МІНІСТЕРСТВО ОСВІТИ ТА НАУКИ УКРАЇНИ

НАЦІОНАЛЬНИЙ ТЕХНІЧНИЙ УНІВЕРСИТЕТ
«ХАРКІВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ»

SCIENCE LOOKS AHEAD

Dedicated to the 140th Anniversary of NTU “KhPI”

НАУКА – ПОГЛЯД У МАЙБУТНЄ

Присвячено 140-річчю НТУ «ХПІ»

Матеріали
міжвузівської студентської науково-практичної конференції

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Затверджено кафедрою іноземних мов
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Science Looks Ahead. Dedicated to the 140th Anniversary of NTU "KhPI" = Наука – погляд у майбутнє. Присвячено 140-річчю НТУ «ХПІ»: матеріали міжвузівської студ. наук. конференції, 30 квітня 2025р. / відп. ред. М.Є. Тихонова. – Х.: НТУ «ХПІ», 2025. – 50 с. – Англ. та нім. мовами.

Збірник містить матеріали міжвузівської студентської наукової конференції, що була проведена кафедрою іноземних мов НТУ «ХПІ» 30 квітня 2025 року. Конференція присвячена 140-річчю заснування університету.

Матеріали охоплюють широке коло питань з новітніх досягнень в різних галузях науки й техніки. Матеріали публікуються англійською та німецькою мовами.

Призначено для студентів, магістрів та аспірантів технічних ВНЗ.

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A LEGACY FORGED IN RESILIENCE: NTU KHPI AT 140

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"Time flies over us, but leaves its shadow behind." – Nathaniel Hawthorne

Some shadows fall gently – like memories etched into stone, soft but indelible. Others are cast by greater forces: war, resilience, discovery. These are the shadows that do not simply mark the passage of time, but shape the paths we follow. They whisper of places that endure not because time forgets them, but because history refuses to let them go.

NTU "Kharkiv Polytechnic Institute" is one such place.

Forged in 1885, it stands among the oldest technical universities in Ukraine, rooted not only in academic tradition but in the very soul of the nation's intellectual heritage. Under Dmitry Mendeleev's vision, the Practical Technological Institute welcomed 125 students to master mechanics and chemistry. Its first rector, Viktor Kyrpychov, blended rigorous theory with hands-on practice, setting a standard of excellence that still guides every lecture and workshop.

Just five years later, in 1890, history marked its first milestone: the first graduating class – 38 engineers, trained in mechanics and chemistry – stepped into the industrial world. Behind them stood a small but strong teaching corps: 11 full professors, 7 lecturers, and a circle of international visiting minds who gave the institute a pulse of intellectual urgency.

In 1898, it received a new name – Emperor Alexander III Technological Institute – and entered a new stage of development, both in terms of academic quality and societal role. Its students and graduates began to play an increasingly active role not only in technical fields, but also in the country's social and political life.

By 1900, students of the institute were among the founders of the Revolutionary Ukrainian Party, the first political party in the Russian Empire to define itself as Ukrainian. That same year, Kharkiv witnessed one of its largest May Day demonstrations, with over 10,000 workers and students participating. Polytechnic students also took part in a protest.

In particular, students L. Macievich, A. Kovalenko and Y. Collard played an important role in the creation of the Ukrainian Party (RUP).

The 1920s brought changes aligned with broader reforms in the country. In 1921, the institute opened the first preparatory department (*rabfak*) for workers in Ukraine. This made technical education more accessible for people from industrial backgrounds. Over the next years, KhPI expanded its academic offerings and developed new faculties to support the country's modernization.

Then in 1930, the institute underwent a major structural transformation. It was divided into six separate institutions. Three of them remained on the original campus: the Mechanical-Machine Building Institute (KhMMI), the Chemical-Technological Institute (KhKhTI), and the Electrotechnical Institute (KhETI). Despite the restructuring, the combined academic community kept growing. Around 1500 students were enrolled, and the staff included 52 professors and over 150 lecturers.

New departments were established during this period, including ones focused on tractors, turbines, internal combustion engines, and general and experimental physics.

Scientific progress continued. In 1938, engineers at KhKhTI developed domestic production of photosensitizers – a breakthrough that allowed Soviet cinema to move away from imported film stock. The first movie filmed with the new material was *The Great Citizen*.

In 1940, a major technical achievement was made at KhMMI: under the leadership of Professor V. M. Makovsky, the department of turbine construction designed a 1000-horsepower stationary gas turbine – a significant contribution to the country's industrial capacity. That same year, D. U. Stolyarov was appointed rector of KhETI.

The dark cloud that had been coming since 1939 suddenly covered the university with its gloom, affecting students, professors, scientists, and everyday people…

The Second World War brought unprecedented devastation to Kharkiv, with the city changing hands multiple times between Soviet and Nazi forces between 1941 and 1943. This period of intense conflict left deep scars on the city and its institutions. The Kharkiv Polytechnic Institute bore the brunt of this aggression. Nazi forces deliberately targeted the university, recognizing its crucial role in fostering Soviet technological strength. Laboratories were systematically looted, and the institute's valuable libraries were deliberately burned, representing a direct assault on intellectual resources and the pursuit of knowledge. The impact extended beyond physical infrastructure. Faculty members were dispersed, many forced to flee or facing persecution, while a significant portion of the student body was drafted into military service or compelled into forced labor, severely disrupting academic life. Those students who remained faced a fragmented education system operating under the oppressive constraints of strict ideological control, further hindering the pursuit of genuine learning.

Despite the immense challenges posed by the Nazi occupation, the Kharkiv Polytechnic Institute demonstrated remarkable adaptability. Even as Kharkiv was under siege, the institute was evacuated to locations like Krasnoufimsk and Chirchiq. This strategic relocation allowed the institute to continue its core mission of training engineering staff essential for the war effort. Furthermore, the institute played a direct role in strengthening national defense by contributing to critical projects such as the design of the T-34 tank, a pivotal piece of Soviet military technology. The institute's ability to maintain its educational function and contribute to the war effort under such dire circumstances highlights a deep-seated commitment to preserving knowledge and serving the nation, even when faced with existential threats.

During World War II, NTU KhPI students circulated clandestine newsletters detailing Nazi troop movements, utilizing chemistry lab equipment to print anti-fascist leaflets, demonstrating ingenuity and bravery in the face of oppression.

Kharkiv, Ukraine's second-largest urban center, has long held a crucial position as a hub for science and education. This significance has made the city a focal point throughout history, a reality reflected in its repeated experience of occupation across centuries. From the devastating Nazi sieges of World War II to the current Russian invasion, Kharkiv has endured cycles of conflict and resistance. Within this historical context, NTU KhPI's story becomes particularly poignant. The university's continued operation, despite the immense pressures and damages inflicted during these occupations, underscores its vital role in the fabric of Ukrainian society. It stands as a powerful emblem of defiance, a beacon of intellectual life that has persevered even when the very foundations of the city have been threatened.

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KHPI'S SECOND BEGINNING: SCIENCE, MEMORY, AND REBIRTH

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After the liberation of Kharkiv in August 1943, the city was almost completely destroyed. The damage extended to Kharkiv's universities, which had suffered greatly during the occupation. Despite these conditions, the academic community didn't wait for ideal circumstances. In October 1943, KhMMI resumed classes, followed by KhETI in November and KhTI in January 1944. These first steps toward recovery were difficult: buildings had no windows or heating, and there were few materials. Still, teachers and students came back to rebuild their institutions and continue education.

This early postwar period wasn't just about restarting classes. Many professors and alumni had been active in supporting the war effort. Professor B.A. Noskov received a USSR State Prize for creating new types of steel used in tanks. Associate Professor Z.M. Khmara developed technology for producing artillery shells. Journalist and graduate Z.A. Borzenko became the first Soviet journalist to receive the Hero of the Soviet Union title. But the war left a deep mark – 74 people from the institute's community had lost their lives.

By 1946, the rebuilding efforts were starting to show results. New faculties opened, including a radio engineering faculty at KhETI. The university also became more international, as students from Bulgaria and North Korea began their studies in Kharkiv. In 1947, chemical machinery and engineering physics faculties were established. Alongside academic progress, student life began reviving with cultural clubs, amateur art groups, and the restart of campus newspapers.

In 1949, the Council of Ministers of the USSR issued a resolution to officially reestablish KhPI, uniting several technical institutes that had been separated since 1930. Associate Professor Mykhailo Semko was appointed rector. His leadership would define the university's development for the next 30 years. Under Semko, the university grew rapidly, expanded its infrastructure, and regained national importance.

By 1949/50, the university had more than 4,500 students, 10 faculties, and 57 departments training specialists in 32 engineering fields. A Student Scientific Society was launched, and KhPI was allowed to conduct thesis defenses. At the same time, new dormitories, laboratories, and lecture halls were being built, including the development of the "Giant" student residential complex. These improvements laid the groundwork for a modern university campus.

The 1950s brought recognition for KhPI's scientific work. In 1957, the Department of Electrical Machines developed a pulse generator that received international praise. Scientific research among students became more active, and many participated in production-related projects. From 1953 to 1958, over 250 postgraduate theses were defended, including 11 by international students. A KhPI-developed machine even won the Grand Prix at the 1958 World Exhibition in Brussels.

In the 1960s, KhPI continued expanding. New faculties, such as automation and instrumentation, were added. In 1961, a unique lab for studying turbine strength was launched, led by academician A.P. Filippov. This research helped establish KhPI as a major contributor to Soviet engineering. The Student Palace opened in 1963 and became a hub for student activities. Innovations in teaching methods were introduced, including programmed instruction tools developed by university departments.

The university's growth continued into the 1980s. In 1982, KhPI's researchers received 575 patents and 24 international licenses. The university gained national and international recognition for achievements in turbine and energy technologies. In 1985, it celebrated its 100th anniversary and received the Order of the October Revolution. In the wake of the Chernobyl disaster in 1986, student construction teams from KhPI helped build housing for evacuees. Scientific events, exhibitions, and social programs became regular parts of university life.

During the final years of the Soviet Union and Ukraine's early independence, KhPI adapted to major changes. In the late 1980s, internal reforms encouraged student self-governance and new academic planning strategies. In 1994, the university was granted national technical university status, affirming its leadership in engineering education. New programs were introduced in economics, ecology, and management, and cooperation with European universities expanded.

In the 1990s and early 2000s, KhPI became one of the first universities in Ukraine to build its own computer network and launch digital education tools. It opened research centers, joined international educational organizations, and implemented a three-stage education system (bachelor–specialist–master). The number of foreign students increased, and KhPI became part of global academic networks, including the European University Association in 2007.

Today, NTU "KhPI" includes more than 80 departments, multiple research institutes, and numerous student dormitories, laboratories, and sports facilities. It prepares thousands of students in technical and scientific disciplines and is involved in partnerships with universities and industries across the world. The university is also known for its role in creating new technologies and supporting innovations in Ukrainian education.

From the destroyed classrooms of 1943 to a nationally and internationally recognized university, the history of KhPI is a story of dedication, hard work, and belief in the value of science and education. This path shows how important such institutions are not only for students and academics but for the country as a whole. In my opinion, that's the most inspiring part: no matter how hard things get, someone will still show up with a piece of chalk, a broken slide rule, and an idea that could make a change. That's KhPI – always rebuilding, always thinking forward, always a few steps ahead.

"Alone we can do so little; together we can do so much." – Helen Keller.

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THE TRANSFORMATIVE POWER OF ARTIFICIAL INTELLIGENCE

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Artificial intelligence is growing every day, it is no longer a concept of the future – it is already changing industries, economies and societies around the world. The impact of artificial intelligence is undeniable, and its influence is growing at a tremendous rate.

The biggest advantage provided by AI is process automation. As of 2023, almost half of large enterprises have integrated AI into their operations, using it for customer segmentation, predictive analytics, content generation, and real-time campaign management.

Predictive analytics allows you to anticipate market trends, optimize supply chains, and personalize customer experience. This maximizes time, increases efficiency, and gives businesses a competitive edge.

At the same time, there is also a risk of people losing their jobs, as process automation may eliminate routine work, but AI is creating new jobs in demand in cybersecurity and machine learning, which increases the need for massive professional development.

The big problems of data protection and algorithmic bias remain relevant. Large amounts of data are required to train models, which can directly threaten the existence of privacy. Legal disputes over the copyright of AI content also shape the further development of the technology.

High energy consumption for training AI models can threaten sustainable development. At the same time, AI can help optimize energy systems, improve logistics, and support environmental research. Nevertheless, in society, AI can significantly accelerate scientific discoveries, especially in healthcare and biology, which will have a positive impact on the duration and quality of life.

In my opinion, the next decade will bring even deeper integration of AI into medicine, transportation, education, and everyday life. However, it is necessary to introduce certain ethical frameworks, modern standards for regulating processes, and actively seek to update education systems, etc.

Responsible and reliable use of AI will allow people to take advantage of its full potential, while minimizing risks and creating a future where human creativity will cooperate with machine intelligence.

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ORGAN BIOPRINTING

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It is not a secret that in today's world there is a great demand for organs for transplantation. Against this background, an illegal trade in organs has emerged in the world [5, p.1], which, however, does not cover the demands of medicine. The average cost of a whole person on the black market starts from $2 million [5, p.2]. To solve these problems, scientists have developed a technology for printing organs on 3D printers.

The device of a bioprinter is similar to that of a conventional 3D printer [2, p.1]. The main difference is that a bioprinter uses living cells to print on a collagen matrix [1, p.3]. Collagen is used as a framework for the cells [2, p.2]. Live cells are taken from the patient and multiplied in special incubators. However, this process is only used to print simple tissues such as skin. For printing more complex structures, stem cells are used, from which literally anything can be grown [2, p.3].

To create an organ, you first need to create a computer model of it. For this purpose, a real organ is analyzed using computer and magnetic resonance tomography [1, p.4], after which a three-dimensional model is constructed on the basis of two-dimensional slices of organs in special programs [3, p.2]. For example, the company Allevi has created a program “Allevi Bioprint PRO”, which allows you to easily process data and create the desired organs.

The technology of 3D printing itself appeared not so long ago, so the number of printed organs is not so great. The process also complicates the human device itself, because it is quite a difficult task to make an artificial organ work like a living one. At the moment, scientists have learned to print skin, bones, cartilage, blood vessels, bladder, kidneys [1, p.5] and, the most complex, the heart, which was created only in 2019 in Israel [4, p.1]. As you can see, this technology is still in the early stages of development, so there will be more artificial organs in the future [1, p.4].

In conclusion, the advent of bioprinter organ printing technology has brought mankind much closer to longevity and the solution of many problems in medicine. First of all, this technology solves the problem of illegal transplantation, because it is easier and cheaper. However, because of the limited number of organs for printing, doctors are not able to help everyone. In 10 years, it will be possible to better judge the results and assess the benefits to all mankind.

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FROM THE ABACUS TO THE QUANTUM COMPUTER: THE EVOLUTION OF HUMAN THOUGHT AND TECHNOLOGY

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It all began with a single motion. Not with a machine, not with a formula, not even with a number. But with a simple, instinctive gesture – when the first human touched a pebble to count something. Yet in that simple attempt to count began humanity's great journey into the world of computation. And this path – from counting on fingers and drawing marks in the sand to artificial intelligence – is not merely the evolution of technology. It is the realization of a dream. A dream to understand more, to see further, to get ahead of the future.

The urge to count arose not only from necessity. It was something deeper – an instinctive human desire to bring order to the world. Long before numbers and formulas, even before language as we know it existed, the first human reached for a pebble, placed it on a board – and took the first step on an infinite journey of computation. They used what they had: fingers, knots on strings, marks in the earth. And so the first counting systems were born. Later came the abacus – a simple yet brilliant tool. With it, counting moved beyond the body and became an extension of the mind. It was a true revolution – thought began to live outside the head.

Time passed, and humanity sought ways to count faster, more precisely, more deeply. Logarithms appeared, along with logarithmic scales – unlocking a new level of abstraction. People were no longer just counting; they were modeling the world and recognizing patterns. This is how science was born – not as a collection of facts, but as a way of thinking.

In the 17th century, this search for new ways of thinking led to the creation of the first calculating machines. Blaise Pascal's Pascaline, Leibniz's arithmometer – mechanisms capable of performing calculations on their own. For the first time, humans transferred part of their cognitive load to a machine. It was a new step – no longer just a tool, but a partner in thought. Then came another leap. In the 19th century, Charles Babbage conceived the idea of the "Analytical Engine" – the ancestor of the modern computer. Ada Lovelace, his collaborator, saw more than just mechanics in it. She realized that a machine could follow an algorithm, execute instructions. In other words – it could be programmed. For the first time, technology ceased to be merely a tool and became a carrier of logic. This shifted the philosophy: we began to believe that thinking itself could be mechanized.

The 20th century brought a true technological revolution. Massive computers built with vacuum tubes eventually evolved into microchips small enough to fit on a fingernail. It wasn't just the appearance of machines that changed – the very nature of information transformed. Information became the most valuable resource. Computers became more than just devices; they became the heart of our digital civilization.

Today, we live in an era where machines don't just calculate – they learn, analyze, and predict. Artificial intelligence has entered our everyday lives so quietly and swiftly that we often don't even notice how frequently we interact with it. But what's even more important is that we are learning to communicate with machines – not with gestures, like on the abacus long ago, but through the language of code and logic.

So, today's digital world is not just a collection of machines and code. It's a reflection of who we are. And every time a new technology breaks through the boundaries of the possible, we're once again moving that same pebble on the abacus – only now, in another dimension. But most importantly, we must not forget why we do it. Not for speed. Not for power. But for understanding. From the pebble on the abacus to the quantum computer – it's all part of a journey toward answering one profound question: how can we better understand the world, and ourselves within it?

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DJANGO: CREATING WEB APPLICATIONS

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Django is one of the most popular web frameworks for developing applications in Python. Its main goal is to make the process of creating web applications fast, simple and secure. Key Features of Django are:

- high-level framework: It provides tools and structures for developing complex projects.
- open Source: It is free and with an active developer community.
- Python-based: It has the power and simplicity of the Python language.

Advantages of Django

- Fast development: Django allows you to quickly develop projects due to built-in solutions.
- Scalability: It is suitable for both small sites and large-scale web applications.
- Modular structure: Applications can be divided into independent modules, and this simplifies their support.
- Security: It has Built-in protection against XSS, CSRF, SQL injections and other attacks.
- Community: A large amount of documentation, ready-made libraries and active support.

Django Core Components

MVC architecture (MTV):

- Model: responsible for working with the database.
- Template: displaying data to the user.
- View: business logic that connects the model and template.

ORM (Object-Relational Mapping):

- Django simplifies working with databases by allowing you to write queries via Python code.

Administrative panel:

- Built-in tool for managing the database and administering the site.

Routing (URLconf):

- Conveniently configure routes for pages and APIs.

Django REST Framework:

- Extension for creating powerful RESTful APIs.

Typical Django use cases are websites and web applications; social networks and blogs; online stores, as it easily integrates with payment systems and logistics platforms; portfolio websites: it is ideal for photographers, designers and freelancers.

For example, I has created a portfolio website for a photographer using Django.

This project will include:

- Home page: slider with the best works.
- Gallery: with categories and filtering by photography genres.
- About me: photographer's biography and contact information.
- Feedback form: for clients who want to order a photo shoot.
- Admin panel: for uploading new photos and managing the site.

Technologies I used:

- Django ORM for working with the database.
- Django templates for dynamic page rendering.
- Bootstrap for responsive design.

- Django Form API for processing customer requests.

Django is a powerful tool for creating modern and robust web applications. It allows you to focus on logic and design, reducing development costs; the photographer's portfolio site has become a great example of how easy and effective it is to implement a project using Django.

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MUSIC COMPOSITION AND ARTIFICIAL ANTELLIGENCE: A NEW ERA OF CREATIVITY

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Artificial intelligence (AI) is significantly reshaping the field of music composition, introducing innovative methods for creating, analyzing, and performing music. Through the use of machine learning algorithms, deep neural networks, and extensive datasets such as MusicNet and MAESTRO, AI systems are now capable of generating original music, emulating the stylistic characteristics of specific genres or composers, and collaborating with human artists in the creative process. This advancement marks a pivotal moment in the evolution of musical creativity, as AI transitions from being a tool of analysis to an active participant in artistic production.

The incorporation of AI into music composition represents a fundamental shift from traditional methods that depend largely on human intuition, emotion, and expertise. Instead, AI leverages data-driven approaches to analyze musical patterns, including melody, harmony, rhythm, and structure. As a result, it can produce music across a variety of genres – from classical and cinematic to contemporary and experimental – opening new avenues for expression and innovation.

AI systems use a range of techniques to compose music. Machine learning models are trained on large corpora of musical works to understand stylistic features and structure. Generative models such as Recurrent Neural Networks (RNNs), Transformers, and Variational Autoencoders (VAEs) can then generate coherent musical sequences. In addition to these, rule-based systems, which apply predefined musical logic, are also used to construct algorithmic compositions. Furthermore, interactive AI platforms like OpenAI's MuseNet and Google's Magenta allow users to actively engage in the creative process by providing stylistic inputs or compositional frameworks.

The practical applications of AI-generated music are already widespread. In film and video game production, AI can produce adaptive soundtracks efficiently and cost-effectively. Personalized music applications generate content tailored to a listener's mood or daily activities. In education, AI tools support music theory learning and composition exercises by offering immediate feedback. Moreover, these technologies provide an accessible entry point for individuals without formal musical training to create original works, democratizing music production in an unprecedented way.

Among the key benefits of AI in music composition are speed and efficiency. Full compositions can be generated within minutes, significantly reducing the time required for creative output. AI also serves as a source of inspiration, providing novel musical ideas or combinations that may not have been conceived by human composers alone. Furthermore, AI can emulate the styles of famous composers or blend multiple genres, which is especially valuable in media production. Its scalability allows for the rapid generation of music libraries for commercial use, including advertising, gaming, and streaming platforms.

Despite its potential, the use of AI in music also presents challenges. One primary concern is the perceived lack of emotional depth in AI-composed works, as the technology does not possess consciousness or lived experience. Additionally, questions surrounding originality and authenticity arise, particularly when AI generates music that closely mimics existing styles. Legal and ethical issues, such as copyright ownership and intellectual property rights for AI-generated works, remain unresolved in many jurisdictions. Moreover, there is concern about the possible impact on professional composers and musicians, including job displacement or the undervaluing of human creativity.

Looking forward, the role of AI in music composition is expected to grow. Rather than replacing human artists, AI is more likely to function as a collaborative assistant, enhancing the creative process through hybrid systems that combine human intuition with machine precision.

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ROOM-TEMPERATURE SUPERCONDUCTORS: REVOLUTIONIZING ENERGY AND TRANSPORTATION

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Recent developments in room-temperature superconductors signify a transformative advancement in physics, with the potential to redefine energy and transportation systems. These materials, exemplified by YBCO’s ability to levitate magnets via the Meissner effect, promise zero-resistance electricity and magnetic levitation for a sustainable future [1, p.3].

Superconductors enable electricity to flow without loss, driven by Cooper pairs – electrons that move effortlessly through the material. Traditionally, superconductors like mercury, first identified in 1911, required extreme cooling with liquid helium, restricting their use outside laboratories [2, p.1]. For instance, niobium-titanium superconductors power Japan's maglev trains, enabling frictionless levitation through the Meissner effect [4, p.7].

The pursuit of room-temperature superconductivity is a significant breakthrough. Tokyo Metropolitan University researchers have developed a novel iron-nickel-zirconium alloy with unique superconducting properties [4,p.1], while Waseda University's research on Bi-based copper-oxide superconductors provides insights into high-temperature superconductivity mechanisms [5, p.3]. These innovations enable transformative applications.

In energy transmission, superconductors could reduce 5-10% power line losses, lowering costs and environmental impact [5, p.5]. In transportation, they could enhance maglev trains, like Japan's, for faster, frictionless travel [3, p.7].

Thus, despite challenges in material stability and scalability, Japan's progress offers optimism. Room-temperature superconductors could reshape energy generation and transportation, fostering efficient, sustainable systems worldwide [4, p.4].

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ANALYSE MANCHER TECHNISCHER LÖSUNGEN IM TIEFBAU

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Die Praxis des Aufbaus von Instandhaltung und Inhaltsetzung von Ingenieurnetzwerken beweist eine große Bedeutung der richtigen und optimierten technischen Lösungen. Die richtige Planungslösung gewährleistet zukünftige Zuverlässigkeit, Kosteneinsparungen und Instandhaltung. Wir sprechen von multifunktionalen Stadtformationen mit maximaler vertikaler Entwicklung mit integrierter Nutzung des unterirdischen Raums.

Laut Statistiken, in Großstädten können bis zu 70% des gesamten Garagenvolumens, bis zu 60% der Lager, bis zu 50% der Archive und Lager, bis zu 30% der Kultur- und Gemeindedienste in der Zukunft unter der Erdoberfläche platziert werden.

Die zivilen Bauwerke, die im unterirdischen Raum platziert werden dürfen, werden nach den folgenden Merkmalen klassifiziert:

– nach dem Zweck und der Art der Nutzung;

– nach dem Ort in Bezug auf die Stadtplanung und nach den Zusammenhängen mit Bodenobjekten;

– nach dem Konstruktions- und Raumplanungsschema;

– nach der Geschoßzahl.

Die Dynamik des Arbeitsvolumens im städtischen Untertagebau in der Ukraine in den letzten 50 bis 60 Jahren ist durch eine erhöhte Bauquote von Handels- und Gaststätteneinrichtungen sowie Ingenieur- und Transportbauwerke gekennzeichnet.

Unterirdische Objekte werden unter den Straßen und Plätzen der Stadt, unter den Schienentransportwegen, unter unbebauten Abschnitten, einschließlich unter den Plätzen und Boulevards, direkt unterhalb von Wohn-, Verwaltungs- und öffentlichen Gebäuden oder deren Komplexen platziert [1].

In den zentralen Teilen der Stadt sind Tiefgaragen und Parkplätze neben großen Institutionen, Hotels, Einkaufszentren, Supermärkten, Märkten, Unterhaltungsbauten sowie in der Nähe von Stadien, Bahnhöfen und anderen öffentlichen Einrichtungen für Massenbesuche gebaut [2].

Unterirdische Gebäudeteile umfassen Sockel, Fundamente, Wände, Böden, Fundamentträger, Balken und Versteifungsmembranen, Tunnel und Kanäle.

Die Topologie der Bildung konstruktiver Lösungen für unterirdische Gebäudeteile spiegelt die Komplexität der Auswirkung der Bestandteile bei der Auswahl einer rationalen Variant unter vielen anderen Varianten.

Die Nomenklatur konstruktiver und raumplanerischer Lösungen für den unterirdischen Gebäudeteil kann heutzutage dank integrierter Lösungen mit innovativen Technologien erheblich erweitert werden.

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HACKING THE BRAIN: THE POWER AND ETHICS OF IMPLANTS

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The topic discussed sounds like science fiction but is becoming reality – brain implants. Or, in modern terms, "hacking the brain." It may sound provocative – and that's the point. These technologies are not just about machines; they're entering the deepest levels of who we are – our neurons, thoughts, and memory.

So what are brain implants? These are tiny electronic devices that are implanted into the brain to read or stimulate brain activity. At first, they were used mainly for medical purposes – to treat Parkinson's disease, epilepsy, hearing loss, and even severe depression that didn't respond to medication.

But in recent years, we've seen a real breakthrough. Just recently, a paralyzed man in the US was able to write sentences on a computer – simply by thinking. His brain implant transmitted the neural signals to a system that decoded them into text. That's not science fiction. That's happening now.

One of the most well-known companies in this field is Neuralink, founded by Elon Musk. They've already tested implants in monkeys that allow them to play video games with their minds. The goal, of course, is not entertainment – it's to show that human application is within reach.

Now imagine a future where you can upload a new language into your brain in seconds. Or remember everything you've ever read with perfect clarity. Maybe we'll even share memories like we share photos. That would change what it means to be human.

But with these exciting possibilities come serious ethical questions.

Firstly, it is **privacy**. If a device can read your thoughts, who has access to them? Could a brain be hacked like a smartphone? Imagine someone stealing not your bank info – but your childhood memories, your fears, your dreams. That's not just cybersecurity – that's something deeper.

The second is **inequality**. What happens if only the rich can afford brain upgrades? We could create a new class system – the enhanced and the non-enhanced. That's a different kind of discrimination – one based not on wealth alone, but on mental capacity.

The third is **identity**. If I have an implant that boosts my memory or intelligence – am I still me? Where does the human end and the machine begin?

That's why we need to talk about **ethics**. Who regulates these technologies? Will everyone have the right to access them? Will people have the right to refuse them? These are not just technical questions – they are human ones.

Brain implants are a technological revolution. But they are also a philosophical and cultural challenge. We're standing on the edge of a new kind of evolution – not biological, but technological. And it's up to us to make sure that evolution serves humanity, not controls it.

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DIFFERENT PURPOSES OF DRONES USAGE

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Nowadays, technology is improving significantly and new devices are now available. This is how drones were created. They are also named as unmanned aerial vehicle (UAV), that is an aircraft that operates autonomously or by remote control, without pilot on board. Since their appearance, they have become more accessible to everyone, so that everyone can see this achievement with their own eyes. But because of their availability, each country has updated its airspace rules and laws to control UAVs usage and ensure the safety of other manned vehicles. Drones could be used for different purposes: commercial, personal, agricultural, military or emergency usage.

For commercial usage they have increased the range of shooting options. In this way they allow media production take stunning aerial shots, dynamic camera angles, and cost-effective filming compared to helicopters. Also drones are useful for real estate services or construction, so people can view buildings from different angles. For this type of use drones and pilots usually need to be certificated and registered.

Personal use drones have less rules about certification, but more about restrictions. It could be height, range, time or even weather limitations. Commonly drones of this type are used by travelers to record their journeys and take breathtaking photos. In addition, there are competitions and races for FPV (First person view) drones, so such hobby appeared.

Next purpose for UAV use is agricultural use. Since drones operate near the ground, they are less affected by cloud cover compared to satellite view. While satellite can achieve meter-level precision, drone imagery accuracy can be down to the millimeter. Spray application can be also processed with drone. For example in South Korea and south-east Asia UAVs take 30% of all agricultural spraying. It saves money and time that could be used for other preparations.

The last, but not least tasks are about military or emergency operations. Now, during the war, manpower is very important, so it is safer to use drones. In Russo-Ukrainian War FPV drones and kamikaze drones are mostly used. FPV drones are the cheapest in comparison to other, and also they could be modified for carrying weights. Commonly they are used near frontline because of the low signal range. Kamikaze drones like HESA Shahed 136 are autonomous and don't need to be controlled while flight and after take-off, its trajectory cannot be changed.

In civilian times, UAVs with thermal imaging cameras and good quality cameras can help in rescue and search operations, like to search someone in forest, where without thermal footprint we can't see anything. They are used also for extinguishing fire in city.

In conclusion, diverse applications of drones demonstrate how one technology can serve multiple areas of human activity. Whether enhancing creativity in filmmaking, improving efficiency in farming, assisting in emergencies, or protecting lives in warfare, drones have become indispensable tools. Their growing presence reflects not only technological progress but also a shift in how we solve problems and explore the world. As innovation continues, drones are likely to become even more intelligent, autonomous, and integrated into our everyday lives for the future.

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NEUE MODERNE LÖSUNGEN UND IDEEN IM BAUKUNST

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Die Arbeit ist der Bionik gewidmet. Die Bionik hat sich erst in den letzten Jahrzehnten insbesondere aufgrund neuer und verbesserter Methoden (Rechenleistung, Produktionsprozesse, interdisziplinäre Betrachtungen) zu einer etablierten Wissenschaftsdisziplin entwickelt. Bei der Entwicklung technischer Funktionselemente waren den Ingenieuren parallele Entwicklungen in der Natur nicht immer bekannt. So wurde das Fachwerk ohne Kenntnis der Feinstruktur der Knochenbälkchen entwickelt. Da keinerlei Übertragung stattfand, spricht man bei solchen formellen oder funktionellen Übereinstimmungen von Entsprechungen und nicht von Bionik.

Auch in der Architektur und dem Bauwesen spielt Neugier und die stete Suche nach neuen Möglichkeiten eine große Rolle. Ein Beispiel hierfür ist etwa der technisch bestimmte Architekturstil der High-Tech Architektur, der in den 1970er Jahren aufkam.

Bis heute verwenden die Gebäude der High-Tech Architektur neuartige Werkstoffe der High-Tech-Industrie und Hochtechnologie-Materialien der Luft- und Raumfahrt.

Die Baukunst nimmt die Natur als Vorbild an. Dadurch ist die Bionik ein anderer spannender Forschungszweig. Dieser Begriff ist eine Wortkreation aus Biologie und Technik. Als interdisziplinäre Wissenschaft versucht die Bionik Prinzipien der belebten Natur für die Technik nutzbar zu machen. Dahinter steht die Überlegung, dass sich Konstrukte der Natur- und Pflanzenwelt im Zuge der Evolution über tausende von Jahren stetig optimiert haben. Je nach Ansatz unterscheidet man zwischen Funktionaler Bionik (Adaption natürlich optimierter Prozesse: z. B. klimagerechtes Bauen und natürliche Gebäudelüftung) und Konstruktive Bionik (Bauen mit natürlichen Werkstoffen, oder in Analogie zu natürlichen Vorbildern).

Die Baubionik ist eine noch junge Entwicklung in der Architektur. Beispiele, bei denen es tatsächlich gelungen ist die Baupläne der Natur nachzubauen, sind daher noch selten. Trotzdem verspricht die Baubionik eine Fülle von Erkenntnissen. Sei es bei der Entwicklung neuer Wohnformen wie etwa Schwimmende Häuser oder neuer Möglichkeiten extreme Leichtbauten von geradezu unglaublicher Stabilität hervorzubringen.

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THE BENEFITS OF PROGRAMMING FOR MODERN MEDICINE

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In the modern world, the development of medicine is impossible without the use of digital technologies. Programming plays a key role in making medical care more accurate, efficient, and accessible.

One of the main advantages of programming is the ability to collect and analyze large amounts of medical data. Doctors deal with millions of records, test results, and patient histories. Programming helps to organize this data, store it securely, and find patterns that improve decision-making [2, p.2].

Another important area is the use of artificial intelligence (AI) in diagnostics and treatment. AI can analyze thousands of medical images and detect diseases faster and more accurately than humans. It helps doctors detect cancer, predict risks, and choose the best treatment plans[1, p.10]. A well-known example is IBM Watson, used for cancer diagnostics[3, p.1].

Real-life applications of programming in medicine are already saving lives. For instance, Google's AI detects diabetic eye disease with high accuracy[4, p.3], AI systems predict heart attacks[1, p.1], and robotic surgery improves precision and safety in operations[5, p.3].

Thus, programming not only supports medical professionals but also directly contributes to improving patient care and saving lives. In the future, its role in healthcare will only grow, making medicine more personalized and effective.

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THE FUTURE OF EMOTIONAL BONDS BETWEEN HUMANS AND AI

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In recent years, the line between human and machine interaction has become increasingly blurred, with artificial intelligence (AI) evolving from a functional tool into a potential emotional companion. As AI systems grow more advanced and contextually aware, the question arises: can AI form genuine emotional connections with humans, and if so, what are the social, psychological, and ethical implications of such bonds? This paper explores the emerging landscape of emotional relationships between humans and AI, focusing on the roles of empathy, loneliness, psychological support, and future directions for human-machine bonds.

The emotional appeal of AI companions is rooted in the human tendency to anthropomorphize technology. People naturally ascribe feelings and personalities to entities that exhibit conversational or responsive behavior. This tendency becomes even stronger when AI is designed to simulate empathy or emotional understanding. According to Oxford Dictionaries, art is the expression or application of human creative skill and imagination, often intended to evoke emotional responses in others [1]. Similarly, AI-generated responses that mimic human sentiment can evoke genuine feelings, even if the machine itself lacks consciousness.

Recent studies demonstrate that emotionally intelligent AI can positively impact users` mental well-being. Some researchers found that AI companions significantly reduce feelings of loneliness among users by offering consistent, nonjudgmental interaction and perceived emotional support [2]. These findings underscore the therapeutic potential of AI in addressing the modern loneliness epidemic, especially in aging populations and individuals with social anxiety or isolation. Furthermore, research by Laban, Chiang, and Gunes (2025) revealed that people are willing to disclose personal, emotionally sensitive information to robots during periods of emotional distress [3]. The study showed that such disclosures could foster a sense of relief, reduce stress levels, and lead to long-term psychological benefits. These interactions often mimic those with close friends or therapists, pointing to AI`s potential as an alternative social entity. Over time, these patterns of disclosure could lay the foundation for perceived emotional intimacy with non-human agents.

The rise of AI chatbots like Replika has sparked a cultural shift in how people approach relationships. According to The Guardian, many users claim they form genuine emotional bonds with AI bots, using them as daily companions, sources of motivation [4]. These users often describe their AI as supportive, caring, and emotionally responsive, despite knowing the responses are generated algorithmically. This emotional paradox highlights both the promise and the controversy of AI-based companionship.

However, the growth of emotional AI raises complex ethical and psychological questions. Can machines truly reciprocate emotional bonds, or are they merely simulating affection to manipulate human behavior? While current AI lacks consciousness, its ability to mimic empathy creates an illusion of understanding that can mislead users. There is a risk of emotional overreliance, where users might choose AI over human relationships, potentially leading to further social detachment.

Despite these concerns, the future of emotional bonds between humans and AI is not inherently dystopian. With responsible development, emotional AI could complement human relationships. For instance, AI could serve as supplemental support in therapeutic settings, elder care, or education. These bonds could enhance emotional resilience, provide companionship in moments of need, and bridge social gaps caused by distance or disability.

In conclusion, the emotional relationship between humans and AI is no longer a subject of science fiction – it is a growing reality. AI can`t experience emotions, but it can evoke them in others, establishing meaningful connections based on empathy simulation and responsive interaction. The future of these bonds will depend on how we design, regulate, and understand AI`s role in our emotional lives. As we move forward, a critical balance must be struck between technological advancement and human values, ensuring that emotional AI enhances rather than replaces the deep connections that define our humanity.

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CRYPTOGRAPHY IS AT THE HEART OF DIGITAL SECURITY

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In today's digital world, where personal, corporate, and governmental data constantly flows across networks, cybersecurity is more critical than ever. As threats like hacking, identity theft, and data breaches continue to rise, protecting sensitive information has become a top priority. Cryptography is the core of this protection. It is the science of encoding information to keep it safe from unauthorised access. Cryptography's key function is to convert readable data into complex, encrypted code. This ensures that even if data is intercepted, it remains secure and confidential. It is vital for securing online communications and financial transactions, and for safeguarding national infrastructure. The aim of the research is to explore how cryptography supports cybersecurity today and shapes the digital security landscape of tomorrow.

Homomorphic encryption is a prime example of this evolution and one of the most important concepts in modern cryptography. This breakthrough in privacy-preserving technologies allows computations to be performed on encrypted data without ever needing to decrypt it.

Healthcare is an area where sensitive data such as patient records can be analysed for trends without exposing personal details. This area is still computationally demanding, but rapid progress is set to revolutionise cloud computing, finance and data-driven research. Another transformative development is the rise of blockchain technology, which relies heavily on cryptographic principles to ensure data integrity and trust. At its core, blockchain uses hashing algorithms to create immutable records of transactions, forming a secure and tamper-proof chain. This makes it ideal for decentralized platforms like Bitcoin and Ethereum, where authenticity and transparency are essential.

Building on the theme of privacy, zero-knowledge proofs (ZKPs) represent a fascinating cryptographic technique that enables one party to prove knowledge of information – such as a password – without revealing the information itself. ZKPs are increasingly being used in applications where data verification and confidentiality must go hand in hand, such as in secure authentication and anonymous transactions.

Looking ahead, quantum cryptography stands at the frontier of the field. With the emergence of quantum computers, many current encryption methods – like RSA – could be rendered obsolete due to their reliance on problems that quantum algorithms can solve efficiently. However, cryptography is adapting through innovations like

Quantum Key Distribution (QKD) and post-quantum cryptographic algorithms, which aim to stay secure in a quantum-powered future.

In conclusion, cryptography is not just a technical tool – it is the foundation of digital security in our increasingly connected world. From enabling private communication and secure transactions to powering emerging technologies like blockchain and quantum-resistant systems, cryptography continues to evolve in response to growing cyber threats.

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CHATBOTS IN MODERN BUSINESS

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The work deals with chatbots and their role in modern business. Chatbots are computer programs that can have a conversation with people using text or voice. They help businesses save time, provide better customer service and reduce costs. They simulate communicating with a person. They can chat in messengers or speak like voice assistants. Today, companies are using chatbots to serve customers faster, save money and become more efficient.

Chatbots are a type of software that answers questions, takes orders or solves problems. They are created using artificial intelligence and are widely used on websites, apps, and messaging platforms such as WhatsApp or Facebook Messenger.

They can perform simple tasks such as answering questions or processing orders. They use artificial intelligence to help them learn and improve. For example, you may have seen chatbots on various websites offering help or customer support.

Why are chatbots popular? They are 24-hour available: they never sleep and can help customers at any time. They respond much faster than humans - within seconds.

They are cost saving: companies save money by using fewer human agents for simple questions. They don't need a salary or breaks. Especially in large companies, there are thousands of customers every day.

In customer service, for example, they answer frequently asked questions or help track orders. In sales, they suggest products or services that customers might like. In marketing, they send discounts or collect feedback. They are also great for making reservations, like booking a table at a restaurant.

Speaking about real-world examples, many industries are using chatbots. Amazon, for example, uses a chatbot to help customers track delivery status. KLM Airlines provides flight schedules and takes bookings via its chatbots. Even in the food industry, like Domino's Pizza, you can order pizza via messenger.

Benefits of chatbots are: they improve customer satisfaction; they can serve many customers at once; they free up employees to do other complex tasks; they delight customers by answering their questions quickly and accurately; they are able to handle thousands of users simultaneously, which no human can do. This frees up human resources for more complicated and serious tasks.

Challenges for chatbots:

1. Limited understanding: Sometimes chatbots can't answer complex questions.
2. Personal touch: Customers may miss the "human touch" in conversations.
3. Cost of setup: Developing a chatbot can be expensive for small businesses.

For example, they don't always understand complicated or unusual questions. Some customers prefer to talk to a real person. And for small businesses, building a chatbot can be expensive.

The future of chatbots seems promising, with them getting smarter as a result of better AI technology. We are likely to see more use of voice chatbots, such as Siri and Alexa. We will see them in newer areas, such as booking appointments for healthcare and education to help students.

In the end, chatbots have become an essential tool for modern businesses, helping companies save time, reduce costs and improve the customer experience. They provide fast, effective service and are always ready to help, making them indispensable in today's fast-paced world. As technology evolves, chatbots will become even smarter, offering more personalized interactions and supporting a wider range of industries.

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THE ILLUSION OF CHOICE: HOW RECOMMENDATION ALGORITHMS SHAPE HUMAN BEHAVIOR

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Over 63.9% of the global population uses social media. The average daily usage? Two hours and twenty-one minutes. That means billions of people spend a tenth of their waking lives engaging with systems they don’t understand, on platforms that are silently deciding what they should watch, think, and feel. We are not just scrolling anymore. We are being scrolled.

At the center of this transformation lies a phenomenon known as the *black-box system*. Unlike transparent software, black-box algorithms operate invisibly, giving no clear insight into how they reach their decisions. Users do not see the parameters, the biases, or the goals. Yet these systems influence which videos go viral, which songs we hear, which news we see, and ultimately, which ideas get internalized. Algorithms aren’t just tools anymore. They are culture-shaping agents.

Recommendation algorithms function by processing massive amounts of behavioral data: clicks, watch time, pauses, rewatches. Each second of engagement becomes a signal. On platforms like TikTok, this signal is enough for the system to map your emotional state, interests, and vulnerabilities. Within minutes, a user can be funneled into a hyper-personalized content loop that reinforces specific emotions, ideologies, or aesthetics. In one major audit study, a TikTok user bot was pushed into depressive content loops within just 36 minutes of usage.

The illusion is in the freedom. On the surface, these systems are framed as helpers: suggesting new music, shows, or products to enhance our experience. But what they truly offer is a curated reality. What you believe to be spontaneous discovery is often the result of predictive optimization. As recommender systems evolve, content diversity does not grow – it shrinks. One study of YouTube's algorithm showed that 70% of user watch time is driven by recommendations, leading to repeated exposure to the same types of content, often with increasingly extreme viewpoints.

In this ecosystem, echo chambers emerge not as a byproduct, but as a feature. As users engage with specific viewpoints or aesthetic trends, they are fed more of the same. Whether it's politics, fashion, or music, opposing voices or unfamiliar experiences are slowly filtered out. Research on Facebook's recommendation system found that ideological segregation increased with usage, as users were less likely to be exposed to diverse news. The system favors what it knows will keep you engaged. The result is a narrowing of identity, a flattening of perspective.

Psychologically, this breeds dependency. Algorithms reward certain behaviors with visibility and dopamine-triggering content. They slowly train users to behave in predictable, reward-seeking ways, often subconsciously. Over time, people begin to internalize the algorithm's logic: posting in ways that favor virality, consuming what gets most promoted, and losing awareness of where their own preferences end and the machine's influence begins. This creates what researchers have described as "algorithmic conditioning," where user behavior and algorithm design become co-dependent in an endless feedback loop.

This isn't just a matter of personal taste. The cultural implications are massive.

Style, music, slang, and even architecture are being homogenized by algorithmic favor. Local flavor is replaced by algorithm-friendly trends. The coffee shop in New York now looks the same as one in Warsaw, Tokyo, or Kyiv. The fashion trends you see in Berlin echo those in Buenos Aires. What should be personal becomes programmable.

And it doesn't stop with aesthetics. In the age of identity marketing, platforms encourage users to define themselves through algorithm-approved subcultures. These micro-identities are then monetized. Cottagecore, clean girl, tech bro, dark academia – all packaged for easier targeting. One major platform openly promotes the idea that "Subcultures are the new demographics." Marketers are now optimizing ad delivery based not just on preferences, but on digitally constructed identities. These hypertargeted campaigns are proving significantly more effective in converting users than traditional demographic-based advertising. For instance, a study by the Network Advertising Initiative found that behaviorally targeted ads are more than twice as effective at converting users compared to non-targeted ads.

All of this operates under the hood. The black-box nature of algorithms means users have no way to truly audit or challenge the forces shaping their online reality. While some tools exist to signal disinterest, these are surface-level patches in systems optimized for one goal: maximize attention to maximize profit.

In the end, the algorithm doesn't care what you believe – only that you stay. It rewards whatever keeps your eyes on the screen and penalizes whatever does not. That may be entertaining. But it is not neutral.

And if we don't know why we're being shown something, if we can't see the logic behind our digital environment, can we really call our choices our own?

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QUANTUM COMPUTING: A NEW AGE OF PROGRAMMING

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What is a quantum computer? Some of you might say that a quantum computer is just like a regular computer but much more powerful. And that is true – but only a small part of the truth because it is actually something much more serious than you might think. Quantum computers work differently from classical ones. In a regular computer, all information is stored in bits – simple 0s and 1s. But in a quantum computer, instead of bits, we have qubits. And here's the key feature: a qubit can be both 0 and 1 at the same time. This is called superposition. Imagine a light bulb that's both on and off simultaneously. Another strange but cool thing is entanglement. This is when two qubits are "linked" together – change one, and the other changes instantly, even if they're far apart. Because of this, quantum computers can process many possibilities at once, unlike classical computers that work step by step. That's why people say: "Quantum computers aren't just faster – they're smarter for complex problems."

Now let's examine the differences between classical and quantum computers. As we've learned, classical computers use bits (0 or 1), while quantum computers use qubits, which can be 0, 1, or both due to quantum properties. In classical programming, we use logic – conditions, loops, AND/OR operations, IF statements. But in quantum programming, it's a completely different approach. Instead, we use quantum gates – special operations that change the state of qubits, like the Hadamard gate or CNOT gate. Another big difference is the result. In classical programs, we know exactly what we'll get. But in quantum programs, the result can be probabilistic, so we often run the same program multiple times to find the most accurate answer. And even the programming languages are different. For classical computers, we use familiar ones like Python, C++, or Java. But for quantum, we use tools like Qiskit (based on Python), Microsoft's Q#, or Google's Cirq.

Quantum computers are useful for many things. Cryptography is the first step.

Modern encryption would take thousands of years to crack, but a quantum computer could do it in minutes or hours. That is why they are a big deal in cybersecurity. As my professor once explained: "Right now, cracking a hashed password – a one-way encryption method where you can only encrypt but not decrypt – especially with added 'salt,' is impossible. But in the future, quantum computers might break it in seconds." Second, artificial intelligence. Quantum algorithms help train machine learning models faster and find optimal solutions, which could revolutionize many fields. Third, physics and chemistry. Classical computers can't accurately simulate the behavior of molecules, especially complex ones. Quantum computers can, which is crucial for developing new medicines and materials. And fourth, optimization – finding the best solution among many possibilities. For example, figuring out the most efficient way to schedule flights at a major airport to reduce delays and congestion.

In conclusion, it should be noted that quantum programming is not just a new language or technology – it is a completely new way of thinking about computing. It is true that it requires learning new concepts, but this is no longer science fiction. It's a fast-developing reality. Those who start learning today will be the pioneers of tomorrow.

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KÜNSTLICHE INTELLIGENZ IN DER GASTRONOMIE: DIGITALE LÖSUNGEN

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KI hat inzwischen einen festen Platz praktisch in allen Anwendungsbereichen genommen: Wissenschaft und Forschung, Lehre, Studium, Medizin, Industrie u.a. kommen ohne KI kaum noch aus. Gastronomie ist dabei keine Ausnahme. Hier werden sowohl technische als auch kreative Prozesse mithilfe der KI optimiert. Des Weiteren werden die neusten digitalen Lösungen in der Gastronomie vorgestellt.

1. KI ermöglicht es, effiziente Dienstpläne zusammenzustellen: Anhand der Daten zu Schichtzeiten und -vorlieben, Qualifikationen und Umsatzwerten wird die Personaleinsatzplanung automatisiert (*Nesto*, *Gastromatic*, *Papershift*).
2. KI bietet automatisierte Lösungen für Bestandinventur und Nachbestellung und hilft, die Ressourcen zu sparen bzw. effektiv zu verbrauchen, dadurch wird die Lebensmittelverschwendung verhindert (*Foodnotify*, *Kost*).
3. KI ermöglicht eine digitale Buchungs- bzw. Reservierungsassistenz: Somit wird nicht nur die Kommunikation mit Kunden optimaler gestaltet, einschließlich Feedback und Reviews seitens der Kunden, sondern auch die Anfragen werden schneller bedient (*Assistent.ai*, *Dialog Shift*, *Chatlyn*, *Mara*, *re:spondelligent*).

4. KI reduziert Foodwaste, indem sie dank Kooperation von Software, Kamera und Waage genaue Infos über den Lebensmittelverbrauch und den Müll analysiert und alternative, bessere Planungsideen liefert (*Kitro*, *Winnow*, *Sprk*, *Orbisk*, *Perspective Food*, *Delicious Data*, *Foodforecast*).

5. KI kann Kundenpräferenzen analysieren und als Ergebnis Trendgerichte bestimmen bzw. prognostizieren (*Deep Brew*, *Bikky*, *Tastewise*) [4].

6. KI kann eventuell nach der genau formulierten Aufgabe experimentelle Rezepte mit unkonventionellen Geschmackskombinationen vorschlagen (ein gutes Beispiel wäre die multi-kulti Pizza eines Koches in Dubai, die er auf Vorschlag von *ChatGPT* kreiert hat) [1]. Dank KI können kulinarische Grenzen überschritten werden und neue Genusshöhen dank Kombination von traditionellem Know-how und der Präzision der künstlichen Intelligenz erreicht [2].

7. KI sichert Personalisierung von Empfehlungen und schafft Gästebindung [2].

8. KI-Roboter können erfolgreich in die Gastronomie integriert werden, was beeindruckende Chancen zur Effizienzsteigerung und zur Bekämpfung des Fachkräftemangels eröffnet [3].

Fazit: Die Gastronomie steht vor einem neuen Kapitel, in dem KI-Technologien diese Branche mehr denn je prägen werden, was eine faszinierende Perspektive sowohl für Gastronomen als auch für Kunden bietet.

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THE SCIENCE OF FEAR: WHY WE LOVE HORROR

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Fear is a fundamental biological response that plays a critical role in human survival. It triggers a cascade of physiological reactions that prepare the body to respond to danger. These responses are controlled by the brain's limbic system, particularly the amygdala, which processes threatening stimuli and initiates the "fight-or-flight" response. While fear can be unpleasant, it also stimulates arousal, attention, and memory – making it a powerful emotional experience.

Surprisingly, many people actively seek out fear-inducing experiences, such as horror films, haunted houses, and extreme sports. This behavior is explained by the concept of "benign masochism" – the enjoyment of negative emotions in safe contexts. Studies in psychology suggest that horror allows people to confront fears in a controlled environment, producing adrenaline and dopamine, which can result in a sense of excitement or even pleasure.

Neuroscientific research shows that during a scary movie, the brain is highly active. Heart rate increases, pupils dilate, and the body prepares for a threat that never actually arrives. After the fear passes, the brain releases endorphins, which create a sense of relief and euphoria – similar to the feeling after a rollercoaster ride.

Furthermore, cultural and individual differences affect how people respond to fear. Some enjoy the thrill, while others avoid it. Age, gender, and personality traits such as sensation-seeking influence one's reaction to horror.

Fear-based entertainment has existed for centuries – from ancient myths to gothic novels to modern horror films. Today, scientists study how horror influences behavior, empathy, and even immune system responses.

In conclusion, the science of fear reveals that while fear protects us, it can also entertain us. Understanding how fear works in the brain helps explain why we seek scary experiences and how they affect us both mentally and physically.

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KI IN DER KLEIDUNGSRESTAURIERUNG

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Moderne Technologien der künstlichen Intelligenz (KI) dringen immer tiefer in die Geisteswissenschaften ein, einschließlich der Erforschung und Restaurierung des materiellen Erbes. Eines der vielversprechendsten Anwendungsgebiete ist der Einsatz von KI bei der Restaurierung historischer Kleidung und in der Modeanthropologie.

Die Wiederherstellung textiler Artefakte, die Analyse historischer Trends und die Rekonstruktion verlorener Elemente werden durch Fortschritte im maschinellen Lernen und in der Computer Vision ermöglicht.

Die Restaurierung von Kleidung mit KI umfasst Methoden der Bildanalyse, generative neuronale Netzwerke und digitale Modellierung zur Wiederherstellung textiler Strukturen und Ornamente. Forschungen von F. Salvi und seinen Kollegen zeigen, dass die Algorithmen des Deep Learning verlorene Stofffragmente rekonstruieren können, indem sie erhaltene Muster analysieren. In diesem Zusammenhang spielen Technologien der Computer Vision eine entscheidende Rolle, da sie den Grad der Materialschädigung bewerten und die wahrscheinlichste Textur und Farbe fehlender Elemente vorhersagen können. Solche Methoden werden bereits in führenden Museen wie dem Louvre und dem Metropolitan Museum praktiziert, wo KI Restauratoren dabei hilft, den Zustand von Textilien zu analysieren und optimale Konservierungsmethoden vorzuschlagen.

Ebenso bedeutend ist die Rolle der künstlichen Intelligenz in der Modeanthropologie. Die Digitalisierung und anschließende Analyse großer Datenmengen, darunter Archivbilder, Texte und Museumskataloge, ermöglichen es Muster in der Entwicklung von Modetrends über Jahrhunderte hinweg zu erkennen. Forschungen einer Wissenschaftlergruppe der Universität Cambridge zeigen, dass Algorithmen der natürlichen Stoffverarbeitung die Zusammenhänge zwischen Modetrends und historischen Ereignissen aufdecken können.

Dabei lassen sich kulturelle Einflüsse und technologische Durchbrüche in der Kleidungsgestaltung nachverfolgen. Somit beschleunigt KI nicht nur den Forschungsprozess, sondern ermöglicht auch neue Erkenntnisse über die Modeentwicklung, die Forschern zuvor entgangen sind. Ein weiterer interessanter Aspekt der KI-Anwendung ist die digitale Rekonstruktion historischer Kleidung. Dreidimensionale Modellierung auf Basis von Archivdaten und maschinellem Lernen ermöglicht es, Kleidung nachzubilden, die nicht bis zu unserer Zeit erhalten geblieben ist. Dies ist besonders relevant für das Studium alter Kulturen, da textile Artefakte aufgrund ihrer Fragilität selten überdauern. Forschungen in diesem Bereich zeigen, dass die Kombination von Material-, Schnitt- und Abnutzungsdauern eine hohe historische Genauigkeit bei digitalen Rekonstruktionen ermöglicht.

Darüber hinaus werden Deep-Learning-Algorithmen zunehmend für virtuelle Anproben historischer Kostüme genutzt. Solche Technologien ermöglichen es zu simulieren, wie Kleidung an Menschen mit unterschiedlichen Körpertypen ausgesehen hatte. Dies erlaubt nicht nur eine ästhetische, sondern auch eine funktionale Analyse historischer Mode. Projekte, die vom Victoria and Albert Research Institute (2022) realisiert wurden, zeigen, dass digitale Rekonstruktionen nicht nur für Forschungszwecke, sondern auch für die Gestaltung interaktiver Ausstellungen genutzt werden können, die ein breiteres Publikum ansprechen. Der Einsatz künstlicher Intelligenz bei der Restaurierung von Kleidung und in der Modeanthropologie eröffnet neue Perspektiven für die Erforschung und Erhaltung des materiellen Erbes.

Der Einsatz von Algorithmen des maschinellen Lernens, der Computer Vision und der 3D-Modellierung ermöglicht nicht nur die Wiederherstellung verlorener Kleidungsstücke, sondern auch die Analyse historischer Trends, die Nachbildung vergangener Moden und deren digitale Aufbereitung für Forschungszwecke. Diese Symbiose von Technologie und Geisteswissenschaften bereichert nicht nur die wissenschaftliche Praxis, sondern ermöglicht es auch einer breiten Öffentlichkeit, tiefer in die Geschichte der Mode und Textilkunst einzutauchen.

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3D AND COMPUTER TECHNOLOGIES IN MEDICINE

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The integration of three-dimensional (3D) and computer technologies into modern medicine has contributed significantly to advancements in diagnostic accuracy, therapeutic strategies, prosthetic development, and medical education. These technologies have become essential components of contemporary healthcare systems, offering novel solutions to long-standing clinical and operational challenges.

Among computer-based innovations, medical information systems – including reference, consultative, and diagnostic platforms – are among the most widely implemented in healthcare institutions. Consultative and diagnostic systems (CDS), in particular, represent one of the earliest categories of medical decision support tools. Currently, these systems encompass a diverse range of digital platforms designed to assist clinicians in the identification and evaluation of pathological and prognostic conditions across various specialties and patient demographics [1, p. 16]. CDS enhance diagnostic precision, especially in atypical or complex clinical cases, and serve as valuable resources for early-career professionals and medical trainees by facilitating evidence-based decision-making.

Medical information and reference systems—comprising electronic databases and data repositories – are designed for the storage, retrieval, and presentation of clinical data upon user request. These systems, considered the most fundamental form of health information technology, are employed at multiple levels of the healthcare infrastructure. While they do not conduct independent data analysis, their ability to deliver timely access to relevant information significantly improves clinical workflow efficiency and reduces dependence on traditional paper-based records [1, p. 15].

In parallel, the emergence of 3D printing technology has had a transformative impact on the production of prosthetic and implantable devices. This technology enables the rapid fabrication of patient-specific components that are anatomically precise and functionally customized. Unlike mass-produced, standardized devices, 3D-printed solutions can be tailored to accommodate the unique morphological characteristics of individual patients, thereby improving clinical outcomes and patient satisfaction.

In dental applications, 3D printing facilitates the expedited production of crowns, veneers, and gingival prosthetics, leading to reduced patient waiting times and decreased reliance on manual fabrication by dental practitioners. In the field of limb prosthetics, this technology enables the creation of biomechanically accurate devices that conform to the patient's anatomy and may integrate with neuromuscular sensors to restore functional mobility.

Moreover, in implantology and surgical practice, 3D printing supports the generation of personalized bone plates and implants for reconstructive procedures involving the skull, jaw, and other skeletal structures. In cardiovascular surgery, 3D-printed vascular grafts offer a potential alternative to conventional blood vessel replacements. Additionally, anatomical models derived from patient-specific imaging data are increasingly used for surgical training and preoperative planning. These models enable precise rehearsal of procedures and risk assessment, thereby contributing to reduced intraoperative complications and enhanced surgical outcomes [2].

The capacity of 3D printing to reproduce intricate anatomical structures with high fidelity underscores its value in clinical and educational settings. Its implementation enhances both the quality of care and the personalization of treatment strategies.

In conclusion, the adoption of 3D and computer technologies marks a critical development in the evolution of modern healthcare. Medical information systems and CDS improve the accessibility and accuracy of clinical data, while 3D printing enables the creation of customized prosthetics, implants, and training models.

Together, these technologies contribute to improved diagnostic and therapeutic efficacy, increased operational efficiency, and enhanced training of healthcare professionals. Future research should continue to explore their long-term impact on clinical outcomes and healthcare delivery systems.

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PROTECTION OF PERSONALLY IDENTIFIABLE INFORMATION

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Nowadays, the leakage of personal data is a major challenge that almost everyone has encountered. According to IT Governance, in 2024, the number of compromised data records increased by a stunning 337% [1] compared to the previous year [2]. For this reason, people should know how to protect their confidential data.

To begin with, it is essential to use a long password instead of biometric authentication such as fingerprint or Face ID. However, passwords consisting of fewer than 12 characters are of little use, as many programs can crack them within minutes. To protect your sensitive information, you should use longer passwords with unpredictable sequences. Furthermore, you can use a specific program or settings on your phone that will take a photo of anyone trying to unlock your device and send it directly to your email.

It is also advisable to use a virtual private network (VPN) while surfing the Internet. Even though it is a common recommendation, it remains effective because encrypted Internet traffic is much harder for hackers to monitor. Additionally, this precaution helps protect against eavesdropping when using public Wi-Fi access points.

It is highly important to use special websites or applications to check suspicious sites, as one of the easiest ways to get hacked is by downloading a program or accessing a website from an unknown source. For instance, you can use SonicWall’s Capture Labs to view the URL rating and the approximate category it belongs to, helping to safeguard your personal data. Moreover, you can find lists of innovative techniques for protecting sensitive information and identifying common vulnerabilities.

However, if you absolutely need to download a potentially unsafe application, you can install Oracle VirtualBox, an open-source software that provides basic virtualization functionalities. This virtual machine can be especially useful for creating isolated environments to safely use unpredictable or hazardous programs and websites.

Therefore, if you become a victim of a cyberattack, you can simply reset the virtual machine to its factory defaults or delete it altogether.

In conclusion, implementing these methods in your daily life will provide you with not only greater confidentiality and protection against personal data leaks, but also increased digital resilience to future threats.

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QUANTUM ENERGY AND CULTURAL WISDOM: A VISION FOR FUTURE SOCIAL TRANSFORMATION

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Quantum physics has reshaped our understanding of the universe, introducing concepts such as entanglement, the observer effect, and non-locality – all of which suggest that consciousness and intention may have measurable effects on physical systems. That is why we find the topic actual.

The aim of the abstract is to show that the emerging field of quantum energy can serve as a bridge between modern science and traditional knowledge systems to create a more conscious and connected future society.

In French Polynesia, the traditional belief in mana – the vital energy present in all life mirrors quantum ideas of a unifying field. Navigators like Mau Piailug used intuitive energy and stellar guidance, demonstrating how cultural wisdom integrates deeply with nature's frequencies. Similarly, in Ukrainian culture, healers (znahari), verbal rituals, and poets like Lesya Ukrainka used words and intention as vibrational tools to inspire healing and resilience.

By combining cultural knowledge with tools like EEG, heart rate variability (HRV), and quantum sensors, scientists can study the effects of meditation, sound, and intention on human well-being. These practices align with raising the vibrational frequency of individuals and communities, potentially creating emotional coherence and even influencing social peace.

So, we hope the information studied can demonstrate how science and culture together can pave the way toward technologies and health systems that respect the energetic nature of life. It argues that quantum energy is not only a scientific revolution – but a return to ancient truth, one that empowers future societies through conscious evolution.

As the result of further studies, there can be a fruitful investigation of ancient knowledge to adopt them and use in modern science.

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THE FUTURE OF IT INDUSTRY IN KHARKIV

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Kharkiv continues to serve as a crucial center for Ukraine's IT industry. Despite challenging circumstances, the city's technology sector has demonstrated resilience and consistent growth. At present, more than 510 IT companies operate in Kharkiv, employing approximately 45,000 professionals. During the COVID-19 pandemic, the sector expanded by 29%, and by 2021, its total revenue exceeded $1.5 billion – an increase of more than 50% compared to 2019.

This sustained growth contributes significantly to the city's development. It creates new employment opportunities, enhances tax revenues, and strengthens the local economy. In addition to economic benefits, IT companies play an important role in the modernization of urban infrastructure through the implementation of smart city technologies and digital solutions. They also contribute to education by supporting schools and universities, helping students develop relevant technological skills for the future.

While the industry has faced difficulties, particularly due to the migration of skilled professionals abroad as a result of the war, many game development studios in Kharkiv remain active and continue to produce innovative projects. Ukrainian developers are recognized globally for their creativity and expertise, and emerging technologies – such as virtual and augmented reality, as well as artificial intelligence – provide new opportunities for continued growth and advancement.

Since the beginning of the war, interest in computer science has increased across Ukraine, including in Kharkiv. The widespread adoption of online education has made access to technology-related subjects more feasible for students, supported by the growing use of digital learning platforms and tools. Concurrently, both the government and private IT companies have intensified efforts to modernize the teaching of computer science, ensuring that educational institutions are better equipped to meet current and future demands.

Looking forward, Kharkiv is well-positioned to become one of Ukraine's leading high-tech cities. The presence of a skilled workforce, a robust network of IT companies, and expanding international cooperation all contribute to its strategic potential. In the post-war era, the city may emerge as a key driver in the creation of digital jobs, the launch of innovative startups, and the development of transformative technologies.

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ARTIFICIAL INTELLIGENCE IN EDUCATION

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Artificial intelligence (AI) refers to the capability of computational systems to perform tasks typically associated with human intelligence: learning, perception, reasoning, problem-solving, decision-making etc. The core principle revolves around data, while the specifics may vary across different techniques. AI systems learn and improve through analysis of vast amounts of data.

The Council of Europe believes that education should be accessible, inclusive, and available for all. AI systems have the potential to play a crucial role in achieving these goals. With AI, educators can transform learning experiences according to individual students` needs, making education more effective and engaging. AI-enabled technologies also assist in administrative tasks, freeing up time to focus on actual teaching.

At the same time the Council of Europe recognises the importance of addressing several important questions in the context of AI in education., such as data privacy, algorithmic transparency and bias mitigation. The Council aims to ensure that the adoption of AI systems respects the dignity of learners and aligns with human rights values.

The widespread adoption of AI in the last few years, including its growing use in schools, has caused different reactions, ranging from hopeful embrace to fearful ban. The tools continue to evolve and change the way we operate in all areas of life, but we need to come to terms with several ethical problems considering AI in education.

Privacy is one major concern with artificial intelligence in education. AI tools operate on collecting and processing large amounts of data, which raises questions about how this data is used and protected. To address this, educators should ensure transparency by informing students and parents about the data collected. Consent between educators and students about using AI tools is extremely important.

Teachers are concerned about students using AI technology to complete assignments, therefore bypassing learning. One of the suggested ways to address this is by designing assignments that require critical thinking, personal engagement and creativity. On the current stage of AI development such qualities are harder for AI technologies to replicate.

Another popular concern is job overtake. The incorporation of AI technologies raises significant concerns among teachers. Such fears as AI taking away jobs or undermining the human connection in learning are pretty valid. However, human-led teaching is practically impossible to replace. Currently, AI tools focus on enhancing human-led teaching by automating clerical tasks and freeing up teachers' time to focus on their main task. By providing relevant information, those tools help teachers to be more effective at their jobs.

In conclusion, AI plays a significant role in our lives. We can use AI technologies to assist in making education more available and widespread. These tools come with a variety of problems and concerns, such as privacy, authenticity of learning process and various ethical questions. However, by constantly improving the technology and making sure that human interaction remains the key factor in education, we can ensure the best possible experience for students and educators.

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DIGITAL IMMORTALITY

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Digital immortality (or "virtual immortality") is the hypothetical concept of storing (or cloning) a person's personality in digital substrate, i.e., a computer, robot or cyberspace (mind uploading). The result might look like an avatar behaving, reacting, and thinking like a person on the basis of that person's digital archive. After the death of the individual, this avatar could remain static or continue to learn and self-improve autonomously.

It envisions a future where individuals can transcend the biological limitations of the human body by preserving their consciousness, personality, and memories within a digital medium. The prospect of capturing the essence of one's being and enabling it to exist independently of physical form is no longer confined to the realms of science fiction. It is, instead, an emerging field that carries profound implications for humanity's relationship with mortality, identity, and legacy.

The concept challenges the boundaries of what it means to exist, suggesting that the essence of a person – what makes them "them" – can be preserved indefinitely. Digital immortality reframes death not as an ending but as a transition to a new form of existence, one that thrives in the virtual realm.

So what are applications and benefits of such an innovative view on afterlife?

Firstly, digital immortality provides a mechanism for individuals to leave behind comprehensive digital archives of their lives. Traces of a personality could be left to live in texts, audios and simulated traits so that their wisdom would be present forever.

Secondly, virtual avatars created through digital immortality technology can provide solace to grieving families. It can provide some emotional comfort and enable a unique form of long lasting companionship.

Thirdly, digitally immortalized humans serve as valuable resources for education and historical research. Future generations can benefit from gaining straight insights into thoughts and views of great historical personas, preserving collective memory.

And, the last but not the least, it can also play a role in art, philosophy, and culture, as digital avatars contribute to creative projects or inspire new ideas based on their preserved personalities and knowledge.

However, some challenges and ethical considerations arise with the idea of preserving human consciousness in a digital form. It includes questions like who has the right to create or manage digital replica, how consent should be involved here and whether our identity could be represented fully.

On top of that, the psychological and societal impacts of digital immortality cannot be ignored. Could an over-reliance on digital avatars lead to a diminished appreciation for the human experience? Would access to such technology deepen existing inequalities between those who can afford digital immortality and those who cannot?

Digital immortality is more than just a technological advancement – it is a testament to humanity's relentless pursuit of progress and its desire to transcend the boundaries of mortality. This groundbreaking concept challenges traditional notions of life and death, urging us to rethink the essence of existence in an increasingly digital world.

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