems to a much greater extent than in the last decades. For that to happen, however, two great challenges must be overcome.

"Across all scientific disciplines, the newly discovered ability to combine and compare data from different sources will improve the accuracy and predictive power of scientific discoveries and help define future directions for research, thus establishing a new starting point for empirical research," write researchers[10] from Stanford. But at the same time, they warn that synthesizing knowledge from inconsistent sources can lead to results "whose scientific relevance and reliability will be difficult to assess." And this is the first challenge, prosaic, because it is common in the development of AI. First, the research community will have to share the way of presenting the results of their research, which in turn requires collaboration and openness, which is the second major challenge.

However, I am convinced that the process of integrating science with artificial intelligence will not be stopped. That is why we will soon witness the verification of many discoveries made simultaneously in many places around the world, and then their integration. Soon after, a new wave of research and solutions will emerge to help us cope with climate catastrophe, hunger and pandemics.

However, while in 5 years, AI will support the development of every field of knowledge, it will not replace scientists in formulating hypotheses. Algorithms will acquire this skill only in the following years.

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[10] Leonelli, Sabina, „Scientific Research and Big Data", *The Stanford Encyclopedia of Philosophy* (wydanie lato 2020), Edward N. Zalta (red.), URL = https://plato.stanford.edu/archives/sum2020/entries / science-big-data /

THE ECONOMY WILL BE MORE EFFICIENT

How is it today?

AI-based solutions are already present in the economy more often than we manage to see. The most common are chatbots serving clients, which I wrote about earlier. They reduce the costs of this service by 1/3, but they are not yet technologies that fundamentally change business. The true potential of AI lies in its ability to learn faster than humans, transform data into information, and then into knowledge, and apply it to support human decisions and automate business processes.

And business already uses a lot of this potential. In the e-commerce industry, AI supports supply chain planning, targets advertising campaigns and offers consumers their favorite products. Algorithms improve logistics and, based on data collected from traffic on the website and in social media, assess the demand for a specific assortment. Thanks to this, the e-shop can order goods in advance and eliminate the risk of stock shortages.

Without AI support, it would also not be possible to machine-translate large amounts of content such as product descriptions on international e-commerce platforms almost instantly, accurately and naturally. Machine translation-assisted chatbots are able to almost instantly respond to customer inquiries from all over the world.

AI applications also help you manage your business. Algorithms control key performance indicators, collect data from various sources, e.g. spreadsheets, monitor financial liquidity, create reports with tables and diagrams, which helps in making key decisions. Many companies use AI applications to prepare their annual reports, and this process is already 100 percent automated. AI also improves the recruitment of employees. Applications that automatically profile candidates, collect data

Entrepreneurs, like most people in the world, need time to mentally adjust to the technological leap, as is happening today. "Businesses will adopt AI not only because they can, but because they must," said Ritu Jyoti, vice president of the AI program at IDC. In his opinion, artificial intelligence will help companies operate more flexibly, innovate faster and, as a result, grow faster than their competitors.

about them and compare their qualifications are already widely used.

The financial sector is rapidly adopting AI-based solutions. Traditional banks already offer automated investment advisory services tailored to the client's profile. The increasingly popular fin-techs base their entire activity on new technologies, including AI.

According to the Microsoft report "AI & Skills" from research conducted in March 2020 in Poland and in 19 other countries[11], 23 percent of these more advanced AI solutions are used large companies operating with us, 44 percent he is introducing them, and the others are not thinking about it yet. But 4/5 of those who have already implemented AI claim that it brings very tangible business benefits.

More skeptical opinions were presented in June 2020 by Technology Quarterly, a supplement to The Economist[12]. They show that AI technologies in business generate too little benefits, so they should not be expected to flourish. In turn, other data show that the current pandemic has stopped this year's implementations in many companies around the world. A year ago, every fifth one introduced them, now only every twenty-fifth.

Despite this skepticism, the number of ready-to-use AI business applications is growing rapidly. There are many more of them than companies can implement. Entrepreneurs, like most people in the world, need time to mentally adjust to the technological leap, as is happening today. "Businesses will adopt AI not only because they can, but because they must," said Ritu Jyoti, vice president of the AI program at IDC. In his opinion, artificial intelligence will help companies operate

[11] https://news.microsoft.com/pl-pl/2020/06/30/badanie-microsoft-ai-motywuje-firmy-do-podnoszenia-umiejetnosci-pracownikow/
[12] https://www.economist.com/technology-quarterly/2020/06/11/an-understanding-of-ais-limitations-is-starting-to-sink-in

Overcoming the communication barrier to the business supplier that the advantage of AI is primarily lifting the lifts and all ports. Large companies will be able to afford dedicated solutions, precisely tailored to their specificity. Smaller ones will buy the so-called box systems, for example, a ready-made e-shop with AI components sewn into the software.

more flexibly, innovate faster and, as a result, grow faster than their competitors.

Therefore, the future of artificial intelligence in the economy is assured and in 5 years it will be visible to the naked eye.

In 5 years and beyond

The popularization of AI systems in the economy will take place thanks to:

1. gradual reduction of their costs
2. simultaneous efficiency improvement
3. simplifying operation.

The first and second processes accompany all innovation, and there is no reason why this should be any different. The third factor has some specificity. Companies offering AI solutions for business will have to simplify their operation. There are common concerns that AI is too complex for ordinary people to use. Therefore, developers of AI systems, due to the ease of use, must convince potential buyers that AI-based solutions are not only worth the price, but also easy to use. There are no employees with appropriate IT qualifications today, and this deficit will continue to grow.

The Polish Industrial Development Agency estimates that by 2025 only our country will need 200,000. specialists in artificial intelligence[13]. Of course, there is no chance of educating them by then. Therefore, controlling AI applications must be done mainly by means of voice commands and simple touch panels. Fortunately, communication with AI based on natural language is already possible today, and it will become more and more precise over time.

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[13] https://www.parp.gov.pl/component/content/article/58357:do-2025-r-polska-bedzie-potrzebowac-ok-200-tys-specjalistow-zajmujacych-sie-sztuczna-inteligencja?utm_source=newsletter&utm_medium=ezdym razie mail&utm_campaign=newsletter_parp

The SME sector will automate all repetitive tasks, use intelligent analyzes and recommendations in all areas of activity, update the prices of products or services on an ongoing basis depending on macroeconomic changes or generate the necessary reports within seconds.

Overcoming the communication barrier will allow entrepreneurs from all industries to see that the advantage of AI is primarily increasing efficiency in virtually all areas of activity.

Large companies will be able to afford dedicated solutions, precisely tailored to their specificity. Smaller ones will buy the so-called box systems, for example, a ready-made e-shop with AI components sewn into the software. Thanks to them, the SME sector will also automate many processes, including all repetitive tasks. It will also use intelligent analyzes and recommendations in every area of its activity, including updating the prices of products and services on an ongoing basis depending on macroeconomic changes or generating reports necessary to make decisions within a few seconds.

All companies, large and small, will know and understand the needs of their customers much better than they are today. Thanks to this, they can reach them with a very individual advertisement and a very individualized product. If the company has 100,000 recipients, thanks to the integration and processing of data about them, it can theoretically create 100 thousand. separate marketing strategies, and certainly create the impression that it provides everyone with a unique User Experience. AI systems will also help design new products and services.

In manufacturing enterprises, no device will have the right to break down. Manufacturing AI systems detect any faults before they happen. The risk that any parts or materials will not arrive on time will be minimized to zero. Supply chains will also be managed by artificial intelligence.

Today, many entrepreneurs get lost in the sea of information about the market and competitors. Thanks to AI applications, they will be able to follow the market situation and all steps of

Developers of AI systems need to convince potential buyers that AI is worth the price and easy to use. There are no employees with appropriate IT qualifications today, and this deficit will only get worse.

the competition, including its social media and opinions of their customers (they will also be tracked).

As I wrote earlier, each employee and manager will be able to use a personal assistant. This will significantly improve their efficiency, and thus the efficiency of the entire enterprise.

In view of the constant improvement of technology, all employees will also have to constantly acquire new knowledge, and assistants will become their teachers.

The most important thing in all this is that improvements in companies will translate into higher efficiency of entire economies. I am convinced that they will also contribute to solving problems that plague all mankind. Optimizing production and supplies will reduce the amount of waste, extend the life cycle of products and materials, and reduce greenhouse gas emissions.

In 5 years, people freed to a large extent from routine activities will devote more time to creative activities at work and in their free time. The role of the culture and entertainment industry, which is already an important branch of the economy today, will increase significantly. Thanks to AI and other technologies, such as virtual and augmented reality, far-reaching personalization of the business offer and user experience will be made.

For example, television, available not only on TV sets, but on many other devices, including augmented reality glasses, will offer us not only an individual program. We will also be able to co-create the watched productions, co-designing their scripts and choosing the characters of your favorite hosts or actors, including those who are no longer living. Similar innovations will catch on in video games.

Generally, in 5 years, AI systems will be used by almost all global business players and every second of the remaining companies. Not because they can, but because they have to.

Chapter IV

PUBLIC SERVICES WILL IMPROVE OUR LIFE

How is it now?

Public services, such as universal education and health care, are the problem of most societies in Europe and other continents. Their effectiveness could be significantly improved by artificial intelligence. For now, however, the public sector is clearly lagging behind business when it comes to implementing appropriate solutions. In Europe, there is also a clear distance between the west and the east of the continent. According to the recent IDC European Tech and Industry Pulse Survey[14], 30 percent. public sector institutions from Western Europe already use artificial intelligence algorithms, and another 20 percent. plans to implement them. In Central and Eastern Europe, these rates are 3 and 8 percent, respectively.
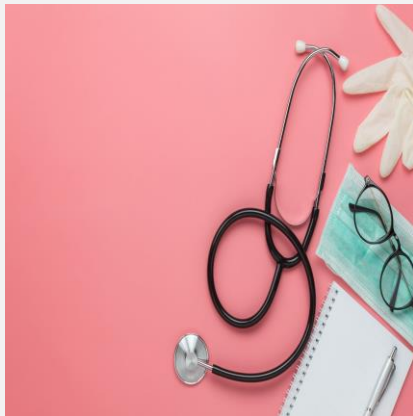
In general, the potential of using AI in the public service is related to the economic strength of each country, innovation and quality of management in the economy and administration, and the number of specialists prepared for it. However, this dependence is not automatic, as exemplified by e.g. slight Finland and Estonia. This shows the way for all those countries that have ambitious plans to use AI to accelerate their promotion to the European leaders, but so far have not really distinguished themselves in their implementation. This also applies to Poland.

In this year's report "Artificial Intelligence Quotient III. The potential of AI in the public sector"[15], prepared in cooperation with Microsoft, we described what AI is already used for in the public sector in our part of Europe. Most often, specific

[14] https://www.isbtech.pl/2020/09/europa-nie-wykorzystuje-pelni-potencjalu-ai/
[15] https://think-tank.pl/wp-content/uploads/2020/06/Raport_Iloraz-sztucznej-inteligencji_vol-III_THINKTANK.pdf

solutions are implemented by the health service, and their aim is to improve diagnostics, improve the organization and management of institutions, as in Romania and the Czech Republic, and for early diagnosis and treatment of mass diseases, as in Latvia.

In Hungary, the National Audiovisual Archives uses a system that helps to precisely classify 20 million objects documenting over 140 years of the country's recent history. In Romania, the Rural Investment Funding Agency (AI) improved the process of forecasting and spending EU funds. Previously, it took the agency's team ten days to prepare a report on this matter. Now it is done in as little as ten minutes with much more accuracy. The Croatian Ministry of Justice sped up the procedures in courts and prosecutor's offices thanks to the AI-based application The Speech to Text. It transcribes oral interviews and hearings with 98% accuracy.

In Poland, artificial intelligence helps tax services detect fraud, analyze images from the x-raying of trucks and railway wagons at borders, and is used to monitor the transport of excise goods throughout the country. Biologists from the Polish Academy of Sciences use AI to analyze large amounts of data from photo-traps observing the behavior of animals in the Białowieża Forest.

According to Wired magazine, the most advanced digital society in the world is Estonians, who have been implementing e-services for 20 years. The latest and most ambitious Estonian AI project in the public sector is the currently implemented "judge-robot". More specifically, it's about using the AI algorithm to speed up online litigation for claims below $ 7,000. euro. The algorithm is to analyze documents, not statements of the parties to the dispute. Dissatisfied can appeal against the SI judgment, which will be reviewed by a human.

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All doctors will be supported by algorithms in making diagnoses, and managers in creating universal preventive programs and early detection of the most deadly diseases. Thanks to AI and the latest discoveries of genetics, individual strategies for prevention, monitoring and treatment will also be created for each individual citizen.
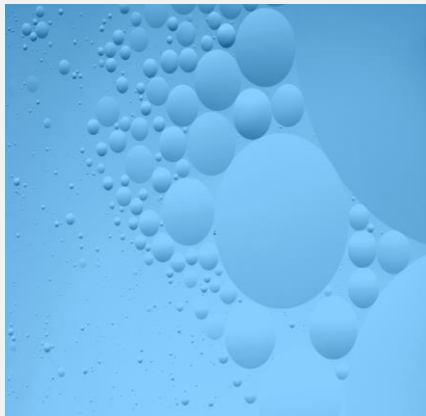
In 5 years and beyond

Already in the years to come, there will be a broad commitment by AI to improving our public services. Societies are increasingly calling for decisions of vital importance for the lives of citizens to be made objectively, taking into account full knowledge and different points of view, without discriminating against anyone and out of concern for sustainable development. Artificial intelligence is able to support these expectations.

The public sector has a huge amount of data on all citizens. So it has what artificial intelligence systems need most to thrive. Therefore, in the coming years, social pressure will increase for the same revolution in public services as in the private sector.

As I mentioned, healthcare is the most advanced in the use of AI solutions in the public sector. And in this area they will become massively popular. All doctors will be supported by algorithms in making diagnoses, and managers in creating universal preventive programs and early detection of the most deadly diseases. Thanks to AI and the latest discoveries of genetics, individual strategies for prevention, monitoring and treatment will also be created for each individual citizen. They will probably be one of the functions of our personal assistants.

Artificial intelligence will also significantly increase its participation in medical research and help scientists better understand the causes of many diseases, and then support them in the production of appropriate drugs and vaccines. Today, the development of a new drug may take 10 years and cost up to 2.5 billion. USD. In the coming years, this process will become shorter and cheaper.

One of the biggest challenges in economically developed countries is the rapid increase in the number of seniors. AI will help to create methods of diagnosis, treatment and therapy monitoring tailored to them, cheaper and more effective than

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at present. Individual AI systems will help them live longer independently in relatively good health. Solutions to reduce their loneliness will also be widely available.

The smart city idea, known from the beginning of the previous decade, assumes improving the lives of residents, among others thanks to new technologies. Artificial intelligence creates completely new perspectives for these aspirations. Thanks to digital analytical platforms collecting data from a network of intelligent sensors, life in the city will become easier. For example, central monitoring of traffic in the streets will reduce congestion. Applications using AI will show us where to find a free parking space or in which part of the city there is the best air for recreation. Cleaning companies will constantly monitor your city's trash cans and react quickly if any of them become full, topple over or unusually stink.

In the cities of the future, a massive increase in individual autonomous cars is much less likely, while public transport will become autonomous, but integrated with the entire traffic management system. Thanks to this, we will move around the city faster, more conveniently and cheaper. Certainly within 5 years, autonomous air taxis will become available for the wealthy and those who value their time. In some large cities of the world they will come into use even faster, in the next 2-3 years.

These are just some examples of the most likely uses of AI in the public sector. In general, artificial intelligence will become an ally of governments, local governments and enterprises carrying out public tasks in improving their services. It will significantly improve the efficiency of their internal processes, help to establish the optimal level of taxes, fees and social expenses, and reduce fraud in these areas. It will also accelerate the activities of the judiciary, reform education, and improve the quality of life in cities.
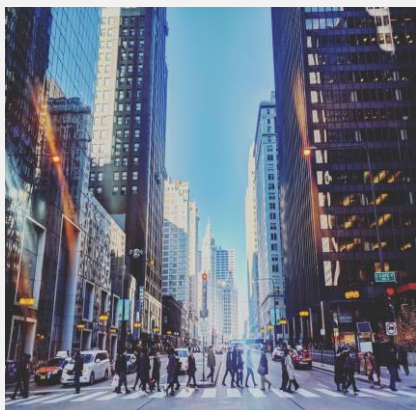
WE WILL FIND SOLUTIONS FOR GLOBAL PROBLEMS

How is it today?

Humanity - for the most part - has already realized that the Earth is facing a climate catastrophe. For now, however, our world is too divided and therefore is not coping well with this challenge. The Metronome, the famous digital clock located in the heart of Manhattan, reminds you of this. So far, it showed the hour, and from September 19 this year it informs passers-by how many years, days, hours, minutes and seconds are separating us from the critical point, i.e. from the moment when the average temperature on Earth will rise by 1.5 degrees C. According to scientists' estimates, we have about seven years left. Then there will be a chain of events that we can no longer stop. We will only be able to watch the catastrophe helplessly.

Therefore, many scientists are hastily looking for ways to stop the threat, and solutions based on artificial intelligence promise the most in this regard. Last year, scientists from IBM described a new plastic recycling system developed by them, called VolCat[16]. It is based on a catalytic chemical reactor that converts PET waste into raw plastic using a specially calibrated blend of chemicals, atmospheric pressure and temperature. VolCat is able to process into raw PET powder even unwashed and found among other rubbish hard plastics from bottles and containers as well as products that were previously very difficult to recycle, such as polyester clothing or toys. In practice, this eliminates the need to sort waste.

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[16] https://www.ibm.com/blogs/research/2020/09/ibm-5-in-5-accelerating-process-of-discovery/

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I turn, researchers from the University of Houston have developed a method to produce a new type of polymer that makes it easier to mix different plastics during the recycling process [17]. Today it is a major obstacle to plastic waste management efforts. Importantly, the newly developed process will allow the production of plastics from cooking oils, not from fossil fuels.

Many research centers are working on technologies for the capture of carbon dioxide from the atmosphere and its safe storage. MIT researchers have trained a neural network that uses earthquakes to estimate low-frequency waves [18]. They showed that thanks to this, it is possible to create a map of underground structures and places to store carbon dioxide. Researchers say it is also a way to search for new geothermal energy resources.

In turn, researchers from the University of Toronto Engineering and Carnegie Mellon University have developed a method with the help of AI to convert waste carbon dioxide into ethylene - a chemical precursor to a wide range of products [19]. The resulting electrocatalyst is the most effective in its class. When powered by wind or solar energy, the system also provides an efficient way to store electricity from renewable sources.

The climate disaster is not the only existential problem of mankind. The Australian National University has established a Commission on the Future of Man, made up of prominent representatives from a variety of disciplines, to deal with the main threats facing humanity and study how and how to deal

[17] https://uh.edu/news-events/stories/2020/march-2020/03092020harth-plastics-recycling.php
[18] https://www.komputerswiat.pl/aktualnosci/nauka-i-technika/naukowcy-chca-aby-szkodliwe-co2-skladowano-pod-ziemia-pomoc-ma-ai/e3126xl
[19] https://www.gasworld.com/researchers-accelerate-co2-to-ethylene-conversion/2019098.article

with them. In this year's report[20], the Commission concludes that our species' ability to inflict mass harm to itself has steadily increased since the mid-20th century, leading to a whole new level of risk.

In the report, the Commission indicates that eliminating the human species from life on Earth can:

1. depletion of natural resources necessary for life, especially water
2. decline of ecosystems and loss of biodiversity
3. the increase in human population beyond the capabilities of the Earth
4. global warming and man-made climate change
5. chemical pollution of the earth system, including the atmosphere and oceans
6. increasing food insecurity and deterioration in the quality of nutrition
7. nuclear weapons and other weapons of mass destruction
8. pandemics of new and incurable diseases
9. the emergence of powerful, uncontrolled new technology
10. a global lack of understanding of these threats and effective efforts to prevent them.

Metronome, the famous digital clock in the heart of Manhattan, kept showing the time. From September 19, it informs passers-by how many years, days, hours, minutes and seconds separate us from the critical point, ie from the moment when the average temperature on Earth rises by 1.5 degrees C. According to scientists' estimates, we have about seven years left. Then there will be a chain of events that we can no longer stop.

All these risks are interrelated and therefore, according to the Commission, must be tackled together. This is the aim of many research centers and companies around the world, and artificial intelligence is to be a tool that will help to see these problems globally and solve them globally.

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[20] https://theconversation.com/there-are-10-catastrophic-threats-facing-humans-right-now-and-coronavirus-is-only-one-of-them-136854

Many research centers are working on technologies for the capture of carbon dioxide from the atmosphere and its safe storage.

In 5 years and beyond

On September 22, 2020, Microsoft announced that it is releasing Premonition [21] to the world - a hardware and information system for detecting health threats caused by mosquitoes. They carry numerous pathogens all over the world and cause over 600 million people illnesses each year. The key to reducing future epidemics is the early detection of disease outbreaks, so that scientists can develop new treatments, and the health service takes appropriate preparations.

The system consists of a network of intelligent insect traps, laboratories that study their genome and send the collected data to the Microsoft Azure cloud for processing and threat analysis. The work was carried out for five years with the participation of scientists from several leading US universities, Bayer experts and the Harris County government in Texas. The solution is scalable, it can work worldwide and can study more than mosquito-borne diseases. In the next 5 years, this could be the real key to fighting pandemics.

According to the World Health Organization, there will be a global shortage of 18 million health workers by 2030. It is already visible today that this problem will be solved by artificial intelligence thanks to the above-mentioned support of doctors in diagnostics, as well as effective prevention and better organization of health systems.
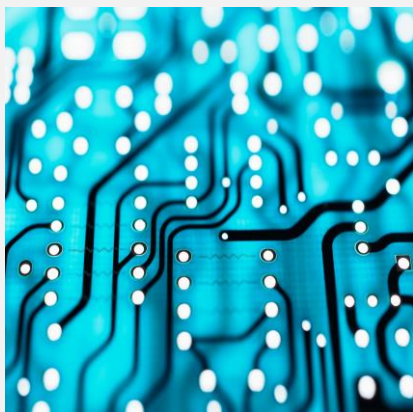
Today, medicine recognizes 7 thousand. very rare diseases that affect around 400 million people worldwide. In the case of 95 percent. these diseases lack effective treatment procedures[22]. Thanks to artificial intelligence, in 5 years time many of them will be able to be successfully treated, and in the next few years there will be methods and medicines for most of them.

The Covid-19 pandemic is steadily increasing the number of people starving. The UN World Food Program estimates that in 2019 there were 135 million of them, and now the problem

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[21] https://innovation.microsoft.com/en-us/exploring-premonition
[22] https://news.itu.int/reducing-the-global-healthcare-shortfall-using-ai/

The global innovation ecosystem will provide us with a cleaner environment, and artificial intelligence will change the situation in high-carbon industries.

affects as many as 250 million people. This requires an immediate reaction from the world, but also a search for system solutions. This is where AI systems come to the rescue. IBM researchers say they can create a digital map of agricultural crops around the world in the next 5 years[23].

If it is widely available to all interested farmers, scientists, agricultural producers and distributors, it will trigger a food revolution. This great global network for food production will share experiences, achievements, scientific discoveries, and experimental results. As a result, each link in the food chain will gain equal access to information and resources. And this, according to the authors of the forecast, means one thing: "more food at lower costs".

Thanks to AI, a real revolution will take place in agriculture. Many manual tasks and processes will be automated, from sowing to harvesting, and then processing and distribution. Algorithms will control irrigation, fertilization, autonomous tractors and combine harvesters, provide information on the condition of crops, react to adverse weather changes and help in making all decisions aimed at increasing the harvest and minimizing losses.

Artificial intelligence will also help to reduce the waste of materials and energy, and thus reduce the negative impact of industry on the climate. "By 2025, structured data and the algorithms that process it will help improve productivity, product quality and reduce waste by up to 50 percent," said Anna-Katrina Shedletsky, president and founder of Instrumental, a manufacturing problem-solving company[24].

David King, CEO of FogHorn Systems, an industrial and commercial software company, says the cost of renewable energy will soon be lower than that of fossil fuels[25].

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[23] https://www.research.ibm.com/5-in-5/
[24] https://www.weforum.org/agenda/2020/06/17-predictions-for-our-world-in-2025/
[25] Ibidem

NEW TECHNOLOGIES WILL HELP IN DEVELOPMENT SI

Advances in deep learning

Artificial intelligence is a general term. In fact, it is made up of various technologies, of which deep machine learning is currently making the most progress. It goes in three directions: supervised learning, unsupervised learning, and reinforcement learning.

The first two work with huge amounts of data (such as images and articles) to find patterns that connect them. For example, medical imaging diagnostics supported by artificial intelligence are currently based on this.

Reinforcement learning tries to use the more sophisticated ways in which human intelligence works. Before making a decision, our mind analyzes previous experiences and chooses the most favorable for us. For example: if we want to run through a usually busy street in a forbidden place, we analyze whether there are no police nearby and how many cars pass at this time. When we are satisfied with the risks from these observations, we run, and our risk reward is to shorten the path.

The gain learning algorithm does not have any instructions on how to proceed either. After analysis, he performs the actions that will result in receiving the highest prize, e.g. winning the game. The AlphaGo program was based on this mechanism, when in 2016 he won Go against a human, the then world champion.

In 5 years, thanks to machine learning with reinforcement, algorithms will create other, much more complex algorithms that will replace people on a large scale in a huge number of their tasks and activities.

Self-developing AI

AI researchers are already trying to accelerate the automation of algorithm programming. For example, neural networks, a common type of machine learning used, inter alia, for language translation and in autonomous cars, they loosely mimic the structure of the brain and learn from training data by changing the strength of connections between artificial neurons. Smaller sub-circuits of neurons perform specific tasks - for example, detecting traffic signs. Then scientists spend months figuring out how to connect them so that they can work together seamlessly.
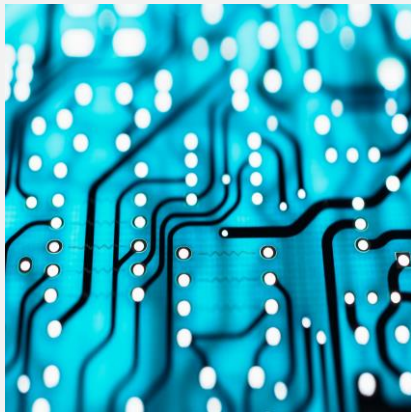
Quoc Le, a computer scientist at Google, and colleagues developed a program called AutoML-Zero[26] that can create AI programs with virtually zero human input, using only basic mathematical concepts familiar to high school students. The ultimate goal is to actually develop new machine learning concepts that develop on their own.

For now, the possibilities of these solutions are quite limited, but in 5 years the futurists' visions that artificial intelligence will develop itself will come true. For now, it works for its needs, helping to optimize the energy consumption needed for data storage and processing. On a global scale, 2 percent of it is used. generated energy.

For example, an AI system developed by Google-owned company DeepMind has been reducing energy consumption in data centers by 40 percent for four years. Artificial intelligence algorithms are also used in industry to diagnose the technical condition of machines and devices and to predict their failures. And soon they will be able to repair themselves.

The strongest countries and the largest companies in the IT industry take part in the race to create a fully functioning quantum computer. Earlier this year, Google informed about its successes, but at the end of June, Honeywell, a well-known industrial concern, announced that it had built a computer with the largest quantum capacity in the world today.

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[26] https://www.sciencemag.org/news/2020/04/artificial-intelligence-evolving-all-itself

The new power of traditional computers

Before the era of quantum computers, the manufacturers of the existing equipment are still trying to increase its computing power, which they need, among others. increasingly complex artificial intelligence systems.

For example, specifically to train the largest GPT-3 model from OpenAI, Microsoft built this year a supercomputer that is considered one of the top five in the world (among those that are known publicly).

This supercomputer has over 285,000. cores (the core is the physical part of the processor responsible for carrying out computing operations, containing many execution units), 10,000 GPUs (computing units residing in graphics cards) and has a network connectivity of 400 gigabits per second for each GPU server. It is hosted on the modern Microsoft Azure cloud platform and benefits from all its capabilities, including the rapid deployment of sustainable data centers and other services.

The US government has announced that by 2023 it will launch El Capitan, which is to outstrip the world's most powerful supercomputers. It will deal with "Strengthening the United States in Security and Defense". Supercomputers are also developing, among others IBM, Google, Chinese Governments, UK Britain and Japan.

Quantum computers

Although traditional computing technologies are still being developed (see above), the integration of AI systems to solve the interdisciplinary problems of the world will create a demand for computing power much higher than now.

The greatest hopes in this regard are associated with quantum computers. I do not have room for a broad explanation of their

5G is an enhanced wireless data transmission. It will allow mass connectivity between devices (Internet of Things). It will also be stable and reliable with low latency, which is essential for real-time device control.

essence (information on this can be easily found on the web). Briefly speaking, however, in a classic computer, the basic unit of information is a bit, i.e. a logical value that takes only two states: 0 or 1. By means of even billions of voltage changes in the transistors of each processor, amazing calculations are made, enabling, for example, the generation of virtual worlds in video games.

Quantum computers operate on the so-called quantum bits, commonly referred to as qubits. One qubit can take many states because it can be one and zero at the same time. Two qubits will already produce a combination of four different states, three - eight, and four - sixteen, etc. This allows qubits to store much, much more information than bits. And this and several other phenomena of quantum mechanics will allow quantum computers to perform as many operations in a second as today's supercomputers take several years.

The strongest countries and the largest companies in the IT industry take part in the race to create a fully functioning quantum computer. Earlier this year, Google informed about its successes, but at the end of June, Honeywell, a well-known industrial concern, announced that it had built a computer with the largest quantum capacity in the world today.

By 2025, structured data and algorithms that process it will improve productivity, product quality and reduce waste by up to 50 percent.

Many global computer giants have announced that in five years' time quantum computing will be fully available and will help solve problems that until recently were considered impossible to solve. This makes the scenarios of AI systems development presented here realistic in 5 years.

High-speed 5G network

Despite numerous fake news regarding the fifth generation of cellular technology, it is starting to work and will soon significantly accelerate the technological revolution in the world. 5G is an enhanced wireless data transmission. It will

allow mass connectivity between devices (Internet of Things). It will also be stable and reliable, with low latency, which is essential for real-time device control in industrial robotics, for the development of autonomous vehicles, safer transport networks, remote medical care, including remote operations.

Compared to previous generations, the 5G network will send much more data in real time, for example, it will allow even a million devices to be connected to the Internet per square kilometer. Therefore, it will support the development of artificial intelligence systems or solutions using augmented reality.

Algorithmic bias (bias alghoritms) favor one group of users over others, because it is often "embedded" in databases created by people, including public databases. And it is from there that they must first be eliminated before they are made available to algorithms.

Digital cloud

A digital cloud is in fact a collection of powerful servers, often referred to as a farm, which can store and process large amounts of data. Our computers, instead of using software on the internal disk, reach for them to the cloud, and the transfer takes place via broadband Internet (soon to the fifth generation).

The results of our work can also be stored in the cloud, i.e. data in the form of specific text documents, presentations, spreadsheets. They do not burden the internal memory of office computers, but are available at any time on request.

From the point of view of the ongoing digital transformation in all areas of life, the cloud is definitely more economical. We use the computing power of our home or office computers from time to time. The cloud intelligently manages the demand it directs and is able to accumulate computing power for the needs of more demanding customers, for example, creators and users of artificial intelligence systems.
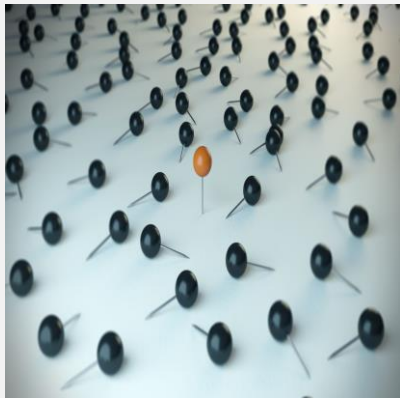
WHAT CAN GO WRONG?

The unknown effects of a pandemic

Having to stay home due to coronavirus has opened many people to remote work and e-shopping. Even those who had previously been wary of the digital world had to adapt to this. That is why many optimists believe that now the social acceptance for the latest technologies will increase by leaps and bounds, and this will encourage the private and public sectors to use artificial intelligence more courageously.

On the other hand, the pandemic has also caused a slowdown in AI implementations in companies around the world, because they simply have other problems on their mind. If the process of constraints in the functioning of the economy takes longer, it may still inhibit the inclusion of AI applications in business and other spheres of life. However, it will not stop developing the existing and developing new solutions. Therefore, in my opinion, all the AI applications described here (and many others) will be ready for use in 5 years.

Double-edged regulations

The European Union will soon adopt regulations ensuring that the development of artificial intelligence on our continent will take place under political and social control. They are intended to make European artificial intelligence safe, trustworthy and supportive of people. But European regulations may also mean that the latest and the most changing solutions for our world will be implemented outside the EU, mainly in the US and China, and we will be dependent on them.

A program called AutoML-Zero can create AI programs with virtually zero human input, using only the basic math concepts familiar to high school students. The ultimate goal is to actually develop new machine learning concepts that develop on their own.

Bias alghoritms

As AI-driven decisions begin to have a greater impact on people's lives, ethical questions arise about the impact technology has on society. How can we ensure that AI treats everyone fairly?
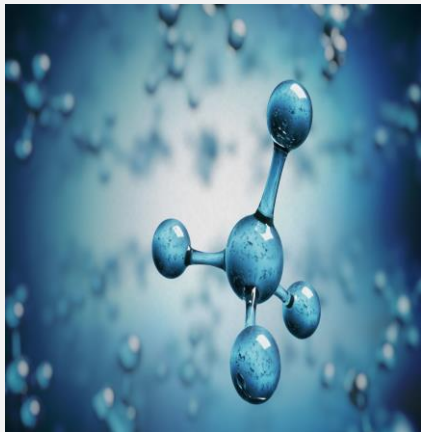
Artificial intelligence systems are designed by humans and are only as good as the data you input into them. And these are unfortunately not neutral. The more algorithms are required to train, the greater the likelihood of bias alghoritms. For example, it results in privileging one group of users over others, because it is often "embedded" in databases created by people, including public databases. And it is from there that they must first be eliminated, before they are made available to algorithms with implemented machine learning mechanisms.

Even if one algorithm creates another, the basis is human-made, and human prejudices will continue to replicate. This problem can hinder and delay the involvement of artificial intelligence in solving the problems of our world.

Increasing inequality

Many scientists working on artificial intelligence announce that their results will be made available to all interested parties for free or at cost. They believe that AI can ensure human welfare and benefit the planet, increase human capabilities, develop human creativity, enable the integration of excluded groups, minimize economic, social, gender and other inequalities.

But many other studies are driven by a wide variety of interests, from governments to powerful corporations. They can use AI to consolidate their power, increase wealth and influence over people. This is a serious and dangerous scenario, because then the current inequalities between

continents and countries, as well as within societies, will deepen even more.

Displacing people from the labor market

AI solutions already automate many activities previously performed by humans. For now, this process is barely visible in comparison to many other technological, business and social transformations taking place in the modern world. However, this influence of artificial intelligence on labor markets will grow faster and faster, and it will eventually lead us into serious perturbations.

According to optimists, for example experts from the World Economic Forum in Davos, thanks to AI solutions, many jobs will indeed disappear, but even more will emerge. For now, however, only this first process is visible. The emergence of new professions depends on the leap in AI solutions in our lives, and this leap is delayed by the lack of people with the appropriate competences.

It is an acknowledged fact that many people will have to abandon their old qualifications, but no one is teaching new ones on a large scale. Common educational systems are not prepared for this either. In our country, for example, the school seems to preserve educational methods and content straight from the 19th century.

As soon as AI solutions begin to seriously reduce costs in business, entrepreneurs will replace people with them before new professions are created. This may cause public resistance and temporarily hinder the diffusion of AI.

© Zbigniew Gajewski

Many optimists believe that now the social acceptance for the latest technologies will increase by leaps and bounds, and this will encourage the private and public sectors to use artificial intelligence more courageously.

ARTIFICIAL INTELLIGENCE IN 5 YEARS AND LATER (IN BRIEF)

Personal assistant	Everyone will be able to have a digital assistant with extensive access to many AI systems: various knowledge bases, e-shopping, home device drivers, entertainment, video games and more. The assistant will do us in some activities, and in most of them will become an invaluable helper.
	At work, it will increase our value as employees: it will speed up activities, increase efficiency, expand our knowledge.
	He will show the greatest value as an educational system. It will be the best teacher in the world.

Science	The cooperation of leading research centers will be advanced in order to standardize the methods of presenting research results for the purposes of integrating the scientific knowledge available so far.
	Science will develop tools to search, integrate and create abstracts in all disciplines of basic and practical research. This will allow science to make a huge leap in development. It is very likely that human knowledge is doubling every 12 hours.
	Scientists will develop concepts of solutions to the most important problems of the modern world, such as pandemics, climate catastrophe or hunger.

Economy	The main contribution of AI will be primarily a leap in efficiency in virtually all areas of economic activity.
	All companies, large and small, will know and understand their customers' needs much better than today.
	Optimizing production and supplies will significantly reduce the amount of waste, extend the life cycle of products and materials, and reduce greenhouse gas emissions.

Public services	All doctors will be supported by algorithms in making diagnoses, and managers in creating universal preventive programs and early detection of the most deadly diseases. Every citizen will have access to a personal health strategy.
	Thanks to digital analytical platforms collecting data from a network of intelligent sensors, life in the city will become easier.
	Artificial intelligence will become an ally of governments, local governments and enterprises carrying out public tasks to improve their services and citizens' satisfaction.

Global problems	Thanks to AI, a real revolution will take place in agriculture. And that means more food at a lower cost.
	AI will detect potential future pandemics and indicate how to deal with them. It will help to control incurable diseases, invent new medicines and vaccines.
	Artificial intelligence will help to reduce waste of materials and energy, but also to develop effective technologies for reducing CO2 and safe disposal of waste and rubbish.

New technologies	Quantum computers will perform as many operations in a second as today's supercomputers take several years. This will be another leap in the development of human knowledge and the usefulness of AI.
	The 5G network will send much more data in real time, for example, it will allow even a million devices to be connected to the Internet per square kilometer. All of this will make our lives easier.
	Artificial intelligence will develop itself. He is able to reduce energy consumption for his own needs and detect future failures of industrial systems controlled by him.

We also invite you to read our report "Artificial Intelligence Quotient III. The potential of artificial intelligence in the public sector"

https://think-tank.pl/iloraz-sztucznej-inteligencji-potencjal-sztucznej-inteligencji-w-sektorze-publicznym-edycja-iii/

THINKTANK

THINKTANK is a Polish analytical center established in 2009. It operates in the form of a social enterprise. It runs a club for decision makers and has its own media and an open network of experts in many fields.

THINKTANK is also a platform for dialogue, exchange of experience, knowledge and good practices for business leaders, politicians, local government officials and officials. We analyze and synthetically present trends and recommendations from selected areas of knowledge, gathering them in our Knowledge Base, available to members of the THINKTANK Club. These areas are:

- management
- leadership
- the impact of new technologies on the economy and public sphere
- Social Communication
- public policies
- European Union.

The aim of THINKTANK's activity is to inspire a substantive public debate in Poland and to build a dialogue between the private and public spheres. We talk and write about matters important to decision-makers in companies and in the state. We popularize the most valuable Polish ideas, solutions and practices abroad.

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