THE WORLD IS NOT ENOUGH

AI IN COMMERCIAL REAL ESTATE

AI BASED
Warsaw office market forecasts
DON'T MISS!

BNP PARIBAS REAL ESTATE

Photo: Shutterstock

A GLOBAL REVOLUTION
is coming

For AI techniques - like in a cult James Bond film - the world is not enough...

Of all commercial real estate trends, it is AI-powered proptech solutions that will completely revolutionise the property sector in the coming years. Forthcoming changes will impact all market players, making owning, renting and working in a building a unique, smoother and more efficient experience. Proptech is agent 007 with a licence to improve, and AI is like his favourite weapon Walther PPK .

What is proptech?

Proptech is short for "property technology". Proptech is a term for IT techniques and technologies used in all aspects of a real estate lifecycle. It aims at transforming traditional business models and/ or enhancing the quality and efficiency of property sector processes. Proptech is also an umbrella term for companies (mostly startups) and investors whose business model is based on the economic use of such techniques and technologies.

PROPTECH
- real estate startups

SMART REAL ESTATE
- intelligent cities and buildings

CONTECH
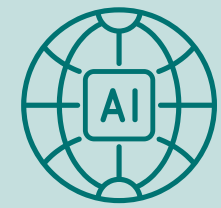- construction startups

FINTECH
- finance startups

CONTECH

SMART REAL ESTATE

REAL ESTATE FINTECH

FINTECH

PROPTECH

COLLABORATIVE ECONOMY

USD **30.16** BILLION
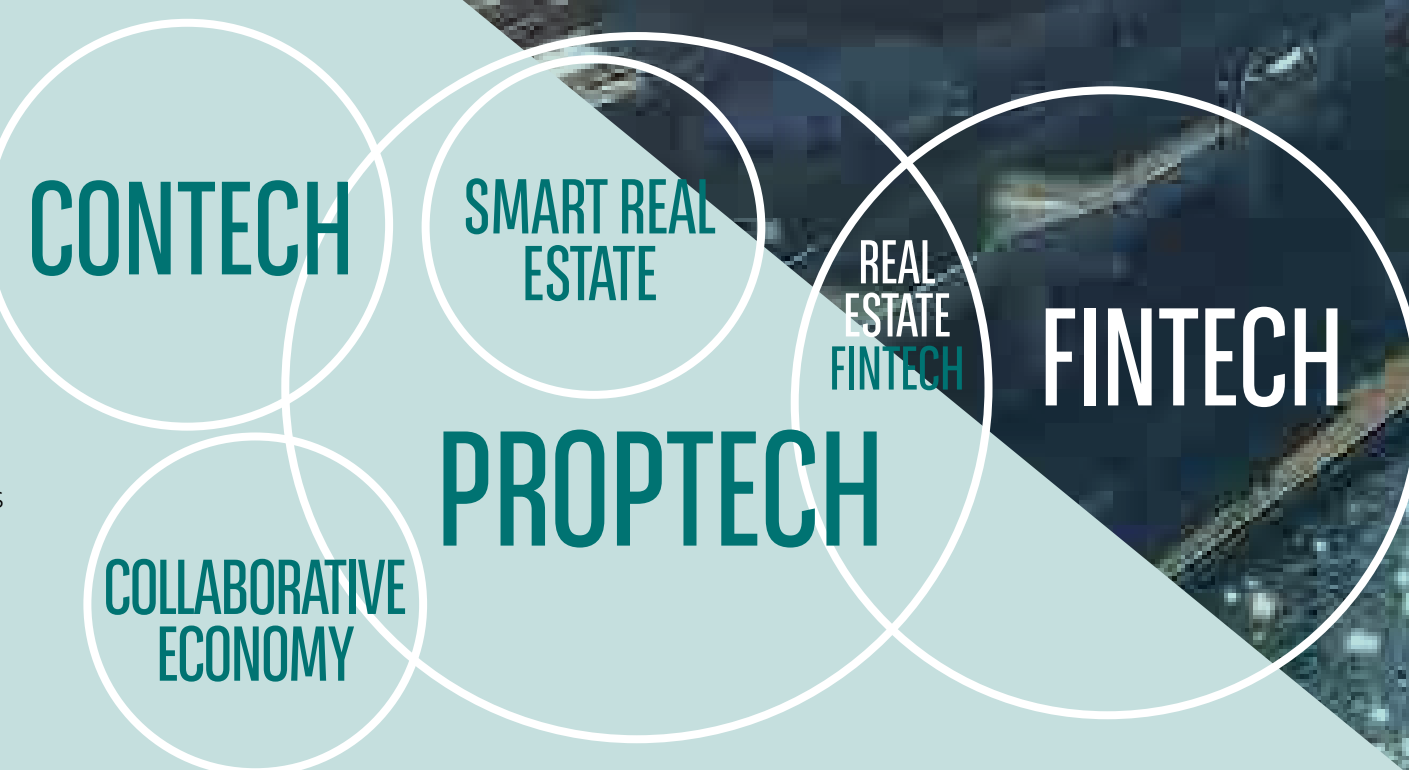
- Global proptech market size in 2022

+16%

- A projected compound annual growth rate of the global proptech market from 2023 to 2032

Source: Precedence Research, www.precedenceresearch.com
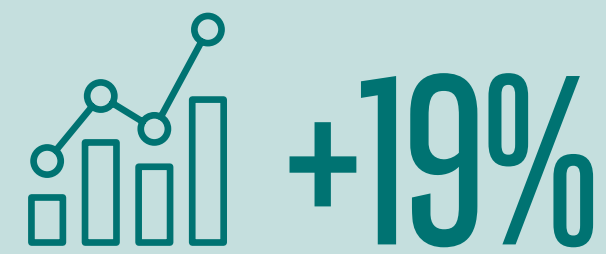
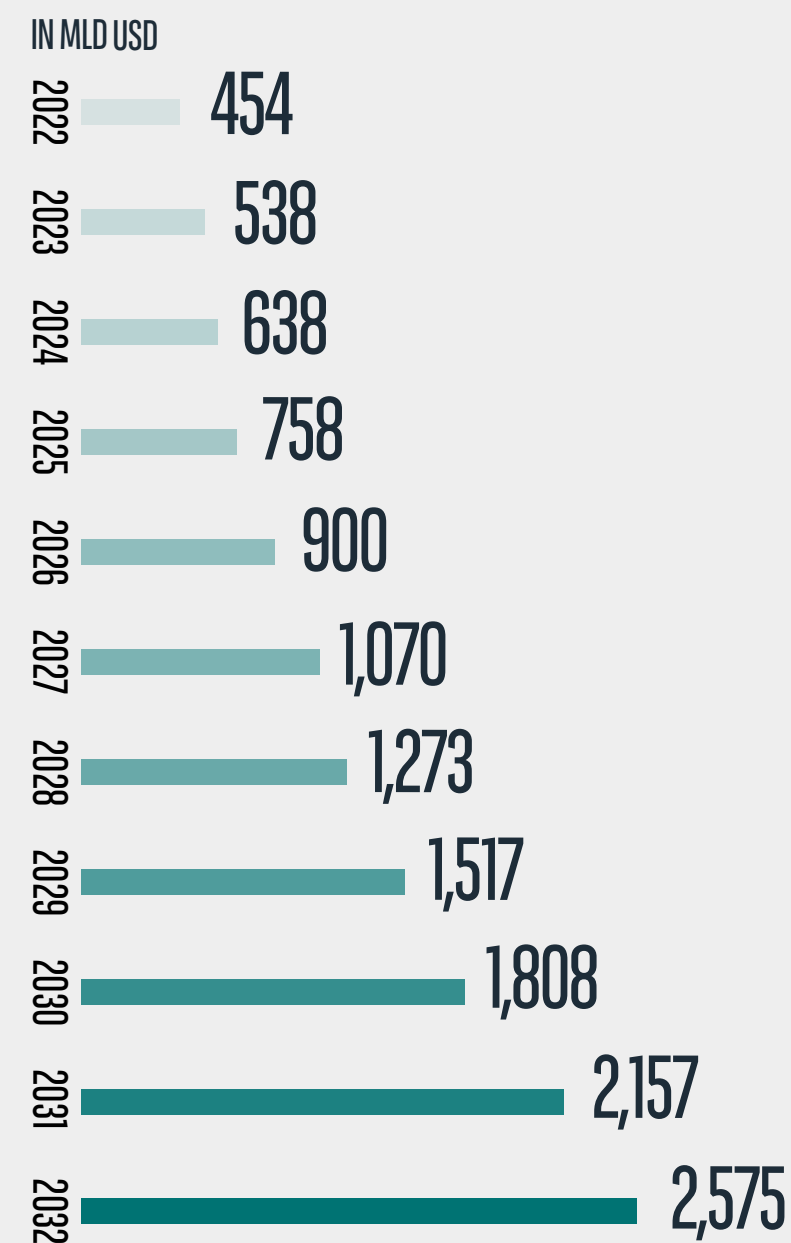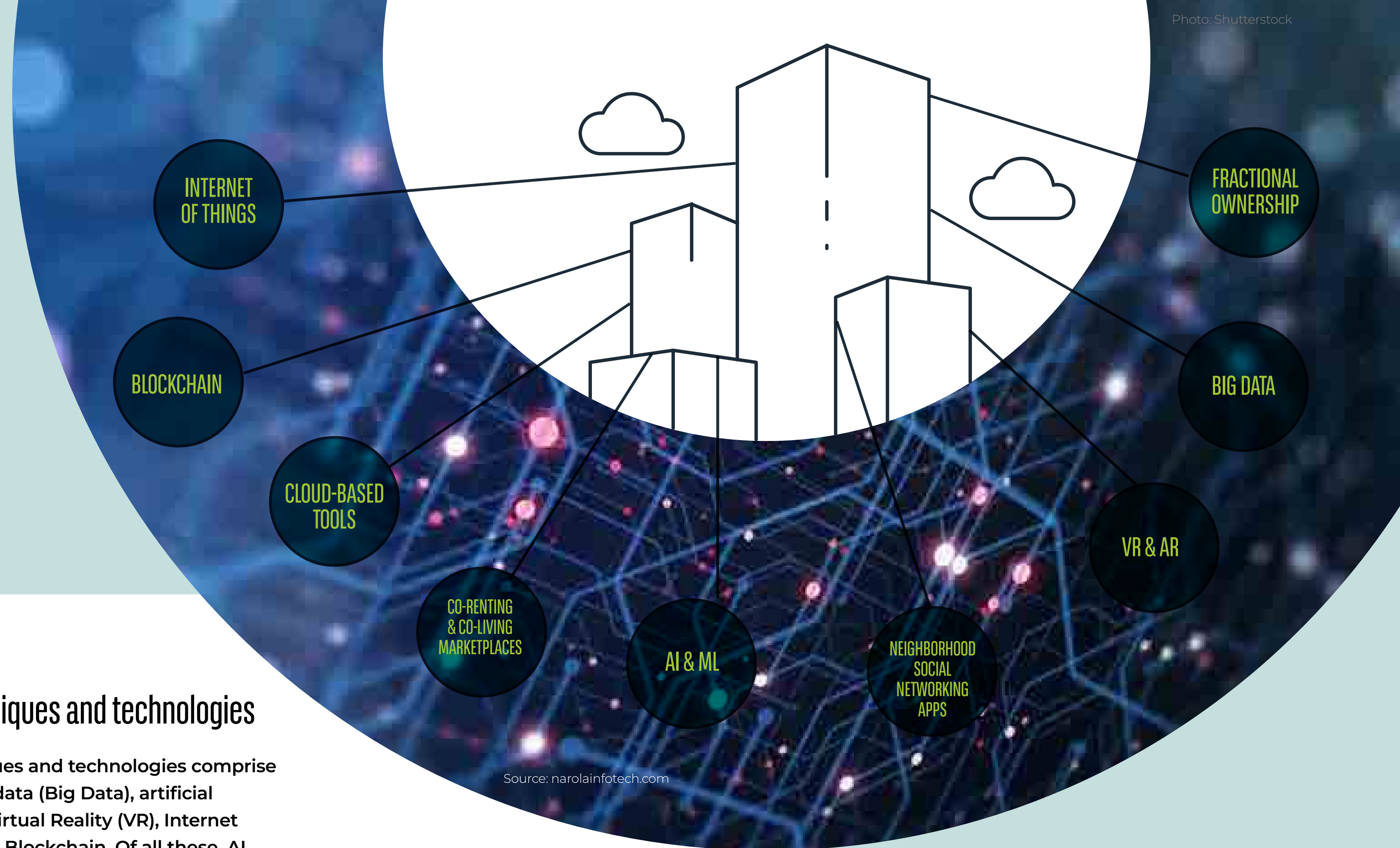# Global artificial intelligence (AI) market size

USD 454 BILLION

- Global artificial intelligence (AI) market size in 2022

+19%

- A projected compound annual growth rate of the AI market from 2023 to 2032

IN MLD USD

Year	Value
2022	454
2023	538
2024	638
2025	758
2026	900
2027	1,070
2028	1,273
2029	1,517
2030	1,808
2031	2,157
2032	2,575

Source: Precedence Research, www.precedenceresearch.com

INTERNET OF THINGS

FRACTIONAL OWNERSHIP

BLOCKCHAIN

BIG DATA

CLOUD-BASED TOOLS

VR & AR

CO-RENTING & CO-LIVING MARKETPLACES

AI & ML

NEIGHBORHOOD SOCIAL NETWORKING APPS

Photo: Shutterstock

Source: narolainfotech.com

Proptech techniques and technologies

Proptech techniques and technologies comprise expansive sets of data (Big Data), artificial intelligence (AI), Virtual Reality (VR), Internet of Things (IoT) and Blockchain. Of all these, AI is expected to bring the biggest change to the market.

AI will have an enormous impact on our reality. H. Kissinger says in his book "The Age of AI" that "Aided by the advancement and increasing use of AI, the human mind is accessing new vistas, bringing previously unattainable goals within sight." The commercial real estate market is not an isolated island here and, being inextricably linked to other sectors of the economy, it has already begun its journey towards a "new world" in which the sky is the limit.

And it all began innocently with one of the world's oldest games: chess...

Nobel Prize 2024

The relevance of artificial intelligence to human development is evidenced by the fact that this year's Nobel Prize in Physics was awarded to John Hopfield and Geoffrey Hinton for their "contributions to foundational discoveries and inventions that enable machine learning with artificial neural networks.

Artificial intelligence
## AND CHESS

Definition first

Artificial intelligence (AI) encompasses a range of techniques and technologies that enable computers and machines to emulate human intelligence and human cognitive functions such as the capabilities to see, comprehend and respond to spoken or written language, analyse data, make recommendations, and more.

On its own or in tandem with other technologies (e.g. sensors, geopositioning and robotics), AI is capable of performing tasks that would otherwise require human intelligence or intervention. Digital assistants, autonomous vehicles and generative tools like ChatGPT are just a few examples of AI in our daily lives.

All this sounds almost surreal and brings to mind humanoids transcending the real world. Fortunately, it is comforting to know that there are two types of artificial intelligence: weak and strong AI, the latter still being a theoretical construct that remains in the realm of debate and is unlikely to materialise any time soon.

Photo: Shutterstock

Weak AI vs strong AI
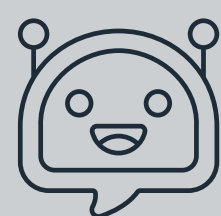
WEAK AI, also known as narrow AI, is defined as AI systems designed and trained to perform a specific task. Examples include industrial robots and virtual personal assistants such as Apple's Siri.
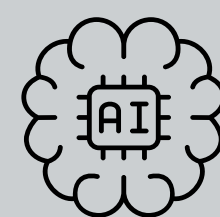
STRONG AI is a theoretical concept of a system capable of replicating the cognitive capabilities of the human brain. If confronted with an unfamiliar task, a strong AI system will use its logic to apply its knowledge of one domain to another and come up with a solution on its own. Strong AI will possess the ability to perform various functions, ultimately learning to solve new problems.

Strong AI systems, if developed, will require intelligence on par with human intelligence and will become self-aware and capable of solving problems, learning and future planning. Strong AI aims at designing intelligent machines indistinguishable from human minds. Such AI machines would have to learn from input data and experiences, continuously developing and refining their capabilities over time.

Fundamental to the development of modern AI systems is a set of algorithms that automatically learn from experience (Machine Learning) and are part of Deep Learning methods known from ChatGPT and based on neural networks. All these algorithms may be part of AI systems or be used only for a specific purpose such as market data analysis. Dozens of new algorithms appear across the world almost every day which are becoming increasingly better at performing new tasks.

zdjęcie: Shutterstock
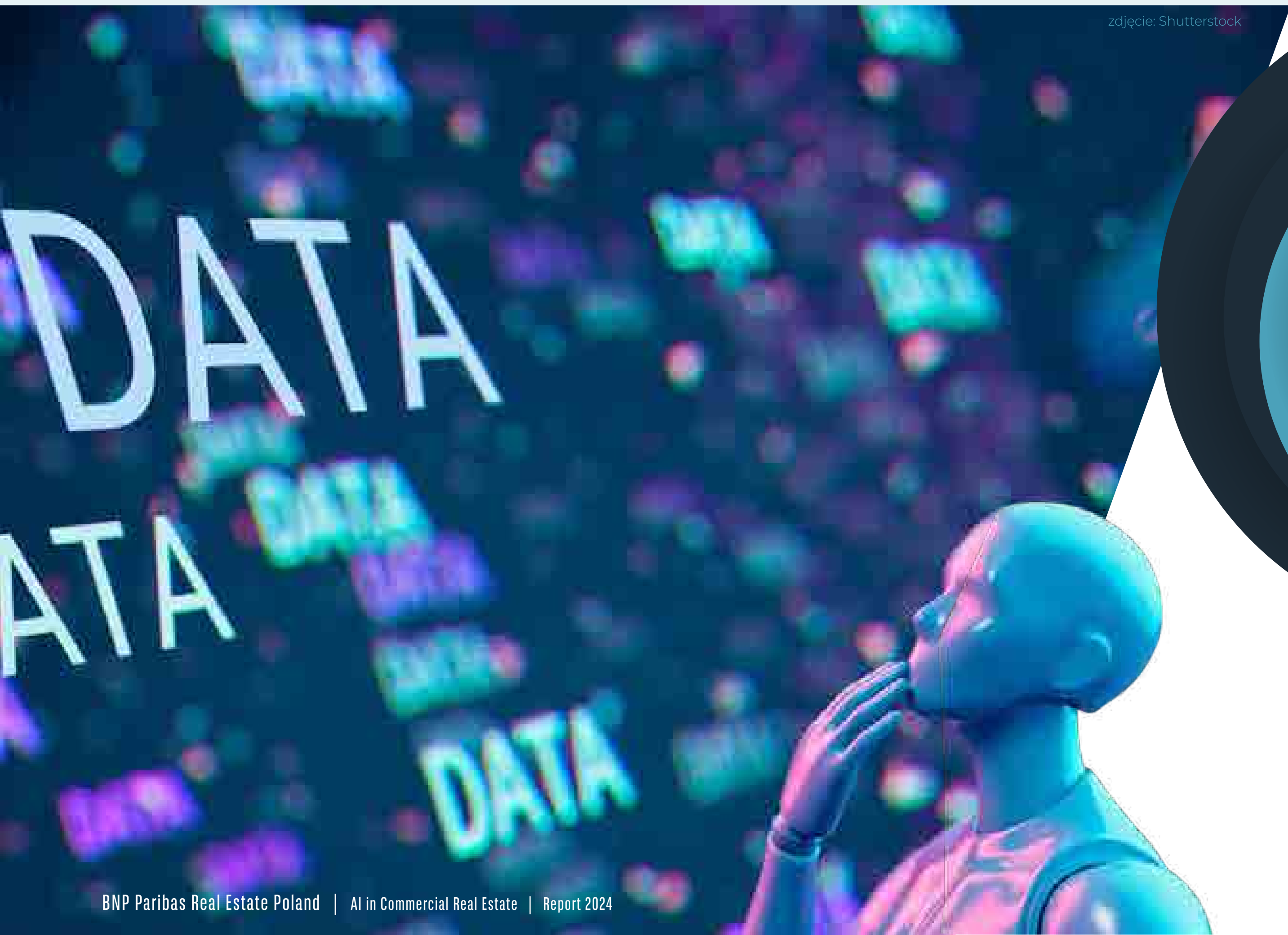
AI TECHNIQUES
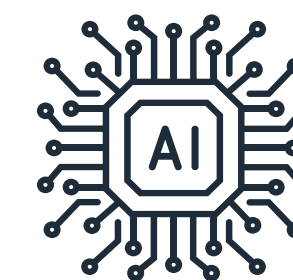
ARTIFICIAL INTELLIGENCE
Any technique which enables computers to mimic human behavior

DEEP LEARNING
Subset of ML which make the computation of multi-layer neural networks feasible.

MACHINE LEARNING
Subset of AI techniques which use statistical methods to enable machines to improve with experiences.

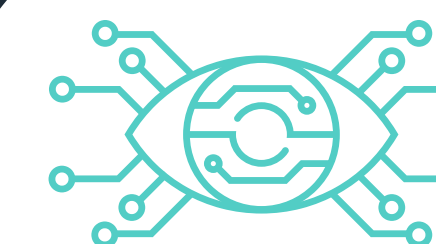In terms of hardware technology, the foundations of AI include new ranges of GPU processors using architectures optimised for greater efficiency with ML and big data algorithms, as well as photonic integrated circuits and quantum computers which are expected to further enhance the speed and capabilities of such systems in the coming years.

THE SHARE PRICE OF NVIDIA, A MANUFACTURER OF GPUS FOR USE IN MODERN ALGORITHMS OF GRAPHICS PROCESSING

| 1D | 5D | 1M | 6M | AATD | 1A | 5A | Max. |

229.65 USD 10/03/2023

1,000
800
600
400
200
0

2020   2021   2022   2023   2024

Source: Google Finance, 2024

DEVELOPMENT OF QUANTUM COMPUTERS

1,250
1,000
750
500
250

Atom Computing

IMB Osprey

Google Bristlecone   USTC Jiuzhang

IBM Eagle

1998 2000 2005 2006 2011 2017 2018 2020 2021 2022 2023

Google Bristlecone: 72 qubits

USTC Jiuzhang: 76 qubits

IBM Eagle: 127 qubits

IBM Osprey: 433 qubits

Atom Computing: 1,180 qubits

Source: https://www.netmeister.org/blog/pqc-2024-01.html
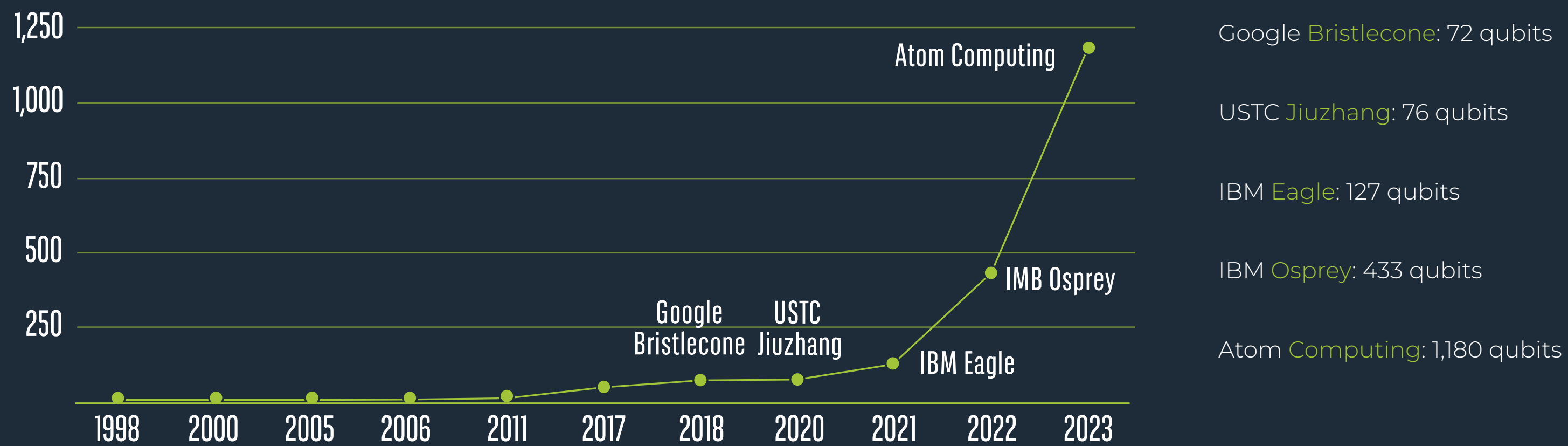
Checkmate | What does AI have to do with one of the oldest games in the world?

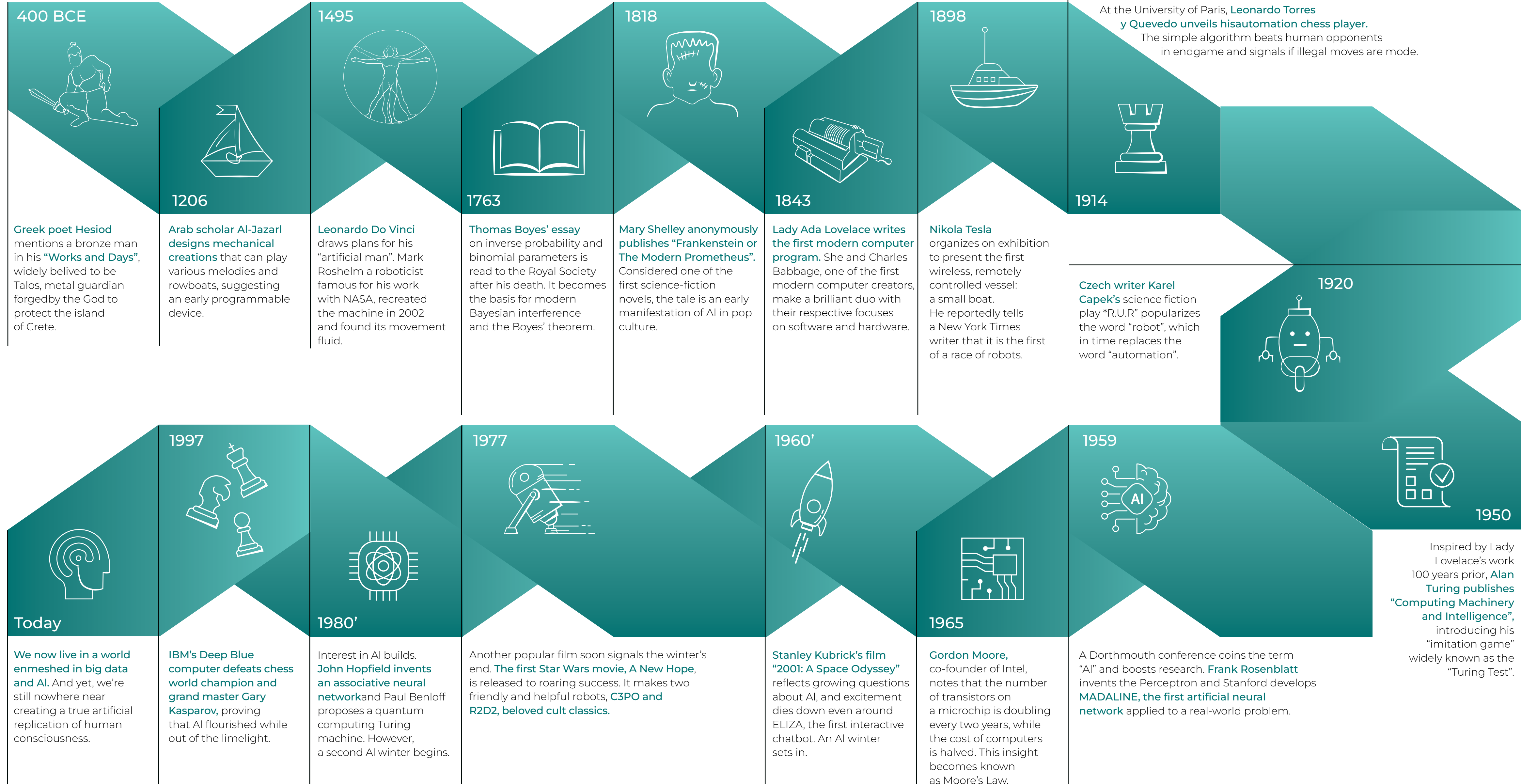**Chess has been used to test new AI ideas since the 1950s, when Alan Turing (a brilliant mathematician, cryptologist and computer science pioneer) developed a test to determine whether a machine can be considered capable of thought, i.e. simulating human thought processes.**

The idea of testing a machine's intelligence level was relatively simple. The Turing test involves an experiment participant engaging in two conversations: one with a human and the other with a machine. The conversations are in text form so that the test does not measure the machine's ability to speak words. Following the conversations, the experiment participant is asked to identify which conversation was with a human and which with a machine. If the participant has any doubts, the machine is considered to have passed the Turing test and can be called intelligent.

His work on artificial intelligence saw Turing quickly shift his focus to chess, which he considered as a way to test the true potential of an artificial brain. The term "artificial intelligence" was not coined until 1956, two years after the untimely death of the mathematical genius. In 1950, Turing created a computer programme to play chess and predicted that computers would ultimately beat humans.

ARTIFICIAL INTELLIGENCE a short story

400 BCE

Greek poet Hesiod mentions a bronze man in his **"Works and Days"**, widely belived to be Talos, metal guardian forgedby the God to protect the island of Crete.

1206

Arab scholar Al-Jazarl designs mechanical creations that can play various melodies and rowboats, suggesting an early programmable device.

1495

Leonardo Do Vinci draws plans for his "artificial man". Mark Roshelm a roboticist famous for his work with NASA, recreated the machine in 2002 and found its movement fluid.

1763

Thomas Boyes' essay on inverse probability and binomial parameters is read to the Royal Society after his death. It becomes the basis for modern Bayesian interference and the Boyes' theorem.

1818

Mary Shelley anonymously publishes "Frankenstein or The Modern Prometheus". Considered one of the first science-fiction novels, the tale is an early manifestation of AI in pop culture.

1843

Lady Ada Lovelace writes the first modern computer program. She and Charles Babbage, one of the first modern computer creators, make a brilliant duo with their respective focuses on software and hardware.

1898

Nikola Tesla organizes on exhibition to present the first wireless, remotely controlled vessel: a small boat. He reportedly tells a New York Times writer that it is the first of a race of robots.

At the University of Paris, **Leonardo Torres y Quevedo unveils hisautomation chess player.** The simple algorithm beats human opponents in endgame and signals if illegal moves are mode.

1914

1920

Czech writer Karel Capek's science fiction play *R.U.R* popularizes the word "robot", which in time replaces the word "automation".

Today

We now live in a world enmeshed in big data and AI. And yet, we're still nowhere near creating a true artificial replication of human consciousness.

1997

IBM's Deep Blue computer defeats chess world champion and grand master Gary Kasparov, proving that AI flourished while out of the limelight.

1980'

Interest in AI builds. **John Hopfield invents an associative neural network**and Paul Benloff proposes a quantum computing Turing machine. However, a second AI winter begins.

1977

Another popular film soon signals the winter's end. **The first Star Wars movie, A New Hope,** is released to roaring success. It makes two friendly and helpful robots, **C3PO and R2D2, beloved cult classics.**

1960'

Stanley Kubrick's film "2001: A Space Odyssey" reflects growing questions about AI, and excitement dies down even around ELIZA, the first interactive chatbot. An AI winter sets in.

1965

Gordon Moore, co-founder of Intel, notes that the number of transistors on a microchip is doubling every two years, while the cost of computers is halved. This insight becomes known as Moore's Law.

1959

A Dorthmouth conference coins the term "AI" and boosts research. **Frank Rosenblatt** invents the Perceptron and Stanford develops **MADALINE, the first artificial neural network** applied to a real-world problem.

1950

Inspired by Lady Lovelace's work 100 years prior, **Alan Turing publishes "Computing Machinery and Intelligence",** introducing his "imitation game" widely known as the "Turing Test".

Blitz chess

Since Turing's times, the advancement of AI technology has been almost like blitz chess.

An event that marked a historic milestone and demonstrated that a machine was capable of outperforming a chess grandmaster was IBM's Deep Blue victory over world chess champion Garry Kasparov in a six-game chess match in 1997. In 2017, the chess world was hit by another earthquake.

The AlphaZero computer programme, developed by DeepMind (now Google DeepMind of Alphabet Inc.), adopted a radically different approach to chess artificial intelligence. Unlike Deep Blue, instead of relying on brutal calculations of billions of positions per second and vast databases of chess openings and games, AlphaZero quickly mastered chess by training on its own and playing games against itself. AlphaZero embraced a more intuitive and human approach.

Thanks to deep reinforcement learning, it perfected its chess-playing skills. In a series of matches, AlphaZero beat Stockfish 8, one of the strongest chess engines at that time, demonstrating its extraordinary capabilities. Its ability to generate creative and unorthodox moves amazed chess fans. AlphaZero won 28 out of 100 games, while Stockfish 8 won none. All the other games ended in a draw.

Chess AI has achieved many new milestones in the last 20 years. Deep Blue had an estimated Elo rating (a chess rating system for estimating a player's strength based on their performance against other players) of around 2,700-2,750. By comparison, Stockfish 8 (16 being its latest version), which was the best chess engine in 2017, had an Elo rating of around 3,480. The Elo rating of the original AlphaZero was approx. 80-100 higher at the time.

AlphaZero also has other capabilities. In 2023, Google DeepMind researchers, led by Tom Zahavy, developed a new modified version of AlphaZero by integrating up to 10 independently trained AI agents, each optimised and trained for various strategies. The coordinating algorithm acts as a kind of virtual manager designed to select the most promising AI agent for a particular move based on the situation. Additionally, the team introduced a 'diversity bonus', i.e. a bonus incentivising the system to pull from a broader range of strategies encouraging more creative problem-solving.

The improved system performs better than the original AlphaZero and demonstrates greater skills and more creativity in solving Penrose puzzles. Unlike the previous version, which was able to solve only 4% of the Penrose puzzles and 12% of additional chess tests, the new version demonstrated success rates of 96% and 76% respectively.

> *"The new Alpha Zero, instead of finding one solution, or one policy, that would beat any player, uses creative diversity."*
>
> **ANTOINE CULLY, Imperial College London –a co-author of the solution**

Source: https://www.quantamagazine.org/

Michał KANARKIEWICZ
CHESS PLAYER, ENTREPRENEUR, BUSINESS CONSULTANT AND SPEAKER

Kasparov's duels with Deep Blue in 1996-1997 and AlphaZero, created in 2017 under the leadership of recently awarded Nobel laureate Demis Hassabis, proved that the competition between humans and AI in chess no longer makes sense. Does this mean the end of chess? Absolutely not! Chess

Deep reinforcement learning

To master chess, an untrained neural network plays millions of games against itself. Initially, it plays completely randomly, but over time it learns from wins, losses and draws to adjust these parameters of the neural network, making it more likely to choose advantageous moves in the future. The amount of training the network needs depends on the style and complexity of the game, taking approximately nine hours for chess and up to 13 days for the more complex Go.

is experiencing a renaissance - the number of players on chess.com has grown from 25 million in 2019 to more than 185 million, and the innovative algorithms that are emerging are only helping to explore new possibilities for the game. AI has become a valuable resource for the next generation chess players, teaching us new strategies, such as attacking with a flank pawn, which was previously considered weak. Therefore, instead of fearing artificial intelligence, we should learn how to work with it.

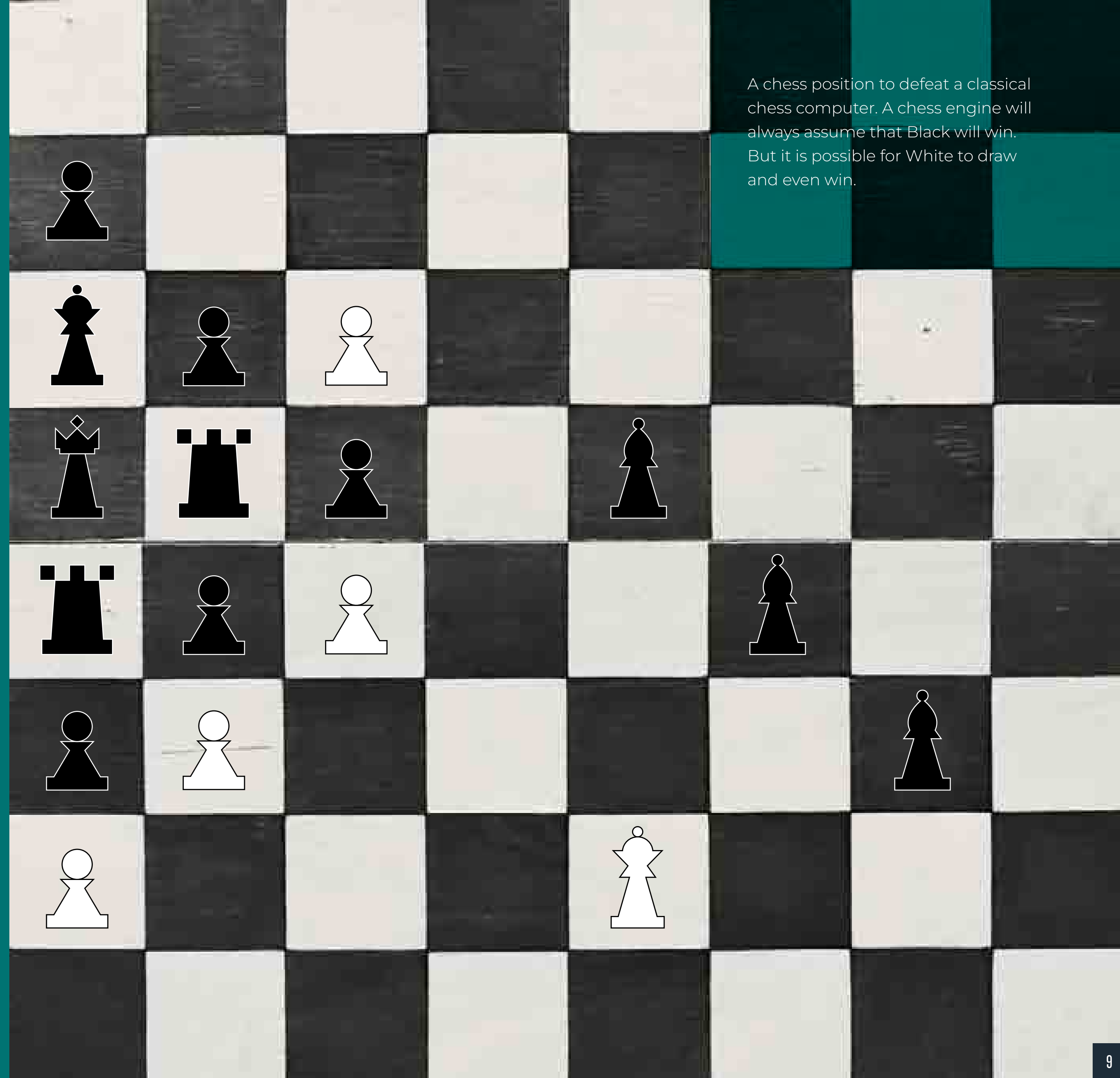Photo: Shutterstock

Penrose puzzles

Penrose puzzles are chess problems originally created by Sir Roger Penrose, Professor Emeritus of Mathematics, Oxford University, designed to study human consciousness and the cognitive abilities of artificial intelligence in order to differentiate between human and machine intelligence. Although chess computers beat practically all human grandmasters, there are still some chess puzzles that computers are unable to solve.

According to the professor, there are puzzles solvable by humans, but not by an artificially intelligent (AI) computer. The White player is to defeat or draw with a computer. For the above position, chess engines will state that Black will win by a large margin, when in fact White can easily draw, or even win!

Drawing should, however, be easy for White. Just move the king (without moving the c6 pawn). The only black pieces that can move are the dark-squared bishops, which cannot checkmate the king, however. Winning should be also possible but only if Black plays badly, e.g. all bishops give up control of the c7 square. Then c7 followed by c8=B or c8=Q is checkmate!

All the bishops in the above chess position can move in lots of different ways, leading to a computation explosion for a classical chess engine. To calculate it out would suck up more computing power than is available on Earth - naturally excluding the powers of the human brain. According to Sir Roger Penrose, this demonstrates that human brains think differently from computers and until an algorithm capable of solving such puzzles is developed, it can hardly be called "real" AI.

Chess engines with the highest Elo ratings of over 3,600 are Stockfish, Leela Chess Zero, Houdini, Berserk, Koivisto, and Komodo. News has recently come out that some computers have exceeded 4,000 ratings.

Magnus Carlsen
- the world's top chess player has an Elo rating of around 2,850

A chess position to defeat a classical chess computer. A chess engine will always assume that Black will win. But it is possible for White to draw and even win.

Can the computer think?

This question has been asked by the greatest minds in the world, but there is still no definitive answer. AI advocates believe that a strong AI programme will - sooner or later - both pass the Turing Test and refute the Chinese room argument. On the other hand, some argue that it will never be possible to fully replicate human cognitive abilities and creativity, and a machine will remain just a machine.

Regardless of the belief in the ability of computers to achieve strong - and thus inherently true – AI, there is still vast potential for the use of its weaker version in real estate. Its implementation in various market processes will take decades, and every market participant must be ready for this.
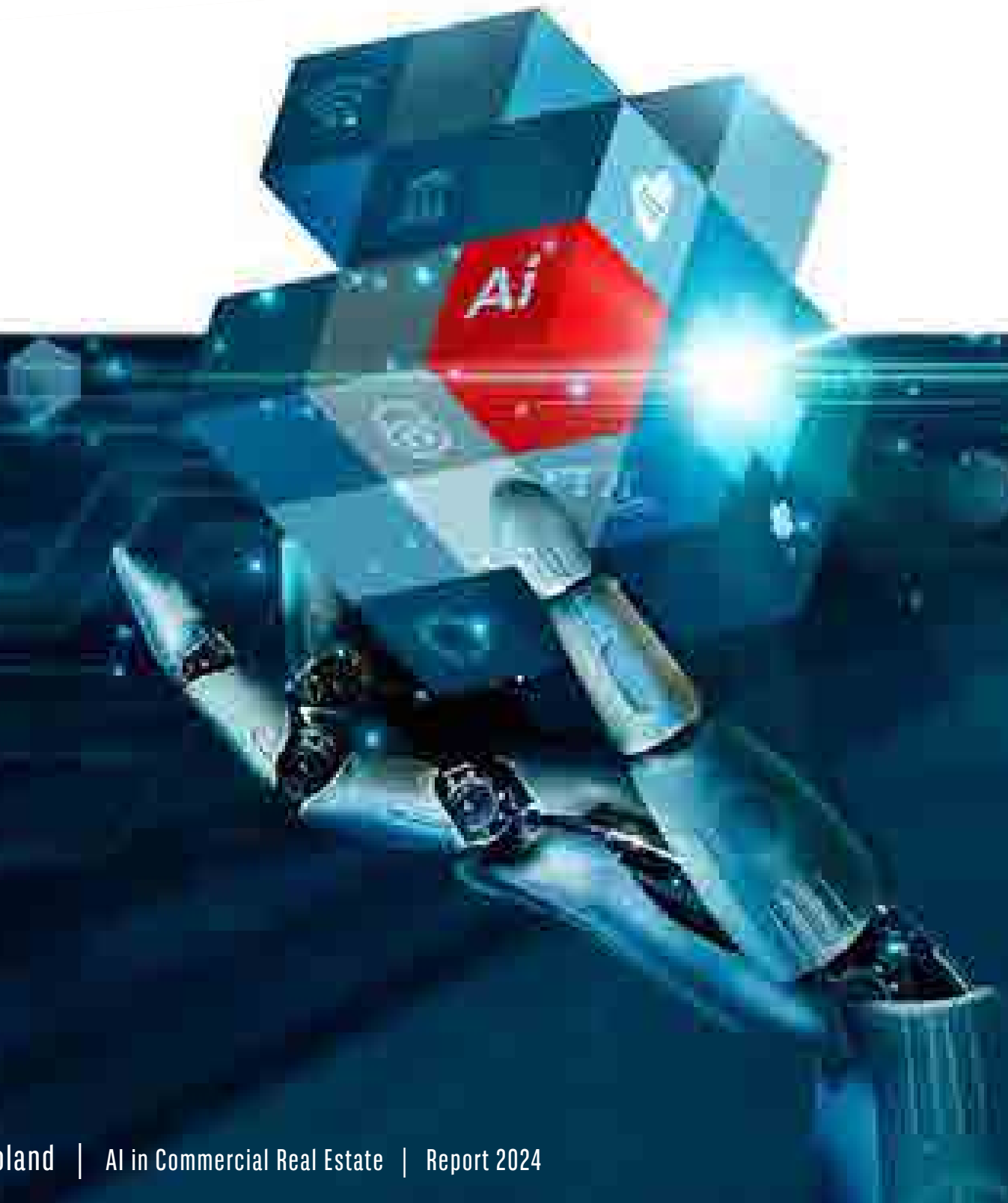
Chinese room

Imagine a room (a Chinese room) with an English speaking person who knows nothing of the Chinese language sitting in it. That person has a set of rules (a manual) instructing them on how to respond to a string of Chinese characters. Given a string of symbols as input, the person checks the rules and produces another string of symbols as output. To anyone outside the room it appears that the room understands Chinese, although the occupant of the room only follows the rules without understanding them.

In 1980, John Searle published an article in the scientific journal The Behavioral and Brain Sciences in which he conducted such a thought experiment.

Searle's argument suggests that a computer, just like the occupant of the Chinese room, is capable of processing symbols and producing output

The question Searle seeks to answer is whether a machine actually "understands" Chinese or only simulates the ability to understand it. Searle calls the former "strong AI" and the latter "weak AI".

by running its programme, but has no genuine understanding just like humans do. According to Searle, even a perfectly programmed AI system that can speak a certain language does not understand the language but is only skilfully manipulating symbols. Therefore, while an appropriately programmed computer could pass the Turing Test, it still would not be considered a rational being.

Bolesław KOŁODZIEJCZYK
**PHD, MSC(ENG), MBA, PGDIP(AI&ML), PMP, MRICS**

**BUSINESS & DATA DIRECTOR
BUSINESS INTELLIGENCE HUB
AND CONSULTANCY**

In business applications, prediction of future market trends based on machine learning (ML) is increasingly replacing classical econometric methods

achieving similar and sometimes even better predictive results. The popularity of this approach stems from the growing need to maximize efficiency, while at the same time placing less importance on the interpretability of results including causal relationships between exogenous (explanatory) and endogenous (explanatory) variables. These changes are also beginning to affect the real estate market, where purely expert and econometric forecasts will soon be replaced to a greater extent by models using modern ML algorithms.

Photo: Shutterstock

N-DIMENSIONAL
real estate space
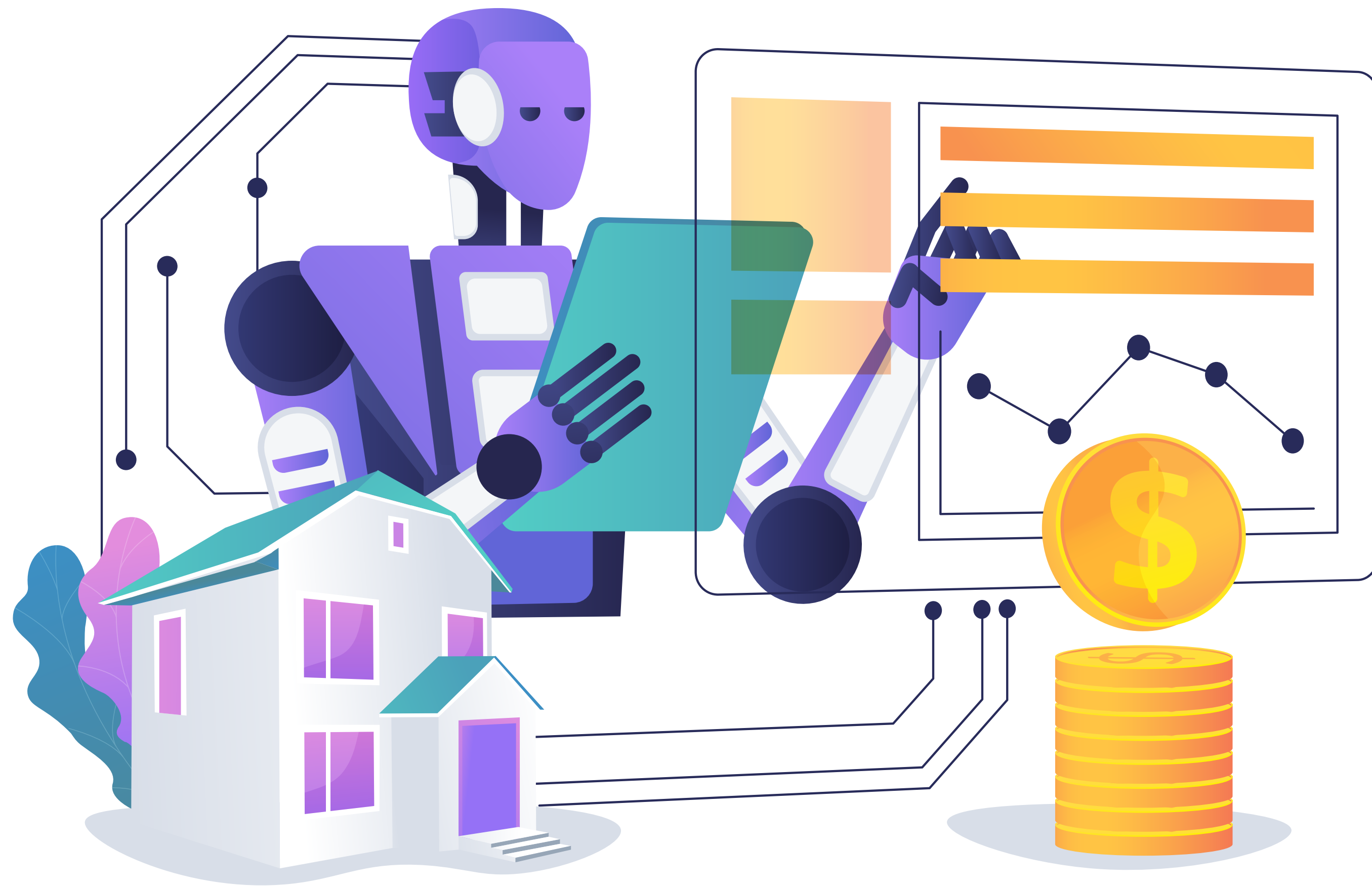
Are we ready?

The commercial real estate market has a multidimensional structure. Land acquisition, construction, building management, leasing and disposal are merely a facade behind a number of processes without which the commercial property market would not be able to operate efficiently.

For example, project preparation requires market and financial analyses, expert valuations, due diligence processes, and property viewings. On the other hand, operational property management encompasses ensuring operational efficiency of systems and low service charges, as well as effective asset services to maximise asset value.

Nearly all these processes will be impacted by the development of AI in the near future. Some are already successfully leveraging advancements in AI, and many are ready for the rapid implementation of AI and unlocking its untapped commercial potential. Meanwhile, the deployment of some new solutions will take longer in the case of some processes due to low data availability and quality or a poor cost-to-benefit ratio. In our opinion, these two factors will ultimately determine the pace and extent of implementations across different areas.

REAL ESTATE LIFECYCLE

Photo: Shutterstock

PROJECT MANAGEMENT
ASSET MANAGEMENT

Land / property
Acquiaitions

Design Brief

Finance

Procurement

Feasibility Studies and property development

PLANNING & ACQUISITION PHASE

DEVELOPMENT PHASE

Design

Managing Assets across the Real Estate Lifecycle

Market Analysis

OPERATIONAL PHASE

Construction

Renovation / Demolition

Property Management

Facilities and operational management

Asset Management

How AI is impacting the commercial real estate industry – the world of the new millennium

REAL ESTATE VALUATION

Properly designed algorithms will collect and process large datasets to improve the speed and accuracy of valuations, with key sources being market, socio-economic and geolocation data, and a property's characteristics.

PREDICTIVE ANALYTICS

AI systems will play an even greater role in predicting market trends and identifying potential investment opportunities, helping forecast rental income, returns on investment, and demand for specific types of commercial properties. This new approach will support real estate investors, owners and even managers in making more informed decisions about buying, selling or maintaining the profitability of commercial real estate.

CHATBOTS AND VIRTUAL ASSISTANTS

Chatbots and virtual assistants will enhance experiences for building tenants and guests by providing information about the property and its vicinity, or by accepting property maintenance instructions.

TENANT MATCHING

AI-powered platforms and systems will streamline the leasing process by matching tenants to the right properties more effectively. To do this, they will use company preferences, such as location, size and budget, or even air quality, to suggest suitable space and support the selection process.

FACILITY MANAGEMENT

AI will optimise facility management by monitoring facility systems and individual components in real time. It will predict the need for system maintenance, improve energy efficiency and enhance tenant experience by adjusting HVAC systems based on occupancy patterns or weather forecasts.

IMPROVED SECURITY

AI-driven systems will detect unusual activities or intruders and alert security staff in real time. To improve building security, access control systems will be fully integrated with facial or vehicle recognition technology.

SPACE UTILISATION

AI will analyse space utilisation patterns to support landlords and developers in reconfiguring space, adapting leasing strategies and even designing new properties to better meet tenant needs.

ENERGY BALANCE AND EFFICIENCY

AI will make commercial real estate more energy efficient. Machine learning algorithms will analyse energy consumption data and suggest ways of reducing usage to bring operating costs down and achieve sustainability goals.

PROPERTY INSPECTIONS

AI-powered drones will carry out property inspections to facilitate the assessment of roofs, facades and other critical components of commercial buildings and lower their costs. Drones will also enhance safety procedures and warn of hazard on construction sites.

WORK COMFORT

AI systems will enhance the work experience through the active monitoring of workplace conditions such as temperature, lighting, and humidity, while adjusting them to external weather conditions, air pollution or planned energy consumption.

RISK ASSESSMENT

By analysing various data sources, AI will help identify and mitigate potential risks of market volatility, tenant defaults and property maintenance issues.

PORTFOLIO MANAGEMENT

AI-based tools will help investors and asset managers effectively manage large property portfolios by providing real-time analyses of the operating parameters of individual properties.

LEGAL AND DUE DILIGENCE ASSISTANCE

In legal and due diligence processes, AI will automate the review and analysis of documents and contracts, checking for compliance with internal policies, while saving time and costs.

The above list of processes and activities represents only a small portion of the commercial real estate hyperspace in which AI is likely to play a leading role in the coming years. In addition to economic factors, access to appropriate data resources allowing for efficient model training and refinement enabled by MLOps systems will be an important catalyst for implementations.

Definition

MLOps, also known as DevOps for machine learning, is an umbrella term that encompasses philosophies, practices, and technologies related to implementing machine learning lifecycles in a production environment. One of their key features is the possibility of continuous refinement of operating models.

Source: BNP Paribas Real Estate Poland, 2024
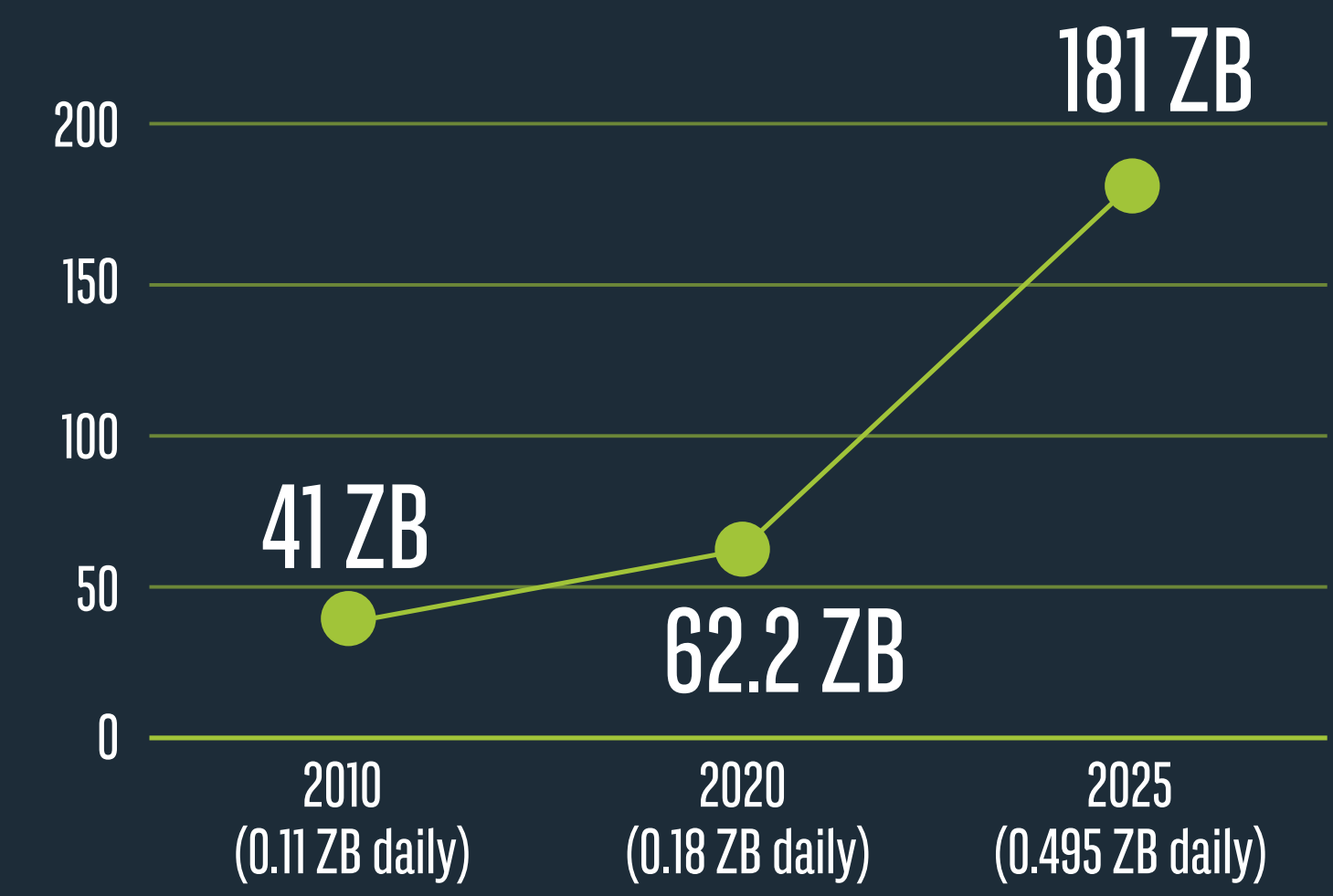
There is no AI without data

Data is critical to AI. It refers to a set of observations or measurements that can be used to train and test new machine learning models which constitute the core of AI systems.

It is the quality and quantity of data that will have a significant impact on the efficiency and practical applications of such models. With sufficient computing power and economic considerations set aside, the only barrier to implementing advanced machine learning algorithms and leveraging AI in market processes is the lack of data.

This is why the internet, retail and financial industries were among the first sectors to begin to use AI techniques on a massive scale. When we pay with a credit card, make purchases or search for data, we continuously and almost effortlessly provide operators with millions of data points that, once processed, will constitute ideal input for machine learning models .

DATA, DATA, ...and more data ("big data")

HOW MUCH DATA IS THERE IN THE WORLD?

Year	Value
2010 (0.11 ZB daily)	41 ZB
2020 (0.18 ZB daily)	62.2 ZB
2025 (0.495 ZB daily)	181 ZB

In 2023, global data generation stood

at **0.337 ZB,** which experts forecast to grow to **0.495 ZB** in 2025

1 zettabyte = 10^{21} = 1000^7 bytes

Hard to imagine - no reason to be ashamed though - large numbers are surprisingly hard to visualise, even for those for whom mathematics is not a challenge.

Source: Edge Delta, BNP Paribas Real Estate Poland, 2024

Subsequently (as if in a feedback loop) such data will be used, among other things, for marketing segmentation, financial predictions or customer contact automation. Google, Żabka, InPost and thousands of other organisations continuously collect and process terabytes of data that we, as consumers, voluntarily provide every day.

In contrast to many other sectors, the real estate industry has always been characterised by relatively low data availability and high costs of data generation, with limited capacity to scale up and use costly AI-powered solutions more widely.

As a result, many market mechanisms are based on low-quality and low-transparency data.

This is compounded by the human factor and tendency to exploit and create information gaps in order to generate above-average profits - especially when the value of a single piece of information is high.

zdjęcia: Shutterstock

A single person creates
1.7 MB
of data every second.

Only **15%** of data is original
(the remaining 85% is actually copies of other data)

50% of all data will
be in the cloud by 2025

The real estate industry joins the game

Fortunately, there is light at the end of the tunnel. Thanks to technological advances and growing customer demands, legal regulations and the need to respond faster to economic changes, the real estate market is also opening up to the world of data, with many proptech companies leveraging new AI opportunities.

AI Brokerage Tech

- BROKERAGE INTELLIGENCE SOFTWARE
- LISTING GENERATION SOFTWARE
- VIDEO GENERATION AND IMAGE ANALYTICS TOOLS
- COLLABORATION PLATFORMS

AI Appraisal and Loan Origination Solutions

- ROBOTIC SOFTWARE AND COBOTS
- AUTOMATED VALUATION MODELS (AVM)
- FINANCING AND RISK ASSESSMENT PLATFORMS
- TITLE MANAGEMENT TOOLS
- UNDERWRITING INTELLIGENCE PLATFORMS
- APPRAISAL INTELLIGENCE PLATFORMS

AI Property Management Tech

- SPACE MANAGEMENT TOOLS
- PROPERTY MANAGEMENT TOOLS
- TENANT SCREENING TOOLS FOR HOSPITALITY

AI Home Automation Solutions

- FULL HOME AUTOMATION MANAGEMENT
- SMART SECURITY SYSTEMS
- SMART BUILDING SYSTEM

AI Energy Resource Management Solutions

- ENERGY INTELLIGENCE SOFTWARE
- RENEWABLE SOURCE MANAGEMENT SOFTWARE
- CLIMATE MANAGEMENT SYSTEM

AI in Real Estate Development & Construction

- CONSTRUCTION DATA MANAGEMENT SOFTWARE
- BUILDING MANAGEMENT SOFTWARE
- INTERIOR DESIGN GENERATION SOFTWARE
- REAL ESTATE DEVELOPMENT SOFTWARE

AI Real Estate Investment Solutions

- REAL ESTATE INVESTMENT PLATFORMS
- INVESTMENT MANAGEMENT TOOLS

Conversational AI Tools

- CHATBOTS AND TEXTBOTS
- VIRTUAL ASSISTANTS

Source: BNO based on https://ascendixtech.com/proptech-market-map

There are countless examples

In the US, Kastle Systems already provides real office user occupancy data to improve urban development strategies, adapt leased space to tenants' needs and support developers in planning.

HoxtonAi, in turn, helps retail property owners and managers collect and analyse shopping centre footfall data for algorithms to better predict retail trends, forecast revenue and modify an in-store offering. In Poland, REDD collects and processes commercial real estate data for use by AI-based predictive systems.

AI is also powered by data captured by modern sensors of advanced building management systems (BMS). Such systems, coupled with AI algorithms, are opening up new spaces for property managers by enabling the optimisation of many building processes, while reducing energy consumption - but that's not all. Other important sources of knowledge may include mobile and satellite data, and other data which combined with data from building systems provide the perfect input for AI algorithms. And this is just the beginning...

Photo: Shutterstock

IN THE SERVICE OF MAN AND THE PLANET
AI in ESG reporting and beyond

Climate and AI

Climate change has been taking place on our planet for thousands of years. Today, AI can be leveraged to respond more flexibly to new environmental challenges.

Energy efficiency, carbon dioxide sequestration and storage, weather forecasting, grid management, building design, transportation, precision agriculture, and modern industrial processes are examples of AI models already supporting us in securing the future of future generations.

Intelligent Energy Management Systems (IEMS) are a powerful tool for monitoring, analysing and optimising energy use in a building. IEMS work by integrating various components, including temperature sensors, energy meters, lighting, heating and air conditioning control units, as well as increasingly sophisticated AI algorithms controlling the whole set-up.

In 2016, Google's DeepMind used advanced algorithms to design a system that allowed the California-based giant to reduce the amount of energy used by its data centres by 40%.

At the beginning of the year, BrainBox AI developed its Artificial Responsive Intelligent Assistant (ARIA) - an AI-powered building management system built on Amazon Bedrock. The ARIA AI engine can modify HVAC equipment parameters in real time and make necessary adjustments every five minutes to reduce energy consumption. It uses such parameters as air demand and humidity, as well as data from other sources such as utility tariff structures, occupancy data, and grid emission rates. According to BrainBox AI, its AI solution can predict a building's future status with an accuracy of 99.6%. The solution can also adapt to changing weather conditions and HVAC equipment changes. A 24/7 monitoring service keeps tabs on alarms or potential problems to ensure equipment runs and uses energy as efficiently as possible. BrainBox AI says that its generative AI function can optimise building operations management and help reduce HVAC energy costs and carbon emissions by 25% and 40% respectively.

Artificial intelligence and climate change mitigation

ENERGY EFFICIENCY, CARBON SEQUESTRATION, AND STORAGE

ENERGY-EFFICIENT BUILDING DESIGN AND RENOVATION

REDUCE DEFORESTATION NATURAL RESOURCE MANAGEMENT

SUSTAINABLE LAND USE, EARLY WARNING SYSTEM, FORECASTING EXTREME WEATHER EVENTS

OPTIMIZING TRANSPORTATION SYSTEMS

GRID MANAGEMENT-ASSISTED **RENEWABLE ENERGY FORECASTING**

PRECISION AGRICULTURE, LESS USE OF FERTILIZERS AND CHEMICALS

RESILIENT CITIES FOR **SUSTAINABLE DEVELOPMENT**

ESG

AI can also help with reporting and analysing ESG (Environmental, Social, and Governance) matters. In 2024, the CSRD will come into effect across the European Union, requiring companies to submit - in addition to financial statements - non-financial reports covering processes related climate change, environmental pollution, waste management, toxic emissions, local community engagement, social initiatives, corporate governance, and many other aspects. The new regulations will be felt in particular by the commercial real estate sector, which is already preparing for them.

ESG reporting - just like financial reporting - will fall under the purview of accountants, but responsibility for data from various corporate operations will rest with an entire organisation. Non-financial reports are more difficult to prepare than financial statements which are standardized and drawn up on the basis of professionally kept accounting records. By contrast, ESG reports do not contain binary data and are, therefore, more difficult to measure and verify.

Some companies are preparing to implement AI-powered tools to facilitate reporting. They are, however, facing a challenge to develop a model for collecting data, structuring ESG reports (for auditors), and their automatic audit. The quality and validity of such data will also heavily depend on the implementation of partially AI-based systems.

This also presents a significant challenge for auditors who will need specialised and often technical insight into the sources of data provided by companies.

Przemek GDAŃSKI
CEO & PRESIDENT OF MANAGEMENT BOARD AT BNP PARIBAS BANK POLSKA

Generative artificial intelligence has already been hailed the most significant innovation since the invention of the computer. Although still in its infancy, AI-driven civilizational change continues to progress. AI is already having a huge impact and we may be on the brink of the greatest industrial revolution in history.

AI will undoubtedly continue to evolve and expand its capabilities. Yet, it would be presumptuous to say we have a full understanding of this technology's future, whether in the long or medium term. What we can and have to do today is take up the gauntlet and seize the opportunities AI presents. We should explore it and seek new ways of applying it in areas critical to our business. Given the enormous potential of AI, coupled with the uncertainty surrounding its

development, no sector can afford to feel safe today. A transformational shift is likely to occur at any time, relegating those who overlook emerging trends to the sidelines.

Dr Keith Horvath has said that AI will not replace physicians, but physicians who use AI will replace physicians who don't, and that may the cautionary tale that could apply to nearly every profession. Scientific breakthroughs are likely to revolutionize many fields, including real estate. It is our responsibility not only to harness these innovations effectively but also to balance technological progress with social responsibility. At each stage of AI development, we should ensure that it serves humanity rather than exacerbates existing divisions.

Energy and economic balance

AI also has its dark side. Researchers from Vrije Universiteit in Amsterdam have recently attempted to estimate the current and future energy, carbon, and water footprint of AI. They have found that AI servers could use between 85 and 134 terawatt hours of electricity annually by 2027, which is comparable to what the Netherlands or Sweden use annually. In many locations, much of this electricity will create a significant increase in carbon emissions.

Research and consulting firm SemiAnalysis estimates that integrating generative AI into search engines like Google, which runs up to nine billion searches per day, could lead to a daily electricity consumption of 80 GWh and an annual consumption of 29.2 TWh, equivalent to what about 2.7 million average U.S. households use in a year.

Electricity consumption is not the only challenge when it comes to AI. Powerful AI data centres need cooling.

> *Research conducted at the University of California has found that with increasing artificial intelligence applications, AI demand for water could reach 4.2-6.6 billion cubic metres in 2027.*

This naturally leads to a question about the benefit-to-cost ratio of such solutions - considering not only the target users of this technology but also a broader perspective.

THROUGH THE EYE
of a property manager

An interview with the Operations Director, Property Management, BNP Paribas Real Estate Poland

Adam JAKUBOWSKI

OPERATIONS DIRECTOR,
Property Management,
BNP Paribas Real Estate Poland

WHICH ASSET CLASSES WILL BENEFIT THE MOST FROM THE DEPLOYMENT OF AI SOLUTIONS?
In my opinion, the office market will be one of the key beneficiaries of AI development.

AI technology can optimise electricity consumption by smart HVAC systems by adjusting heating, ventilation and air conditioning settings to meet real-time demand.

AI-based solutions also enable collecting and analysing employee preferences regarding temperature, lighting and other workplace conditions, and thereby adjusting in-office conditions to individual user needs. In addition, AI-powered systems monitor air quality, background noise levels and other environmental factors to ensure an optimal work environment. For example, they can automatically control ventilation or activate air filtration systems whenever pollutants are detected

AI can also be deployed to monitor building systems, analyse sensor data and predict potential failures, to enable preventive maintenance that will reduce the risk of breakdowns and repair costs. By

supporting maintenance planning through the analysis of historical data on system failures and wear and tear, AI-enabled technology can optimise maintenance schedules, minimise downtime and maximise system availability.

AI can also enhance office space management to improve space utilisation. By analysing actual office space usage data, AI will facilitate better space planning and allocation. For example, sophisticated algorithms may suggest reorganising offices, conference rooms or communal areas to maximise the use of available resources.

Overlays for building management systems (BMS) analyse parameters continuously to assist in adjusting AI-based solutions implemented in office buildings. This generates significant cost savings, improves user comfort and safety, and leads to enhanced operational efficiency. AI also enables better resource management and more informed strategic decision-making, translating into long-term economic gains and sustainable growth.

Analysis of other asset classes reveals that AI is also highly relevant. AI-powered systems in shopping centres can analyse footfall levels, shopping preferences and sales patterns to enable better product and retail floorspace management. AI also supports security and surveillance systems, helping to optimise service costs.

AI in warehouses can optimise logistics processes, manage inventory, and support predictive maintenance systems to reduce downtime and repair costs. It also optimises utility consumption costs.

Photo: Shutterstock

Adam has more than 20 years of experience in the commercial real estate industry.

He holds a master's degree in geodesy and spatial management, specialisation in real estate management and valuation, from the University of Warmia and Mazury in Olsztyn.

Since 2017, he has held the position of Operations Director at BNP Paribas Real Estate Poland where he manages a team of property managers on a daily basis.

The portfolio of managed properties overseen by Adam amounts to over **1 million sqm**, and includes facilities from every asset class: **office buildings, industrial and logistics facilities, hotels and retail**. Adam has extensive technical knowledge and years of experience of working with challenging projects, which he is eager to share with his team and colleagues.

He was previously associated with organizations such as Colliers International, King Sturge and Echo Investment.

ARE SERVICE CHARGES A REAL CONCERN FOR PROPERTY TENANTS AND LANDLORDS?

Service charges encompass all property maintenance and operational expenses. For office buildings, these charges specifically include the costs of electricity, water, heating, cooling, technical infrastructure maintenance, repairs, cleaning, property management, as well as taxes and insurance premiums. Such costs are an important factor impacting leasing decisions. Recent years have seen a substantial increase in service charges, which has raised significant concerns. In Warsaw, the average increase was approximately 30%, while in regional cities it was around 21% compared to 2022. This growth was naturally fuelled by inflation trends and was the strongest for electricity and gas bills which now account for over 40% of all service charges in some buildings. Perpetual usufruct fees and taxes are also rising significantly, reaching the maximum levels permitted by law.

CAN AI HELP REDUCE OR AT LEAST SLOW DOWN THE GROWTH OF SERVICE CHARGES?

Definitely. AI is already capable of reducing the pace of growth in service charges. Smart BMS monitor and optimise real-time electricity consumption, significantly bringing costs down. Landlords are also growing increasingly interested in automated reception systems and building security automation systems. Threat detection systems enable organisations to reduce the number of traditional security posts and will replace them entirely in the future.

WHICH AREAS OF BUILDING TECHNOLOGY ARE LIKELY TO SEE THE BIGGEST INCREASE IN THE USE OF AI TECHNIQUES?

Primarily in energy management. AI optimises electricity consumption through advanced building management systems that automatically adjust lighting, heating, ventilation and air conditioning to environmental conditions and tariffs. By analysing data from various building systems, AI can predict potential failures and schedule maintenance, thereby preventing costly repairs. Significant advancements have already been made in security, where AI-powered video monitoring and access control systems enable more efficient building security management.

AI will also play an important role in space optimisation, data analysis and space design. It can recommend the most efficient office space layouts, helping downsize leased offices through a better use of available space. Looking ahead, waste management will become a major issue. AI will be instrumental in managing waste efficiently by analysing produced waste and optimising disposal and recycling processes. These technologies have the potential to significantly lower service charges and enhance the operational efficiency of buildings.

CAN AI-BASED SOLUTIONS GENERATE ECONOMIC GAINS IN THE LONG TERM?

Existing solutions demonstrate the huge potential for generating economic gains through AI use in building management by enhancing office building management efficiency and reducing costs.

AI deployment in energy, maintenance, security and waste management, as well as space optimisation can generate significant long-term economic gains. In an era of rising service charges, AI is becoming a key tool for property managers seeking to optimise expenses and add value to their assets.

Photo: Shutterstock
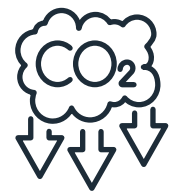
Photo: Shutterstock

HOW CAN AI TECHNOLOGIES HELP IMPLEMENT ESG POLICIES?

Implementing ESG policies is becoming a critical part of property management. Property managers are facing the new challenge of preparing data for ESG reporting.

With AI and smart meters, they can integrate reporting systems with real-time data to analyse it without the need to engage additional staff. The key areas of focus in this regard will be:

ENERGY AND WATER CONSUMPTION

AI can monitor and manage energy and water consumption to help achieve sustainability goals.

TRANSPARENCY AND REPORTING

AI can automate data collection and analysis for ESG reporting to improve transparency and compliance.

CARBON EMISSIONS

Smart energy management systems can significantly reduce carbon emissions through better resource management.

WASTE MANAGEMENT

AI can support waste segregation and optimise recycling to support a more sustainable use of resources

Photo: Shutterstock
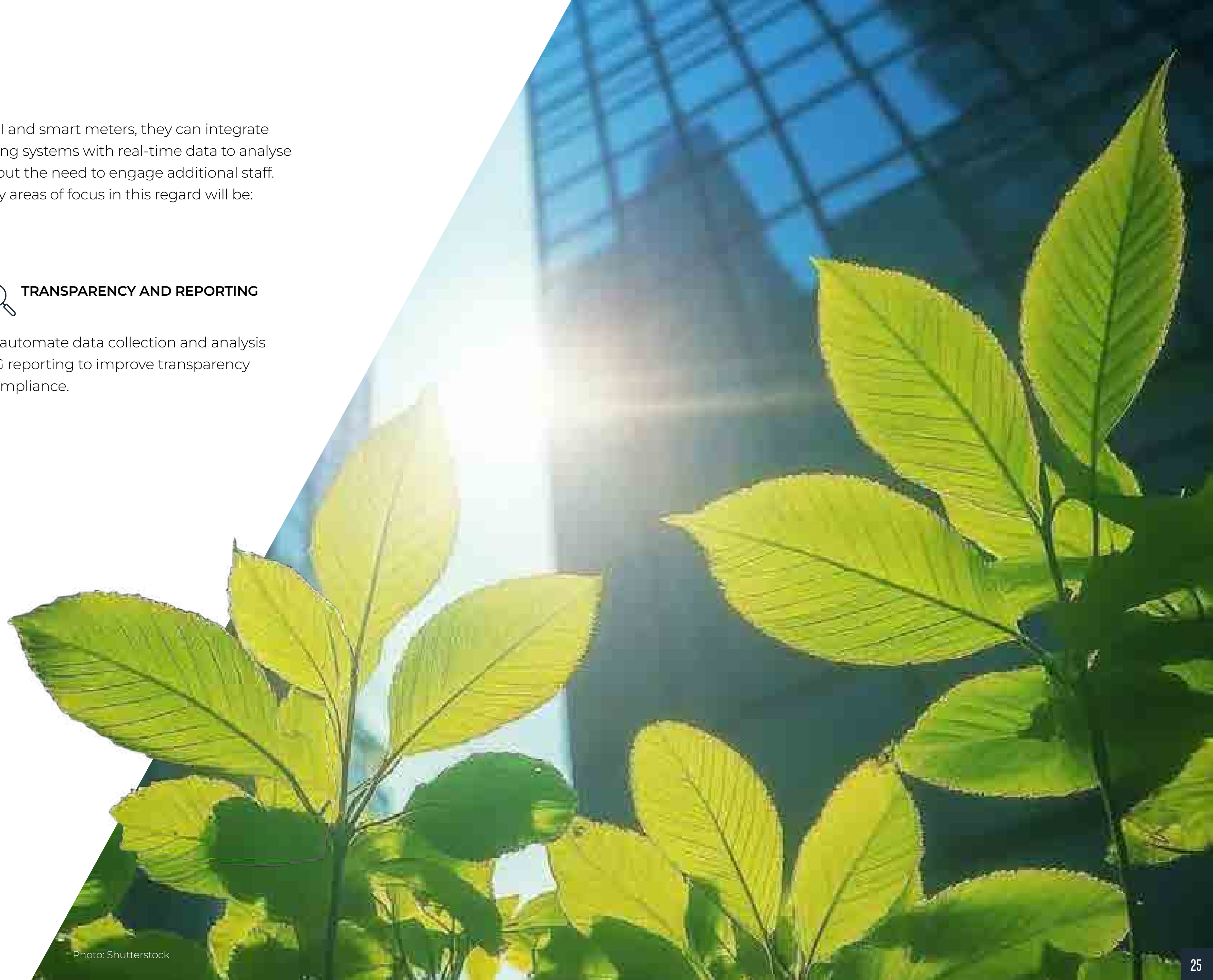
Case study:
THE BRIDGE (GHELAMCO)

For the real estate market, AI is no longer just a buzzword but increasingly a reality. Office developer Ghelamco is a pioneer in artificial intelligence. It uses AI-powered systems both in building construction and operations, including in The Bridge, its latest office project being developed in Grzybowska Street in Warsaw.

AI is incorporated into a property's lifecycle from the very beginning of a new development. A good example is an AI-driven system using an industrial robot to drill holes and install mounting elements in lift shafts. Up to several hundred holes have to be drilled for anchors which are required in lift installation. Drilling in a concrete shaft is a tedious, repetitive and physically demanding job that requires high precision for safety reasons. While the coordinates for the holes are usually pre-determined, the robot will first scan the shaft wall to detect reinforcing bars beneath the surface and any irregularities in the concrete. The system uses an algorithm to calculate tolerances and, if necessary, to adjust the positions of the holes.

AI also enhances the construction and operation processes of the building through sophisticated monitoring and facial recognition systems.

> *Cameras have been deployed on The Bridge construction site to identify individuals entering and exiting the site with up to 98% accuracy and capability to accommodate changes in facial features such as facial hair or weight change.*

The AI-powered system also prevents unauthorised access by monitoring the perimeter fence of the construction site and alerting relevant services if a breach occurs. Additionally, The Bridge will be equipped with CCTV cameras and AI-powered systems capable of detecting items left in common areas, such as packages, that could pose a potential terrorist threat. Moreover, during COVID-19 restrictions, Ghelamco tested solutions and algorithms for detecting elevated temperatures in individuals entering its Warsaw UNIT building.

Photo: Schindler R.I.S.E robot at work on The Bridge skyscraper

Ghelamco is now focusing on leveraging AI on a micro scale, implementing specific solutions for selected systems and processes. At its Warsaw UNIT, it is testing a solution planned for use at The Bridge to control the heat exchanger station using sophisticated algorithms/models to balance workplace comfort with energy efficiency.

One of the key challenges in implementing such solutions is the lease agrreements which have traditionally included relatively inflexible terms regarding environmental conditions in buildings. The building systems at The Bridge will enable carbon footprint monitoring and reduction to support ESG reporting. However, close collaboration between the property manager and tenants will be essential to fully unlock the potential of its systems. Ghelamco is open and ready for such collaboration in meeting high decarbonization requirements resulting from ESG guidelines.

GHELAMCO

Ghelamco Poland is a leader on the Polish office market, and a pioneer in ESG, innovation and place-making projects. Over the past 33 years, the company has established its leading position as an investor, developer and general contractor by delivering over 1,200,000 sqm of best-in-class office, residential, retail and warehouse space.

The total volume of sold projects has exceeded EUR 1.3 billion. The company is part of the Ghelamco group, one of the largest international developers in Europe with operations in Belgium, the United Kingdom and Cyprus. In Poland, Ghelamco has completed developments in such cities as Warsaw, Krakow, Katowice, Łódź and Wrocław.

Ghelamco has for years consistently set new real estate market trends in Poland. It was the first developer in Poland to have its office projects certified in the prestigious BREEAM certification system (2010), as well as SmartScore and WiredScore (2022). It was also the first company to discover the office potential of Warsaw's Wola district by building Warsaw's central business hub near Rondo Daszyńskiego. Its flagship projects such as Warsaw Spire, The Warsaw HUB and Warsaw UNIT have brought a new standard of quality to the Polish office market and shaped the Polish capital's skyline. Ghelamco is also active in the luxury and residential real estate market, with Foksal 13/15 in Warsaw being one of the most spectacular projects in this segment.

As the industry leader in ESG, Ghelamco is targeting energy neutrality by 2025. To achieve this goal, it has inaugurated a programme to build solar energy farms and powers its new projects exclusively with clean energy. Ghelamco takes a broader perspective on sustainable construction and actively contributes to shaping the urban space. The construction of Plac Europejski in Warsaw and the establishment of the Art in the City Foundation, which is dedicated to improving the quality of public urban space in Polish cities, stand out as flagship examples of such activities.

Jarosław FIUTOWSKI

DEPUTY TECHNICAL DIRECTOR
Ghelamco

New AI-based solutions are currently being tested at Warsaw UNIT for broader facility management through the Building Management System (BMS). We remain cautious about these tests, prioritising the safety and comfort of building users.

We are, however, optimistic about the potential to optimise carbon emissions and service charges, which will translate into tangible savings for tenants while significantly reducing our environmental impact. Looking ahead, we are planning to deploy similar solutions at The Bridge.

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Predicting THE FUTURE

ML and DL machines which are part of the AI ecosystem can also be used to predict the future. As data availability continues to improve, algorithms are becoming increasingly accurate in forecasting future trends, supporting managers in making strategic decisions.

To support its clients, the Business Intelligence HUB of BNP Paribas Real Estate Poland has also implemented such solutions. Below are our first ever two-year forecasts for office absorption and vacancy rates in Warsaw powered by intelligent machine learning algorithms. Testing shows that such forecasting outperforms traditional time series analysis models.

Our forecast shows that net absorption (i.e. a measure of the rise in the volume of occupied space) will remain below the 19-year average in the coming quarters. This is likely to keep the vacancy rate stable at its current level over the next four quarters, after which it will begin to edge down.

Key trend drivers include the continued low office supply, moderate geopolitical and macroeconomic forecasts for Poland and Warsaw, high interest rates and subdued investor demand for office assets.

While ML models cannot guarantee future market behaviour, they are becoming increasingly accurate and useful for business decision-making in a climate of economic uncertainty.

Will our forecasts prove accurate? How precisely did our machine learning models predict future market conditions? Find out in our "At-A-Glance" market reports a few quarters' time.

TWO-YEAR FORECAST FOR OFFICE NET ABSORPTION AND VACANCY RATES IN WARSAW
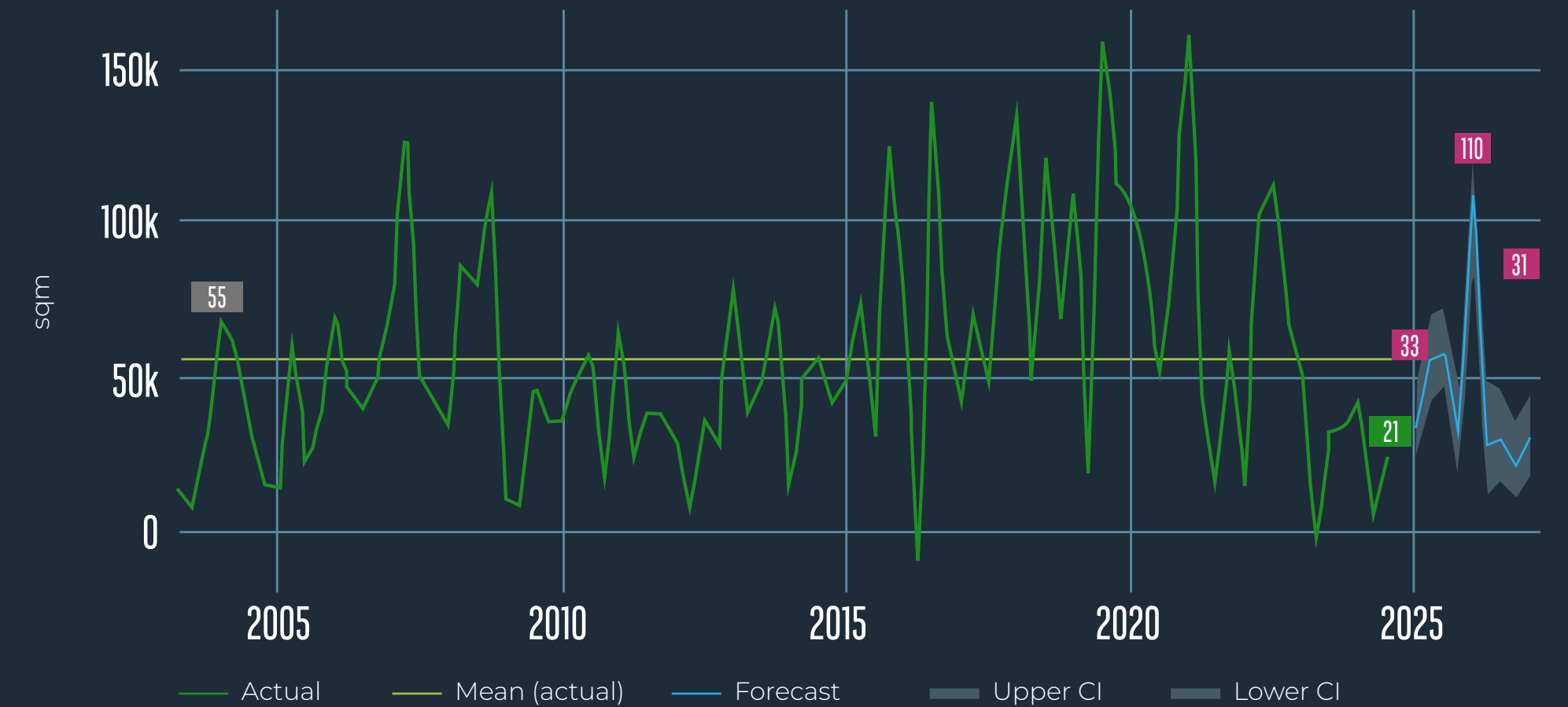
Source: BNP Paribas Real Estate Poland, September 2024

Małgorzata FIBAKIEWICZ
HEAD OF OFFICE AGENCY

While artificial intelligence is revolutionizing the real estate market , automating processes and providing advanced analytics based on increasingly large data sets, the role of the real estate agent is becoming even more crucial. In the digital reality, the real estate agent not only acts as an advisor consolidating more and more elements of the process, but also combines technology with a human approach, helping clients interpret data, understand the complexities and dependencies of the market and make more informed decisions.

AUTHORS

Bolesław KOŁODZIEJCZYK
Director, Business Intelligence Hub & Consultancy
boleslaw.kolodziejczyk@realestate.bnpparibas

Klaudia OKOŃ
Senior Consultant, Business Intelligence Hub & Consultancy
klaudia.okon@realestate.bnpparibas

Piotr CHECIŃSKI
Data Analyst, Business Intelligence Hub & Consultancy
piotr.checinski@realestate.bnpparibas

CONTACTS:

Erik DRUKKER
CEO
erik.drukker@realestate.bnpparibas

Małgorzata FIBAKIEWICZ MRICS
Head of Office Agency
malgorzata.fibakiewicz@realestate.bnpparibas

Piotr RUSINEK
Head of Project & Development Consultancy
piotr.rusinek@realestate.bnpparibas

Michał PSZKIT
Board Member
Head of Property Management
michal.pszkit@realestate.bnpparibas

Fabrice PAUMELLE
Head of Retail Agency
fabrice.paumelle@realestate.bnpparibas

Arkadiusz BIELECKI MRICS
Head of Valuation
arkadiusz.bielecki@realestate.bnpparibas

Mateusz SKUBISZEWSKI MRICS
Head of Capital Markets
mateusz.skubiszewski@realestate.bnpparibas

Justyna MAGRZYK-FLEMMING
Head of Business Services
justyna.magrzyk-flemming@realestate.bnpparibas
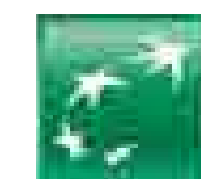
More informations: **www.bnppre.pl**

Photo: Shutterstock