

The top half of the cover features a dark blue and purple background with a glowing circuit board pattern. In the center, the letters 'AI' are displayed in a large, white, sans-serif font, enclosed within a glowing rectangular frame that resembles a microchip. The frame has small square notches at its corners and is surrounded by horizontal and vertical lines of light. The background is filled with intricate circuit traces and small blue dots representing nodes or data points.

AI

VIETNAM AI HANDBOOK

--- Second Edition ---

August 2024

Privacy Compliance 

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About the Handbook

The current state of AI

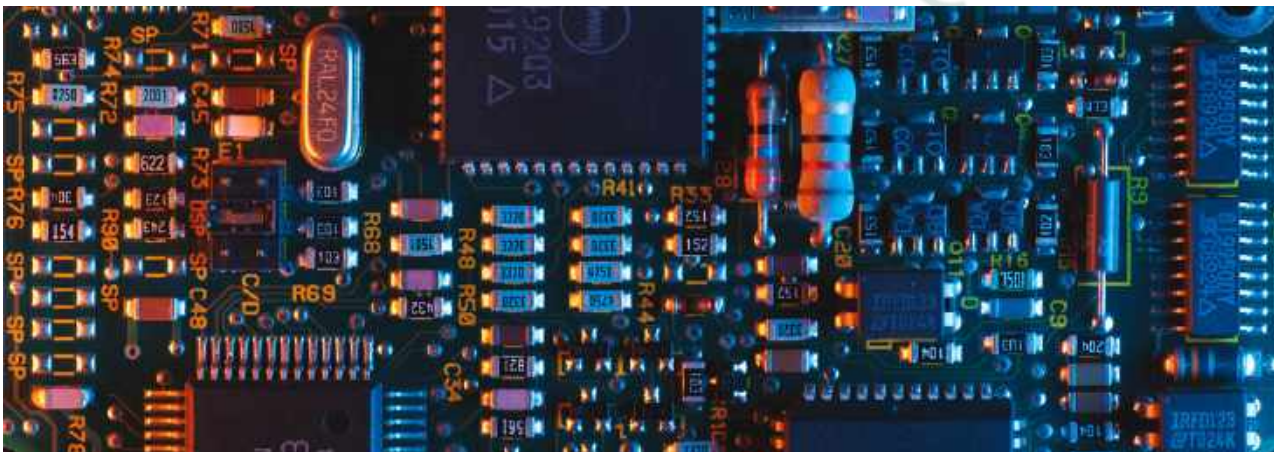
Artificial intelligence (AI) is a technique that enables a computer to mimic human behavior and imitate or exceed human decision-making ability in solving complex tasks independently or with minimal human assistance [1]. AI has been contributing to a wide array of economic and societal benefits across the entire spectrum of industries and social activities.

Recent years witnessed an AI Spring, marked by notable advancements primarily led by companies, universities, and research labs based in the United States. The AI market size worldwide is increasing rapidly from about 95.6 billion US dollars in 2021 to more than 207.9 billion US dollars in 2023 and is expected to grow even stronger in the coming decade, reaching 1 trillion US dollars in 2028 [2].

Generative AI is a key component of this AI boom. From 2022 to early 2024 the world has experienced the breakout of generative AI. In 2022, large language models were improved to where they could be used for chatbot applications; text-to-image models were at a point where they were almost indiscernible from human-made imagery; and speech synthesis software was able to replicate human speech efficiently. These advancements have unlocked novel applications for using Generative AI to tackle intricate problems, foster artistic creation, and contribute to scientific investigations [3].

The majority of AI-driven products available today fall into the category of weak AI, designed and trained for specialized tasks. GPT-4, a recent addition to Generative AI introduced in 2023, represents a significant leap towards an early version of artificial general intelligence, aiming to mimic complete cognitive abilities—a fundamental aspiration in the field of AI research.

The first half of 2024 has witnessed a significant surge in the advancements of AI technologies across various platforms. Several major tech companies, including OpenAI, Google, and Microsoft have introduced their latest updates in AI products, marking a pivotal moment in the evolution of AI.



Overview of the Handbook

This Handbook provides an overview of AI and the existing legal framework for AI. Accordingly, the Handbook includes the following main contents:



Introduction

Introducing and analyzing the concept of AI, briefly presenting the history of AI development from the mid-20th century to the present, highlighting the main types of AI, and summarizing the working mechanism of AI to get an overview of AI from a technical perspective.



Impacts of AI

Presenting outstanding and important applications of AI in the fields of healthcare, business, education and transportation to emphasize the benefits that AI brings to humans; examining the multifaceted challenges posed by AI across labor, ethics, legal and social impacts to comprehend its limitations and ongoing human involvement in perfecting AI.



AI legislation

Giving examples of current and upcoming legislation regarding AI in major countries, mainly focusing on the European AI Act; providing and analyzing case studies related to legal issues of AI.



Vietnam's AI outlook

Giving an overview of current state of AI in Vietnam; analyzing the problems posed by AI that Vietnam is currently facing and giving recommendations to tackle with these problems.

After the first edition of the Handbook was released in January 2024, there have been many developments in the AI sector around the world. A notable example is that the EU's AI Act has been officially published and gone into effect. This 2nd edition of the Handbook was drafted to keep the readers up to date with such developments and to further delve into the various aspects of AI.

Introduction of AI

Introduction of AI



Definition of AI

Artificial Intelligence (AI) is a field of research within computer science and computational science in general. The term Artificial Intelligence was coined by Stanford University Honorary Professor John McCarthy in 1956, and he defined it as *“the science and engineering of making intelligent machines, especially intelligent computer programs.”*[4]

So, what qualifies as intelligence?

According to the definition of Stanford University Human-centered Artificial Intelligence, intelligence is the ability to learn and apply rational techniques to solve problems and achieve goals, adapting to an ever-changing world context. A pre-programmed robot may exhibit flexibility, accuracy, and consistency, yet it is not considered intelligent.

Experiment on digger wasp

When a digger wasp returns to its nest carrying prey, it leaves the prey at the threshold and goes inside to check for any intruders. While the wasp is inspecting the nest, the position of the prey is moved. Upon exiting, the wasp observes the altered position of the prey, then repeats its behavior, placing the prey at the threshold and re-enters the nest. If the prey continues to be moved, the wasp repeats this cycle of inspection multiple times. In this case, the wasp's behavior is not deemed intelligent due to its lack of adaptability in new circumstances.[5]

To determine whether a machine system is intelligent, besides assessing its capability for learning and adaptive problem-solving, one must also consider the extent and method of learning and problem-solving. In this regard, according to the book “Artificial Intelligence: A Modern Approach” by Stuart Russell and Peter Norvig[6], a leading textbook in the field of AI, there are four prevalent viewpoints:

Acting like a human

The goal of AI is to create machines that exhibit behavior similar to humans, behaviors that require intelligence. To determine what constitutes acting like a human, the Turing Test is employed. A computer passes the test, or is deemed intelligent, if a human interrogator, after posing questions and receiving textual responses, cannot distinguish whether the answers come from a person or a computer.[7]

Rational thinking

In reality, human beings, influenced by psychology, emotions, educational backgrounds, and cognitive abilities, do not always think and act correctly, reasonably, or toward favorable outcomes. Therefore, the concept emerged of constructing AI based on the idea of thinking and acting correctly and reasonably. Rational thinking involves a thought process based on the principles of logic, representing arguments that cannot be refuted, consistently leading to correct conclusions when given correct premises.

Thinking like a human

Intelligent behavior is only achieved if the thinking process mirrors that of a human. From this understanding, models and systems are created to simulate similar cognitive processes. For instance, Allen Newell and Herbert Simon, during the development of the General Problem Solver (GPS) model, did not intend their system to solve problems accurately. Instead, their focus was on mimicking the reasoning steps that humans undertake when addressing similar problems.

Rational action

Rational action is understood as taking actions to achieve the best possible outcome or the best expected result in situations involving uncertainty. The rational thinking approach emphasizes making correct inferences and predictions. Rational action might be based on rational thinking, but in many cases, acting reflexively, such as in dangerous situations, can lead to better outcomes than spending time on careful deliberation. This is the approach chosen by Russell and Peter Norvig for analysis and is also regarded by many as the basis for AI systems designed as rational action systems.

AI is the science and engineering of creating intelligent machines, understood as machines capable of acting rationally, aiming for the best possible outcomes suited to various changing circumstances

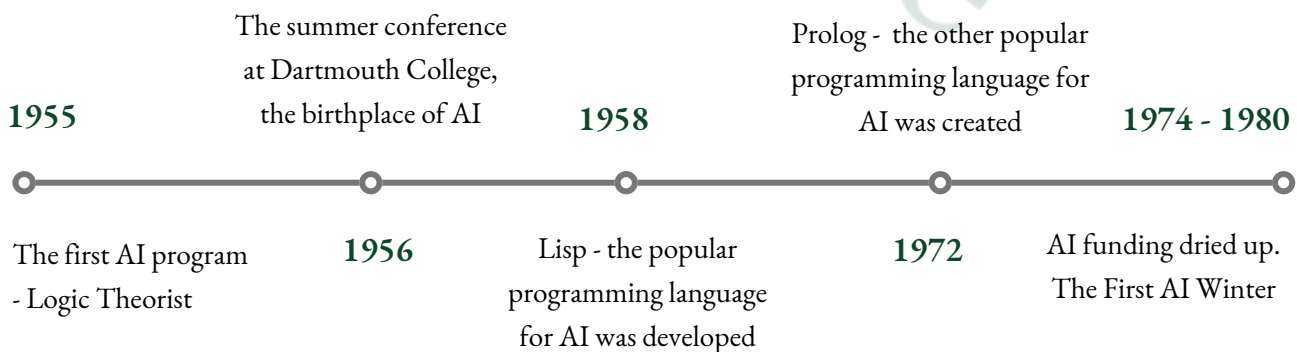
History of AI

The summer conference in 1956 at Dartmouth College, USA, is considered the birthplace of AI. Ten researchers in cybernetics, neural networks, and human intelligence conducted a two-month workshop aiming to explore ways to enable machines to use language, form concepts, think abstractly, and solve problems considered uniquely human at that time. Most attendees, including John McCarthy, Marvin Minsky, Allen Newell, became pioneering experts in the field of AI. The workshop affirmed AI as an independent scientific field with its methods and unique areas of study.

In 1955, Allen Newell, J.C. Shaw, and Herbert Simon created the Logic Theorist, the first AI program. The Logic Theorist demonstrated proofs for 38 out of 52 theorems from a math textbook, including a succinct proof for the theorem on isosceles triangles, more concise than traditional methods. In 1958, John McCarthy developed the Lisp programming language, one of the two most popular programming languages for AI. He also published a paper titled “Programs with Common Sense”, proposing the Advice Taker program, the first complete AI system capable of efficiently learning from experience like humans.[8]

In the prior AI generation, programs struggled due to a lack of deep knowledge in relevant fields, rendering them incapable of solving complex problems that demanded specialized expertise. This led to the development of an expert system, specifically designed to tackle problems within a particular domain by reasoning based on knowledge obtained from experts, represented in the form of “If...then...” rules. During this period, in 1972, Alain Colmerauer developed the Prolog language, which, alongside Lisp, became one of the most popular programming languages in AI.

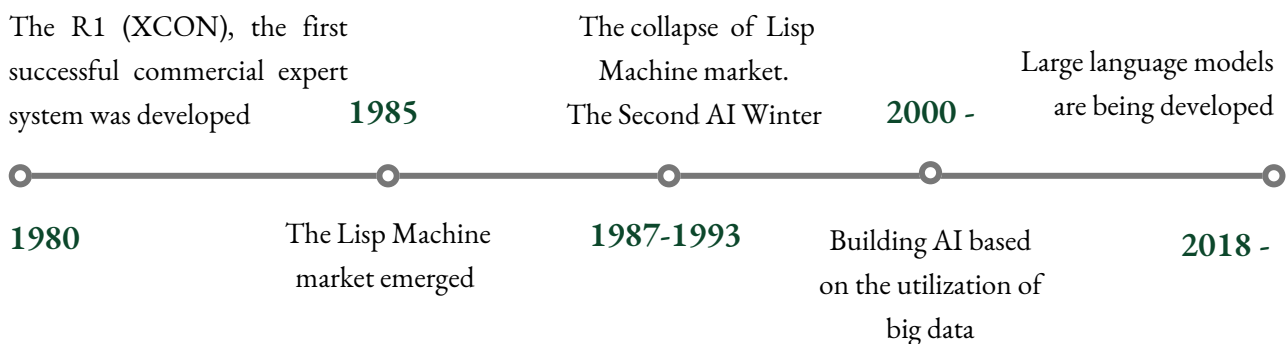
After initial success, in the early seventies, challenges related to computer power shortages hindered the AI development process, failing to meet the initial expectations. Pessimistic reports regarding the prospects of AI were presented to the governments of the UK and the US, leading to governments discontinuing funding for AI projects. From 1974 to 1980, AI funding dried up, and research came to a standstill. This period became known as the First AI Winter.



In 1980, the Digital Equipment Corporation developed the R1 (XCON), the first successful commercial expert system, initiating a surge in investment in expert systems, ending the First AI Winter. By 1985, companies were spending over a billion dollars a year on expert systems, and an entire industry known as the Lisp Machine market emerged to support them. From 1987, advancements in computing technology, emergence of cheaper alternatives, and the collapse of the Lisp Machine market led to the “Second AI Winter.”

The development of large language models, trained on massive text datasets, began in 2018. These models are capable of understanding and generating texts that closely resemble human writing. OpenAI utilized this technology to create ChatGPT, which was launched in 2022 and gained immense popularity. In 2023, OpenAI released ChatGPT-4, a large language model with enhanced capabilities across multiple tasks. It is considered an early version of artificial general intelligence, which was the initial goal of AI researchers.

During earlier phases, AI development primarily focused on constructing algorithms and systems based on expert knowledge. As we entered the 21st century, the emergence of the internet and e-commerce significantly increased the volume of digitized data. Many studies indicated that using data intelligently was more crucial than building complex algorithms. This led to a shift towards building AI based on the utilization of big data. Many applications rely on big data, such as Amazon’s recommendation system, the virtual assistant Siri, Google’s automatic translation and speech recognition.



Types of AI

Weak AI

Weak AI, also known as Artificial Narrow Intelligence (ANI), refers to AI that is trained and focused on performing specific tasks such as driving, transcribing human speech, etc. This is the type of AI we predominantly see today. Some examples of weak AI include intelligent assistants like Siri or Alexa, Gmail's spam filters, Netflix's movie recommendations, self-driving cars, etc.



Siri



Netflix's movie recommendations



Gmail's spam filters



Alexa

Examples of weak AI

Strong AI

Strong AI includes Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI). AGI is a theoretical form of AI in which machines exhibit intelligence comparable to that of humans, whereas ASI surpasses the capabilities of the human brain. In contrast to weak AI, strong AI is a machine with full cognitive abilities like humans, capable of self-awareness, learning, problem-solving, and future planning.

Currently, strong AI remains largely theoretical, existing primarily in novels or science fiction films; however, scientists predict that humans will successfully create them by the end of this century. In 2023, OpenAI introduced GPT-4, a versatile large language model. In addition to text inputs like its predecessors, it could use images as inputs, identify objects, and analyze them to generate responses. Some scientists consider GPT-4 as the initial, albeit incomplete, version of AGI.



GPT-4, considered as the incomplete version of strong AI

Mechanism of AI

AI works by combining large amounts of data with fast, iterative processing and intelligent algorithms, allowing the software to learn automatically from patterns or features in the data. In a simple view, the mechanism of AI can be indicated as follows:

- AI systems require large amounts of data which can be text, images, videos, or any other relevant information. AI algorithms process this data to recognize patterns, correlations, and trends. Different AI techniques handle different types of data and tasks, such as machine learning for recognizing patterns or natural language processing for understanding human language.
- Each AI technique has its own method of training AI, for example in supervised learning, models are trained on labeled datasets to recognize patterns. Through supervised learning, algorithms learn to make predictions or classifications based on this labeled data.
- AI models adjust themselves iteratively, improving accuracy with each iteration. They learn from mistakes and successes, refining their understanding based on feedback.
- Once trained, AI models can make predictions, recommendations, or decisions based on new or existing data, using their learned patterns and rules. Many AI systems also have a feedback loop where the outcome or decision is used to further train and refine the model, ensuring continuous learning and improvement.

Some notable methods to enable and train AI include:[9]

Machine learning

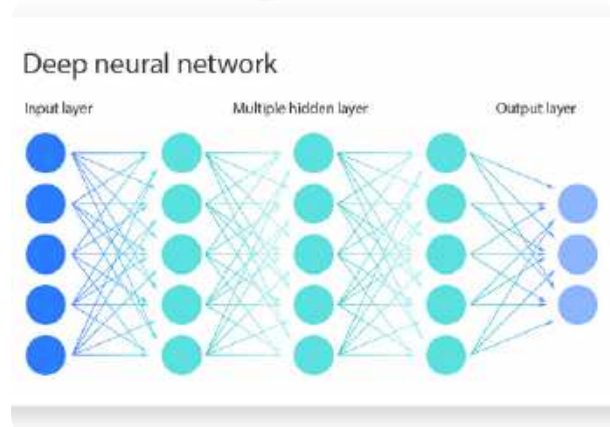
Machine learning automates analytical model building. It uses methods from neural networks, statistics, operations research, and physics to find hidden insights in data without explicitly being programmed for where to look or what to conclude. This includes supervised learning (using labeled data), unsupervised learning (finding patterns in unlabeled data), and reinforcement learning (learning through trial and error based on feedback).

Deep learning

Deep learning uses huge neural networks with many layers of processing units, taking advantage of advances in computing power and improved training techniques to learn complex patterns in large amounts of data. Common applications include image and speech recognition.

Neural network

Neural network is a type of machine learning that is made up of interconnected units (like neurons) that process information by responding to external inputs, and relaying information between each unit. The process requires multiple passes at the data to find connections and derive meaning from undefined data.



Responsible AI

Responsible AI is an approach to developing and using AI from both an ethical and legal standpoint, with the goal of using AI in a safe, trustworthy, and ethical way that increases transparency and reduces AI-related issues such as bias.[10] There are no universal criteria to define responsible AI, but each AI developer will come up with their own criteria that suit their mission and values.

According to Google, the criteria of responsible AI are:[11]

- Beneficial to society;
- Avoid creating or reinforcing bias;
- Built and tested for safety;
- Be accountable to people;
- Integrate privacy design principles;
- Maintain high scientific standards;
- Use for purposes consistent with the above principles.

According to the European Commission's Ethics Guidelines for Trustworthy AI, the criteria to determine a trustworthy AI system are:[12]

- *Human agency and oversight*: including ensuring fundamental rights, human agency, and oversight;
- *Technical robustness and security*: including attack resistance and security, contingency plans and general safety, accuracy, reliability, and reproducibility;
- *Privacy and data governance*: including respect for privacy, data quality, integrity, protection, and access;
- *Transparency*: including traceability, explainability, and communication;
- *Diversity, inclusiveness, and fairness*: including avoidance of bias, universal accessibility and design, and stakeholder engagement;
- *Social and environmental well-being*: including sustainability and environmental friendliness, social impact, society, and democracy;
- *Accountability*: including the ability to audit, minimize, and report on negative impacts, trade-offs, and remedies.

AI developers need to build a set of AI rules that align with their goals and values and provide the necessary requirements/actions/implementation steps during the AI development process to implement each principle. In addition, companies can make reports on the status of applying these principles in creating, training, testing, and putting into use AI each year to create trust and assure customers.

Some AI principles of large companies/organizations include Google AI Principles, European Commission Ethics Guidelines for Trustworthy AI, Microsoft Responsible AI Standard, IBM's Principles for Trust and Transparency, etc.

Curent popular AIs



Chat GPT

ChatGPT is a chatbot based on the Generative Pre-trained Transformer (GPT) language model, which was first introduced by OpenAI in 2018 and trained to follow instructions in a prompt and provide a detailed response.

Operation mechanism

ChatGPT employs a deep neural network structure with layered transformers designed specifically for handling sequential data, particularly natural language text to generate human-like and coherent outputs. To train ChatGPT, a vast amount of text data is inputted into the model to enable it to learn the patterns and relationships among words, phrases, and sentences. The model undergoes iterative refinement as it encounters more data, continuously improving its comprehension. After training, ChatGPT can be fine-tuned for specific tasks or applications like content generation or language translation.[13]

The operation of ChatGPT follows a series of steps. Initially, the user inputs a query or prompt into the system. This input is then processed by the model, leveraging its understanding of language patterns and associations to generate a response, which is then returned to the user. The user can further continue the conversation or pose additional questions.

Advantages & Disadvantages

ChatGPT has the advantage of natural language generation, enabling it to craft responses that closely resemble human language and maintain coherence. However, ChatGPT might struggle to identify and react to emotional cues like sarcasm or humor, potentially leading to responses that might seem tone-deaf or insensitive.

ChatGPT can be applied in several aspects such as enhancing customer support services by offering tailored assistance to customers through creating virtual agents, identifying and preventing cyber-attacks by analyzing the language used in the email, improving healthcare services by providing personalized assistance to doctors, etc. After a year in operation, over 180 million people have created a ChatGPT account and the ChatGPT website gets around 1.5 billion visits each month.[14]

OpenAI recently unveiled GPT-4o, a groundbreaking multimodal model capable of reasoning across audio, vision, and text in real-time. Users can now have voice conversations with ChatGPT directly from their computers or phones, setting a new standard for generative and conversational AI experiences. Prior to the release of GPT-4o[15], OpenAI introduced Sora, its first text-to-video generator model in February 2024. Sora garnered attention for its ability to generate videos up to a minute long while maintaining visual quality and adhering to the user's prompts. Based on textual descriptions, Sora can generate high-quality videos, complex scenes with multiple characters, specific types of motion, and accurate details of the subject and background. It can even extend or fill in missing frames of existing videos[16].



Chat GPT



Midjourney

Midjourney is a Discord-based generative AI program for generating images with the text-to-images method, created and hosted by San Francisco-based independent research lab with the same name, Midjourney, Inc. The tool is currently in open beta, which it entered on July 12, 2022.

Operation mechanism

Midjourney uses algorithms to generate images from text. Moreover, the algorithm is able to take user input and make unique pictures based on it, as well as customize images and adjust colors, shapes, and textures. Midjourney AI can create amazing art in different styles like cyberpunk, steampunk, ink, oil painting, and anime that looks like it was made by a master artist.

Midjourney operates exclusively within Discord, functioning as a bot accessible through the official server or by inviting it to other servers. To generate images, users use the /imagine command and type in a prompt. The bot then returns a set of four images. From there, users can select specific images they wish to upscale for enhanced quality or size. The results generated by Midjourney have codes known as seeds so users can track and make another image generated using offered seeds based on their past results. These codes can be searched in the mid-journey databases for future text-to-image generation.[17] Midjourney extends its functionalities beyond the text-to-images tool, offering users a range of applications, such as the remix tool, which enables users to merge two images or the expand tool which provides users with suggestions on expanding the horizons of the original images.

Advantages & Disadvantages

Midjourney is used widely by graphic designers and architects. Designers use Midjourney to find ideas for creating graphic publications. The program was used by the designers of The Economist to create the front cover for an issue in June 2022 or in Italy, the newspaper Corriere della Sera published a comic created with Midjourney in August 2022. Architects can use Midjourney as a starting prototype and brainstorm for shape and material ideas. After researching the user needs and boundaries for the exact plan, Midjourney can help architects to generate early design options which are starting points for future development.

However, Midjourney still has some limitations such as the images generated can be biased, racist or conspiratorial. Midjourney can also be used for creating fake images, contributing to spreading fake news, for example, the image of Pope Francis wearing a white puffer coat or the fictional arrest of Donald Trump.



An image generated by Midjourney

Replika

Replika is a generative AI chatbot created by Luka, a San Francisco-based technology company.

Operation mechanism

Replika is designed to be a personal AI friend or companion. It utilizes machine learning techniques to adapt to users' preferences, behaviors, and interests, aiming to create a personalized experience. Its primary focus is on conversational interactions, providing users with someone to talk to, share thoughts with, and engage in meaningful conversations. Users can communicate with Replika using free text, voice, or even augmented reality (AR) on their devices. Replika's goal is to offer companionship, provide emotional support, and encourage self-reflection and personal growth through its conversational interactions. It is often used by individuals seeking a non-judgmental space to express themselves or improve their mental well-being by sharing thoughts and feelings through conversations. The AI learns from these conversations, aiming to understand the user better and respond more appropriately over time.

Advantages & Disadvantages

Replika was launched in November 2017 and witnessed a remarkable development in the number of users, from more than 6 million users in 2019, the Replika website claimed it had over 10 million registered users in 2022.[18] Replika is used in journaling and self-reflection, overcoming grieving periods, understanding emotions, sleep aids and research on human psychology and AI-human interaction.

Despite numerous advantages, Replika has been criticized for using users' sensitive data and the exposure of unscreened minors to sexual conversation. In February 2023 the Italian Data Protection Authority banned Replika from using users' data and then, the application had to remove the ability for the chatbot to engage in erotic talk.





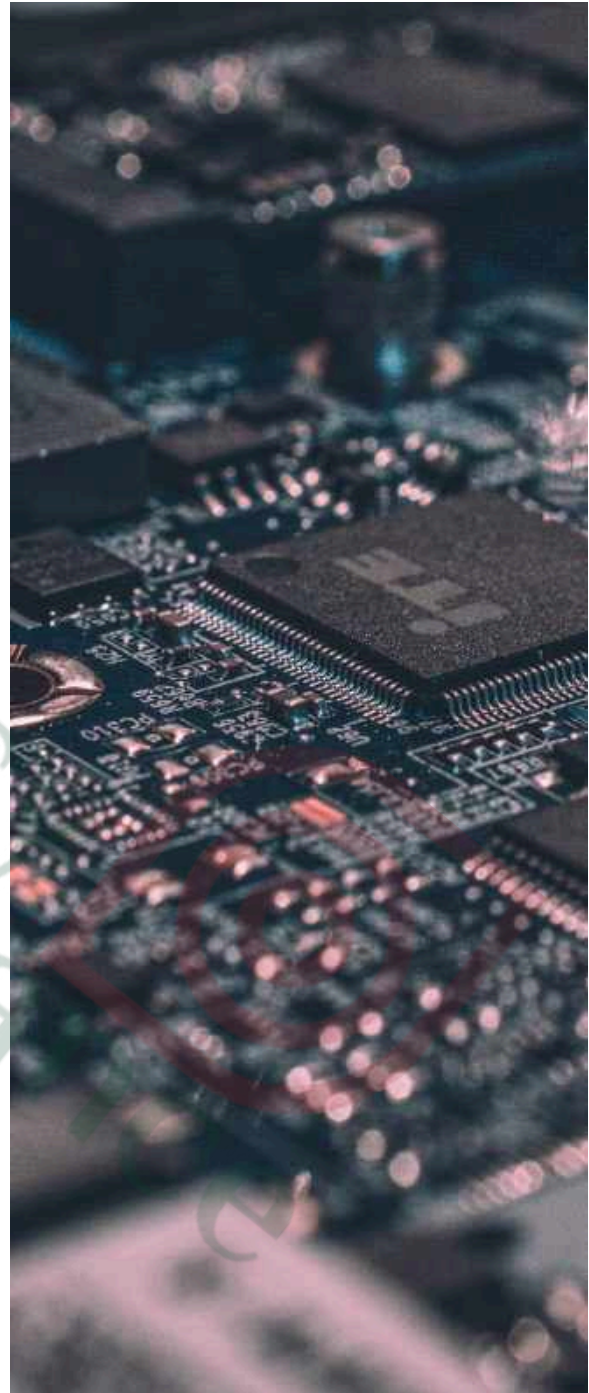
Gemini

Gemini is a family of multimodal large language models developed by Google DeepMind, which launched the first version on December 6, 2023, positioned as a contender to OpenAI's GPT-4.

Capabilities

Gemini is Google's largest and most capable AI model — able to generalize and seamlessly understand, operate across and combine different types of information including text, code, audio, image and video. Gemini is also Google's most flexible model yet — able to efficiently run on everything from data centers to mobile devices. Gemini is optimized for three different sizes including Gemini Ultra - for highly complex tasks, Gemini Pro - for scaling across a wide range of tasks and Gemini Nano - for on-device tasks.[19]

Gemini Ultra is the first model to outperform human experts on MMLU (massive multitask language understanding), which uses a combination of 57 subjects such as math, physics, history, law, medicine and ethics for testing both world knowledge and problem-solving abilities. It can recognize and understand text, images, audio at the same time and extract insights from hundreds of thousands of documents through reading, filtering and understanding information. Another outstanding capability of Gemini is that it can understand, explain and generate high-quality code in the world's most popular programming languages, like Python, Java, C++, and Go.[20]



Recently, Google introduced its most capable AI model - the Gemini 1.5 Pro. This release reflects Google's focus on expanding its AI-driven services and integrating more advanced AI features across platforms such as Gmail, and Google Docs. With the ability to recall and synthesize details across millions of tokens of context, Gemini 1.5 Pro can process and reason over vast amounts of information and allow users to upload Google Docs, PDFs, video links and more for summaries and analysis[21].

 **Apple Intelligence**

On 11 June 2024, Apple launched Apple Intelligence, a personal intelligence system for iPhone, iPad, and Mac that combines powerful generative models with personal context to provide extremely useful and relevant intelligence for users. Apple Intelligence is deeply integrated into iOS 18, iPadOS 18, and macOS Sequoia. This tool leverages the power of Apple silicon to understand and generate language and images, manipulate applications, and use personal context to simplify and accelerate everyday tasks. With the Private Cloud Compute system, Apple has set a new standard for privacy in AI, offering flexible and scalable computing capabilities between on-device processing and larger server-based models. These models run on dedicated Apple silicon servers.[22]



Impacts of AI

Impacts of AI

Overview of impacts of AI

AI has emerged as a pivotal technology in this century, profoundly influencing various aspects of our lives. The rise of AI has ushered in an era of automation, restructuring labor forces, altering healthcare methodologies, transforming our ways of communication, and sparking concerns regarding potential impact of AI on society.

Advantages

It is undeniable that AI has been supporting humans in alleviating several pressing problems of the world. AI-powered tools and systems are utilized in almost every field of life, including business, health care, education, transportation, and environmental protection. AI aids in diagnosing diseases, predicting outbreaks, enabling early disease detection, and more precise treatments. AI-powered tools customize learning experiences, offering personalized tutoring, enhancing accessibility, and streamlining administrative tasks for educators. AI helps monitor environmental changes by analyzing large datasets, facilitating more accurate weather forecasts, and enhancing sustainability practices. By leveraging AI technologies, humans can address critical global challenges more efficiently, offering promising solutions and shaping a better future for various aspects of society.

With regard to the workforce, the impact of AI is significant. Automation facilitated by AI is rapidly replacing human workers, especially in routine and low-skilled occupations. While this transformation has potential for efficiency improvement and cost reduction, it also raises concerns about job displacement.

It is crucial to acknowledge that AI is not solely a job disruptor; it is a job transformer. By handling repetitive and low-value tasks, AI liberates human workers to concentrate on higher-order tasks demanding creativity, critical thinking, and empathy. This shift reshapes the employment landscape rather than simply eliminating positions.[23]

Disadvantages

Firstly, AI is used to collect and analyze huge amounts of data of various natures, including data relating to character and behaviors of each person, which has created great concerns over data protection, cyber security as well as data privacy.

Secondly, AI's decision-making abilities can create ethical dilemmas, especially in areas like healthcare and criminal justice where human lives are affected.

Thirdly, another significant worry revolves around unintentionally amplifying biases and fostering discrimination within AI systems. These systems rely on extensive datasets that might inherently embody biases derived from past human choices. Consequently, AI can reinforce gender, racial, or socioeconomic biases, resulting in discriminatory consequences, notably in domains like employment, lending, and the justice system.[24]

Fourthly, the borderless and personhood complexities of AI also present significant challenges for jurisprudence. The current legal landscape in many countries struggles to categorize AI entities, addressing concerns related to accountability, liability, and rights. The status of AI within legal systems worldwide remains uncertain, leading to a lack of appropriate frameworks to govern its actions and mitigate potential risks.

Applications of AI

Applications of AI in health care



Medical diagnostics

AI algorithms have demonstrated exceptional capabilities in analyzing medical images, enabling the rapid processing of X-rays, MRIs, and CT scans, empowering healthcare professionals to obtain precise and comprehensive insights from diagnostic scans. AI algorithms excel in analyzing extensive collections of medical images, specifically in identifying and categorizing tumors associated with cancer. These AI systems provide oncologists with crucial insights into the tumor's stage, growth rate, and likelihood of metastasis, facilitating the creation of personalized treatment strategies for patients.[26]

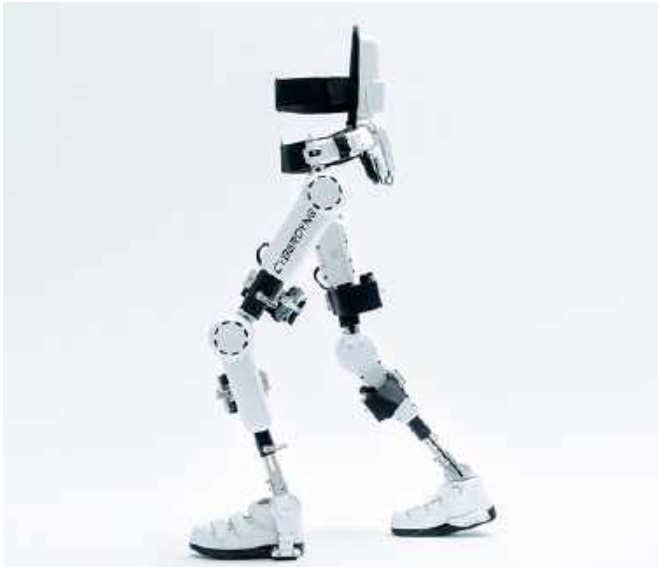
Secondly, AI's role in early disease detection is pivotal, as it can analyze vast patient records and find minute patterns and abnormalities that may indicate a disease's presence. AI is able to generate personalized health risk assessment by evaluating genetic data in relation with bio-signals, vital signs, medical history or living environment.[27]

Drug discovery and development

Machine learning techniques have been employed to evaluate drug molecules' biological activity, absorption, distribution, metabolism, excretion characteristics, and physicochemical properties, which is essential in assessment of drug molecules' behavior on the human body. For example, DeepTox is a deep learning-based model utilized to assess the toxicity of compounds based on a dataset comprising numerous drug molecules.

Besides, AI is applied in evaluation assessment of drug–target interactions by creating tools for automatic molecular docking. Molecular docking refers to a molecular modeling technique employed to examine how two molecules bind and form complexes, which is valuable in identifying interactions between a drug compound and a specific target. For instance, AutoDox is a suite of automated docking tools designed to predict how small molecules, bind to a receptor of known 3D structure. [25]





Patient assistants

Assistive robots support the physical limitations of elderly and impaired people by assisting them in daily tasks and serving as an additional pair of hands or eyes. These robots play a versatile role, aiding in mobility, household tasks, medication management, eating, grooming, bathing, and facilitating social interactions. For instance, RIBA, an assistive robot equipped with human-like arms, was specifically designed to assist patients in lifting and moving heavy objects or Cyberdyne's Hybrid Assistive Limb exoskeleton, is designed to help patients rehabilitate from conditions that lead to lower limb disorders, by using sensors placed on the skin to efficiently detect electrical signals in the patient's body and responding with movement at the joint.[28]

Some AI-based platforms can help patients to recover from their cognitive abilities decline. Virtrael is one of such platforms that serves to assess, stimulate, and train various cognitive skills that experience a decline in the patient. The Virtrael program matches the patient with a therapist, allows the patient to communicate with the therapist and other patients and sets challenges to help patients practice their memory, attention and planning abilities.[29]

Intelligent personal health records

Wearable Health Devices (WHDs) are an emerging technology facilitating continuous monitoring of human vital signs such as heart rate, blood pressure, body temperature, etc. throughout daily life, whether at work, home, or engaged in sport activities with minimal interference and discomfort during normal activities.

This type of intelligent personal health recording equipment helps users proactively monitor their own health status, detect early signs of illness, monitor the recovery process after medical interventions and provide data supporting doctors in accurately diagnosing and offering appropriate treatment for each individual. WHDs are also very useful in sport activities/fitness to monitor athlete's performance or even in first responders or military personnel to evaluate and monitor their body response in different hazardous situations and to better manage their effort and occupational health.[30]



Applications of AI in business



Customer service assistants

AI is applied in developing virtual receptionists and customer answering services. Virtual receptionists are able to carry out various tasks including answering customer queries and requests, taking phone calls, booking appointments, taking orders, discharging other inbound services in multichannel and also reporting and analyzing data collected from the calls. For example, Ruby receptionist is one of the leading multichannel customer communication solutions for small businesses, whose key features are 24/7 live phone and chat answering, call recording and notification, spam chatters and callers prevention.

Virtual receptionists are based on machine learning, answering questions by identifying keywords and previously identified patterns. AI can direct all calls that cannot be answered by AI to the human operator and answer all questions that are repeated or frequently asked. Employing virtual receptionists decreases the time taken for customers to receive answers, increasing customer satisfaction and loyalty. This application can also be used to substitute human labor, lower business costs and collect different customers' data, customer behavior analysis in marketing and sales.[31]

Investment management

Many companies, especially major financial institutions rely on AI to bolster their investment strategies.

For instance, BlackRock utilizes its AI engine, Aladdin, internally and for clients to aid investment choices. Aladdin employs natural language processing to assess textual data like news, broker reports, and social media updates, swiftly sifting through millions of articles and diverse content sources, aiming to pinpoint shifts in public sentiment or interest. It evaluates sentiment related to mentioned companies and assigns scores, which support investors in making more accurate decisions.

Additionally, banks like UBS and Deutsche Bank leverage SQREEM (Sequential Quantum Reduction and Extraction Model) to mine data, create consumer profiles and align them with wealth management products.





Targeted marketing

AI can help marketers understand consumer behavior, actions, and indicators and therefore, target the right group of customers in a timely and effective manner. Facial recognition software, one of AI-driven tools, aids in tracking customers' in-store visits and linking images to their social media profiles. AI is used to analyze customer data collected from these tools and cookies collected when Internet users access any websites or pages, to segment audiences by factors such as basic demographics, shopping interests, or browsing behavior, and then create unique advertisements tailored to each audience segment.[32]

By learning customer routines and interests, AI platforms have the capability to swiftly determine how to allocate expenses across various media channels. They ensure continuous client engagement and optimize campaigns to maximize value of marketing campaigns.[33] Marketers may also use AI technology to detect microtrends and even anticipate trends and create marketing campaigns based on these predictions to be the frontrunner in upcoming trends.

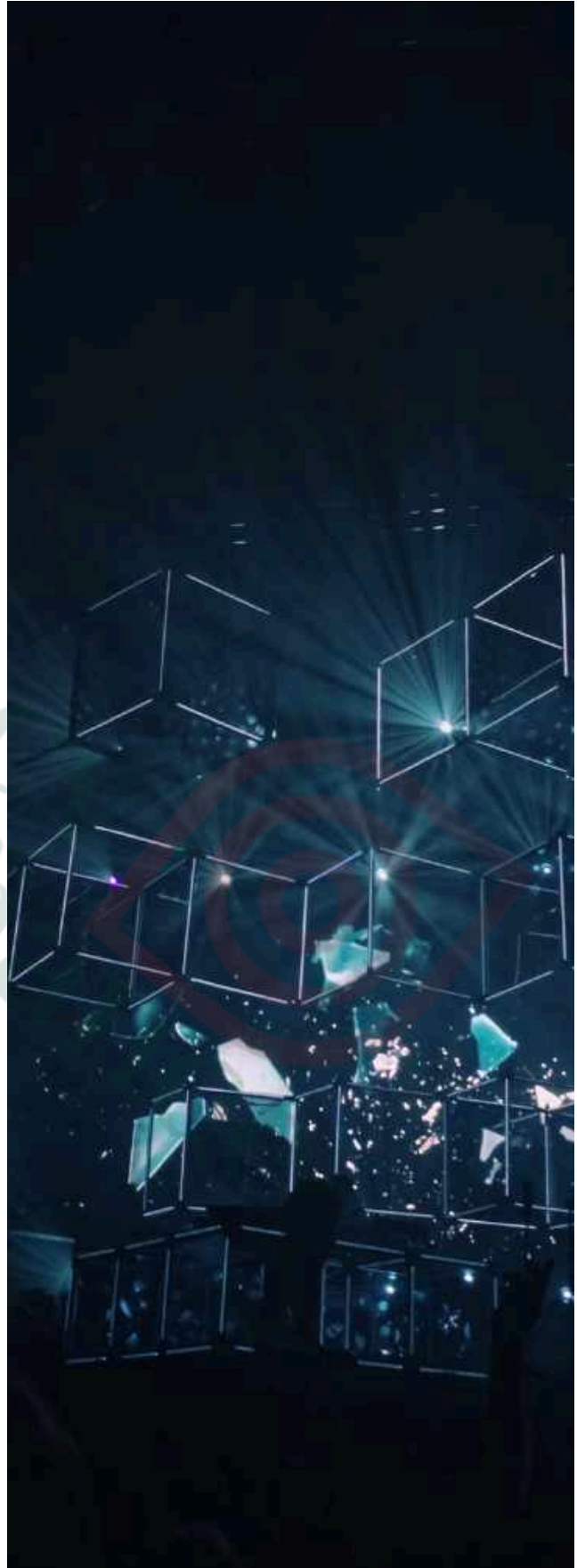
Applications of AI in education

Learning experience personalization

AI-based platforms have the capability to gather and assess student data on interactions with educational materials, completion times for exercises, test outcomes, and overall academic performance. This information enables a comprehensive understanding of each student's attitudes and requirements. Leveraging this data, AI tools can craft individualized learning paths and dynamically adjust them based on the learner's progression.

For instance, when an AI-driven system detects a student's struggle in completing specific tasks, including tests and exercises, it can recommend alternative study materials, switch the order of exercises, or slow down the pace of the learning process. Simultaneously, the system can suggest self-assessment tests tailored to the materials the student has studied, fostering a more personalized learning experience.[34]

Companies like Carnegie Learning have developed smart platforms that use AI to provide personalized learning and feedback to students from pre-K to college. Their intelligent instruction design can identify knowledge gaps, redirect to new topics and create learning contents catering to individual needs. [35]



Applications of AI in education



Automated grading

AI-powered grading software utilizes natural language processing and machine learning techniques to replicate the grading patterns employed by human teachers in educational settings. Automated grading systems can handle various types of exercises such as multiple choice questions, short answers and even essays, based on assessment criteria and standards set by teachers. Automated grading systems bring numerous advantages including consistent and accurate evaluation, fairness, teachers' workload reduction and instant feedback.

There are many education companies using AI-driven grading tools for creating automated learning platforms such as Prep, an English test practicing platform in Vietnam, that automatically corrects students' faults on grammar, spelling, coherence; and grades the work based on each test's own standards and give detailed feedback on better rewrite options.

VR-based learning

Virtual Reality enables active learning, a teaching approach centered on engaging students actively in the learning process. It encourages their complete involvement and participation by immersing them in interactive experiences where they learn by "doing" rather than passively absorbing information like in traditional lectures.[36] With access to VR-based content, students can engage in experiences that might be unavailable for them. Using Google Expeditions, students can go on virtual field trips to visit historical sites, explore nature landscapes or participate in traditional festivals in countries across the world without physically leaving their classroom.

Skyview app allows students to look at the stars in the night sky, learn about their shapes, formations and other physical characteristics visually. VR in schools can be instrumental in aspiring students to pursue careers related to STEAM by providing a platform for them to practice real-world skills and scenarios. For instance, with Visual Body, students can have a virtual trip through the human blood flow to discover how inner organs work without having to step inside a hospital.

Applications of AI in transportation



Self-driving vehicles

AI integration into self-driving cars is crucial for their development, ensuring they can navigate safely and efficiently in real-world conditions. AI algorithms process data from various sensors like cameras, lidar, radar, and ultrasonic sensors to perceive the car's surroundings and machine learning helps to identify objects, pedestrians, road markings, and other vehicles. AI-powered systems, then, interpret the data collected and analyze the surroundings, predict possible scenarios, and choose the best course of action, such as accelerating, braking, or steering. AI also assists in creating detailed maps for navigation and localization, it helps the car understand its precise location on the road and plan routes effectively. Moreover, AI is used extensively in simulations and testing environments to simulate diverse driving scenarios and fine-tune algorithms without physical risks. With AI, companies have successfully brought self-driving vehicles to the market. In December 2018, Waymo was the first to commercialize a robo-taxi service, in Phoenix, Arizona and now offers services in various US cities.

In March 2021, Honda was the first manufacturer to sell a legally approved Level 3 car[37] and Nuro was approved for Level 4 in Palo Alto in August 2023.

Road condition monitoring

Computer vision in AI transportation is able to detect damage to the road surface by looking for changes in the asphalt and concrete. By utilizing computer vision algorithms, it becomes possible to identify potholes and cracks on the road as well as show exactly how much road damage there is in order to alert the relevant authorities to take action and improve road maintenance. The algorithms function by gathering image and video data and processing it to create automated systems for detecting and classifying cracks. There are numerous AI-driven road maintenance products currently in operation, including EyeVi. EyeVi consists of a sensor-agnostic car-mounted mapping hardware set and a software package that includes automatic feature recognition and data processing.

Captured data is run through EyeVi DataFlow software which is an automated data processing pipeline to produce georeferenced panoramic images, HD orthophotos, point cloud datasets and can extract data about cracking, network cracking, edge defects, fretting, potholes, patching, weathering of the roads.

Driver monitoring

AI-powered systems have now been integrated into car cabins to enhance and ensure safer driver monitoring. This technology utilizes face detection and head pose estimation to detect signs of drowsiness and distraction of the drivers, significantly contributing to the prevention of numerous crashes and fatalities each year. AI-driven technology can alert drivers when fatigue significantly affects their driving, prompting them to pull over and take a break or when detecting a driver is distracted, maybe by his phone, the AI system can remind them to stay focused.[38]

One of the remarkable driver monitoring products is Smart Eyes, which uses sensors, such as in-car cameras, computer vision, and AI to bring insight into the driver's state and behavior. Smart Eyes enables a wide variety of features for improved road safety and driver convenience, including tracking the driver's eyes, head and face movement, tracking how the driver is sitting, moving or interacting with objects or interfaces of the vehicle to detect and prevent fatigue and distraction while driving.



Applications of AI in the Government



Monitoring

U.S. Customs and Border Protection (CBP) uses AI to help screen cargo at ports of entry, validate identities in the CBP One app, and enhance awareness of threats at the border. AI models are used to automatically identify objects in streaming video and imagery. Real-time alerts are sent to operators when an anomaly is detected, enhancing CBP's ability to stop drugs and other illegal goods from entering the country. The Science and Technology Directorate supports academic research and the development of technologies for enhanced border security through the Center for Accelerating Operational Efficiency[39].

The United States government organizations and insurance companies use an AI tool trained on image data from a company named NearMap to identify any changes in infrastructure or property. NearMap on the U.S. General Services Administration schedule offers streamlined access to scalable and accurate aerial mapping tools, location data, and imagery of over 80% of the U.S. population. The inclusion of the U.S. General Services Administration is of great importance to federal government agencies. It enables government entities to save money and time by avoiding using pre-established and standardized pricing, terms, and conditions to acquire high-quality goods and services and by avoiding long contractual terms[40].

Task Automation: Chatbots

Australian Tax Office (ATO) implemented an intelligent virtual assistant in 2016 to deliver a contemporary self-service support tool available 24/7, providing an enhanced service offering that understands the client's intent, delivers responses tailored to the client's needs using natural language understanding and can then be printed and used for future client reference. By June 30, 2016 (three months after launch), the virtual assistant had held over 270,000 conversations. The implementation of the virtual assistant resulted in 79 percent of client inquiries answered without the need to follow up with further interaction with the ATO[41]. Moreover, the ATO has achieved a reduction in client red tape (time it takes clients to find the information needed) valued at approximately \$9.7 million per annum. With figures last updated at the end of 2023, its virtual assistant has helped raise more than \$242 million in liabilities, collected more than \$60 million in cash and finalised more than 535 audits and reviews[42].

The Department of Homeland Security in the U.S. uses EMMA, a virtual assistant catering to immigration services. EMMA guides around one million applicants per month regarding the various services offered by the department and directs them to relevant pages and resources.



Healthcare and Disease Spread Prevention

AI in healthcare has achieved several breakthroughs in medical science, from early disease detection and prevention to clinical decision support.

AI allows real-time tracking of patients' health[43]. This includes monitoring weight, height, blood glucose, stress levels, heart rate, etc., and feeding this information to AI healthcare systems, which can notify doctors of any possible risks.

Governments can leverage AI to provide effective health services to citizens. For instance, during the pandemic, AI impacted the detection and control of the COVID-19 virus.

In the UK, the National Health Service (NHS) formed an initiative to collect data related to COVID patients to develop a better understanding of the virus. Through various partnerships, the NHS set up the National COVID-19 Chest Imaging Database (NCCID)[44], an open-source database of chest X-rays of COVID patients across the UK. This initiative aimed to develop deep learning techniques meant to provide better care for hospitalized COVID-19 patients.

Similarly, the NHS has developed an AI tool[45] that can detect heart disease in only 20 seconds while the patient is still in an MRI scanner. Normally, it would take a doctor 13 minutes or more to analyze the MRI scans of a patient manually.

Likewise, the U.S. Centers for Disease Control and Prevention uses an AI tool[46] to streamline polio virus tracking and reporting. It can identify virus types and form clusters of different disease reports.

The Australian government's syndromic surveillance system[47], PHREDSS, monitors patient symptoms in hospitals every day to determine emerging disease outbreaks and configure health policies accordingly.

Legal Services

Regarding AI for patent search, the US Patent and Trademark Office must determine how similar patent applications are to the state of the prior art. The USPTO is using AI to assist examiners with finding relevant documents and additional prior art areas to help them in adjudicating new patent applications[48].

In the field of researching AI civil rights impacts and generating text to aid legal services, the Office of the General Counsel (OGC) of U.S is using AI to generate written paragraphs intended to augment written documents, research legal and civil rights issues related to AI, and evaluate AI's ability to assist in providing legal service to the Secretary and all other officers and employees of the Department[49].

Applications of AI in law



Legislation

In October 2023, city lawmakers in Porto Alegre, Brazil passed the country's first legislation written entirely by artificial intelligence[50]. City councilman Ramiro Rosário asked OpenAI's ChatGPT to draft a proposal to prevent the city from charging taxpayers to replace stolen water meters. Rosário then presented the AI-generated proposal to his fellow council members without disclosing its origin, and it was unanimously approved.

Similar experiments have been conducted in the U.S., Bill S. 31 for an Act drafted with the help of ChatGPT to regulate generative artificial intelligence models like ChatGPT was introduced by Senator Barry R. Finegold to the Massachusetts Senate on February 16, 2023, and was accompanied by Bill S.2539 for an Act relative to cybersecurity and artificial intelligence. The bill aimed to help this technology grow without having negative consequences, regulate large-scale generative AI models like ChatGPT, requiring companies operating such models to register with the state Attorney General, conduct risk assessments, implement anti-plagiarism measures, and follow data protection standards. Currently, the bill has been accompanied by a new draft[51].



Law Enforcement

The New York Police Department (NYPD) started testing predictive policing software as early as 2012. A series of documents released by the department in 2018 after the Brennan Center filed a lawsuit identified three firms — Azavea, KeyStats, and PredPol — that were involved in an NYPD predictive policing trial. Ultimately, the NYPD developed its own in-house predictive policing algorithms and started to use them in 2013. The NYPD created predictive algorithms for several crime categories, including shootings, burglaries, felony assaults, grand larcenies, grand larcenies of motor vehicles, and robberies. Those algorithms are used to help assign officers to monitor specific areas. While the NYPD has described the information that is fed into the algorithms — complaints for seven major crime categories, shooting incidents, and 911 calls for shots fired — it has not disclosed the data sets in response to a public records request from the Brennan Center[52].

The Delhi Police's use of the Automated Facial Recognition System (AFRS) to maintain a dataset of facial data of select protestors tops the list of eye-opening FRT systems in India. It was employed for the first time at the Prime Minister's rally in New Delhi in December 2019, with the intent of taking action against protestors raising slogans or banners against the Prime Minister.

Judiciary

The UK Judicial Office, overseeing judges, issued a guidance[53] on December 12, 2023, laying out how AI can be useful for some tasks, such as summarizing large bodies of text, writing presentations, or administrative tasks like composing emails and memoranda. It also highlights the use of AI is not advised in legal research and legal analysis. As such, Judges in England and Wales have approval to use AI in parts of their job, the guidance states that it can help summarize large amounts of text and write presentations, emails, and a court's decision on a case.

For lawyers and legal professionals around the world, many AI tools have been built to help gather insights from large sets of data and focus on the information that matters most, enabling them to be more efficient and more strategic, and offer more value to their clients. The use of AI is applicable in a wide range of scope: from drafting/templating communications/legal contracts, conducting legal research to reviewing legal documents and translating. However, the use of AI not only requires the user to verify the information for accuracy, but also to avoid inputting confidential information into free versions of those services, which learn from user prompts. Moreover, in some countries, there are specific rules lawyers must be aware of and in compliance with when using AI. For instance, Judge Arun Subramanian of the Southern District of New York updated practice guidelines[54] for his courtroom on July 29, 2023 to state that while the use of ChatGPT and other similar technologies is not prohibited, attorneys “*must at all times personally confirm for themselves the accuracy of any research conducted by these means.*”. Judge Michael Baylson of the Eastern District of Pennsylvania issued an order[55] on June 06, 2023 stating that if AI was used, lawyers must “*disclose that AI has been used in any way in the preparation of the filing.*”

AI Application in Finance and Banking

Fraud Detection and Money Laundering

J.P. Morgan has been using AI-powered large language models for payment validation screening for more than two years, resulting in reduced fraud and improved customer experience. The result has been lower levels of fraud and a better customer experience, with account validation rejection rates cut by 15-20 percent. J.P. Morgan is also using AI to automatically show insights to clients, such as cashflow analysis, when they need it[56]. Besides that, HSBC with Google Cloud developed and implemented an AI solution named Anti Money Laundering AI (AML AI). This system helps identify two to four times as much suspicious activities compared to traditional systems, simultaneously reducing false alerts by 60%, reducing the processing time for detecting suspicious accounts from criminal abuse, and identifying money-laundering patterns, uncovering both suspicious individuals and criminal networks, which rule-based systems often miss[57].



Risk Assessment

HSBC is partnering with Google Cloud to adopt a cloud-based machine-learning powered solution as its primary anti-money laundering (AML) transaction monitoring system. The new detection system, called Dynamic Risk Assessment (DRA), uses Google Cloud's AML AI, an AI-based risk detection product, as the core. HSBC leverages its extensive domain expertise in financial crime compliance and data assets to help train and fine-tune models created by AML AI.

The scalability and high-performance computing power of the cloud enable the solution to significantly reduce batch processing time for HSBC's large customer base and drive advanced models to improve detection capability and deliver more accurate results[58]. Meanwhile Microsoft recently announced a partnership with risk assessment firm Moody's to develop enhanced risk, data, analytics, research and collaboration solutions powered by generative AI.[59]



Algorithmic Trading and Portfolio Optimization

Voya Investment Management has implemented a virtual analyst - Voya Machine Intelligence (VMI). VMI combines machine learning and AI techniques with traditional investment research and quantitative analysis to create a dynamic, active investment strategy, identifying persistent patterns in data and determining whether to purchase a stock. VMI incorporates risk management strategies to identify and avoid negative events, controversies, excessive portfolio crowding, and monitor stocks for potential risks[60].

Chatbots for Customer Service and Support

NatWest has launched Cora+, an upgrade to its digital assistant - Cora, developed in collaboration with IBM - and will be one of the first banks in the UK to deploy generative AI through a digital assistant. Cora+ will build on current capabilities into an intelligent virtual agent that uses generative AI to derive information from multiple sources through multi-channel integration, and to provide personalized and contextual support to banking customers. This supports the British bank's intention to provide "a more intelligent, interactive and conversational experience", supporting customers in answering banking queries 24/7 through natural language processing and machine learning capabilities[61].

In Vietnam, TPBank, for example, has implemented facial recognition technology into its LiveBank automated banking channel, increasing client security and convenience. Its AI program can analyze 128 criteria to reliably identify a person among millions of consumers without the need for identification documents. Furthermore, FaceID identification kiosks are used by VietinBank to identify consumers. Many of Vietnam's biggest banks, including VPBank, Techcombank, VIB, and ACB, have embraced AI for various purposes[62].



Challenges posed by AI

Legal challenges

Intellectual Property (IP)

This is an especially hotly debated topic in recent years due to the rise of generative AIs like ChatGPT, MidJourney, DALL-E, etc. Content creators have been fiercely fighting against these AIs with multiple lawsuits underway. This is one of, if not the most contentious issue relating to AI that has captured the global zeitgeist on AI. Such challenges could be classified into 02 broad areas:

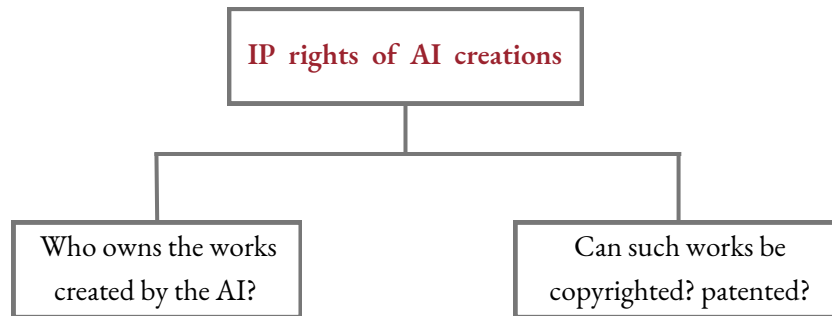


- **Training data**

In the simplest terms, generative AIs collect and analyze a large set of data in order to recognize patterns in the data and when prompted by the user, it would create new data based on the patterns it has observed and the prompt of the user. This means that for the AI to function, it would require a huge amount of training data on all subjects and topics imaginable. It is unavoidable that the training materials used for the AI would also include copyrighted works of content creators.

Thus, content creators such as artists have been alleging that AIs unfairly profit from their works. However, the legal battle to determine whether using copyrighted works as training data for AIs constitutes an infringement of IP rights or not is very much ongoing. With many different legal systems and laws on IP, there are many views on the usage of copyrighted works as training data for AI. Lawsuits are still being waged as of the writing of this Handbook.

- Ownership/IP rights of AI creations



Who owns the works created by the AI?

The answer could be entirely dependent on the terms and conditions of the AI used to generate the works. For example, in the latest Terms of Service of MidJourney, effective as of March 7, 2024[63], the Content Rights of the user state:

“ You own all Assets You create with the Services, provided they were created in accordance with to the fullest extent possible under applicable law. There are some exceptions:

- Your ownership is subject to any obligations imposed by this Agreement...If You are not a Paid Member, You don't own and the rights of any third-parties.
- If you are a company or any employee of a company with more than \$1,000,000 USD a year in revenue, you must be subscribed to a “Pro” or “Mega” plan to own Your Assets You create. Instead, Midjourney grants You a license to .
- If you upscale the images of others, these images remain owned by the original creators. ”

“ By using the Services, You grant to Midjourney, its successors, and assigns a perpetual, worldwide, non-exclusive, sublicensable no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works derivative works of, publicly display, publicly perform, sublicense, and distribute text, and image prompts You input into the Services, oras well as any Assets produced by You through the service at Your directionService. This license survives termination of this Agreement by any party, for any reason. ”

This means that, you – the user of MidJourney’s services would own the images, however, in all cases, MidJourney would still retain the copyright license to the images. MidJourney also has the foresight to use the term “to the fullest extent possible under applicable law” to account for the many jurisdictions that the user may be subject to, and also advise the user to consult with legal professionals on the issue of intellectual property rights. This is an indication to the uncertainty of how the ownership of AI-generated works is being regulated.

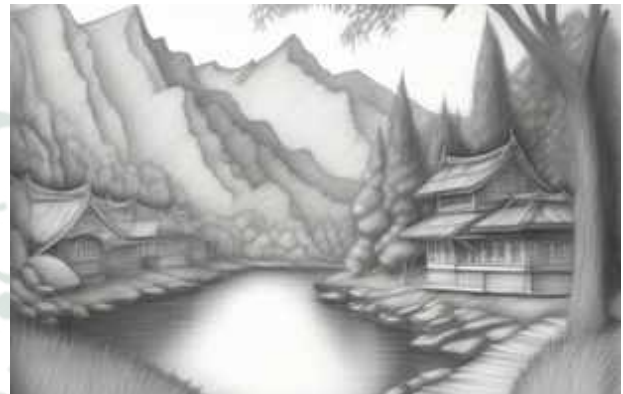
Can such works be copyrighted? patented?

There have been images, texts, music, articles, programs, codes, and inventions made entirely by AI. There has been much debate surrounding the issue of whether AI creation can be copyrighted or not. Recently, in August 2023, a US District Judge ruled that AI-created inventions cannot be protected and thus affirmed the US’s stance that a work can only be copyrighted if it has been created by a human for only a human can be the copyright holder.[64]

However, on the other hand, in February 2023, artist Kris Kashtanova’s AI-generated graphic novel “Zarya of the Dawn” was granted copyright by the US Copyright Office since it was deemed that there has been human input and the novel was not entirely created by AI. The graphic novel was therefore considered “AI-assisted” and not “AI-generated”. While the novel itself was granted copyright, the AI-generated images in the novel were not.[65] As such, it would be prudent for AI users to modify their AI creations enough to give them a human element before attempting to copyright them.



Water color landscape picture



Pencil drawing landscape picture



A realistic cute dog



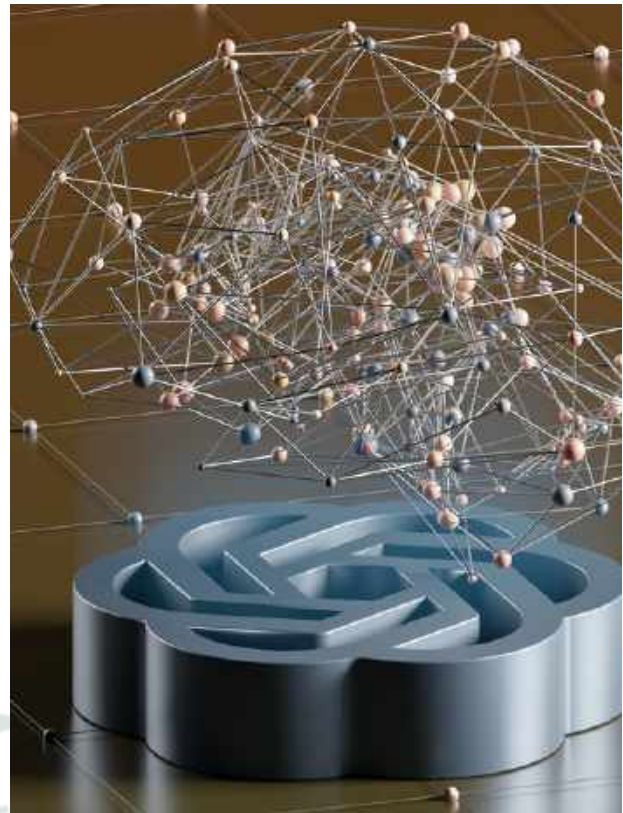
3D wings

Examples of AI artworks

Legal liability of AI

An AI has the capacity to incur damages to the users or third parties, either by providing false, inaccurate and biased information. The question would then become: Who would be liable for such mistakes and who would compensate for the damages (if any) resulting from such mistakes? Would it be the creator of the AI? the user? or the AI itself? As AI is not recognized as having the legal status of a human in most countries, it cannot take legal responsibility for its actions. As for the creators, it is possible that they could be held accountable for the damages caused by the AI by virtue of them being the manufacturers and the AI being their product. However, that is difficult to determine in real life.

The issue is still very much ongoing, with differing stances on the matter. As such, users of AI should be very cautious when employing the use of AI to assist with their work.



Jones v. W + M Automation, Inc.

In *Jones v. W + M Automation, Inc.* in 2002, the New York's Appellate Division dismissed a plaintiff's complaint against a manufacturer and programmer of a robotic loading system for product defect. The court viewed that the defendants were not liable for plaintiff's injuries at the GM plant because these defendants were able to demonstrate that they "manufactured only non-defective component parts." As long as the robot – and associated software – was "reasonably safe when designed and installed," the defendants were not liable for plaintiff's damages.

However, if GM modified the hardware or software, they could still be liable for the injuries and damages. The implication is that creators of AI software or hardware aren't liable for any injuries as long as these products were non-defective when made. Whether the AI is defectively made will depend on prevailing industry standards.[66]

Data privacy



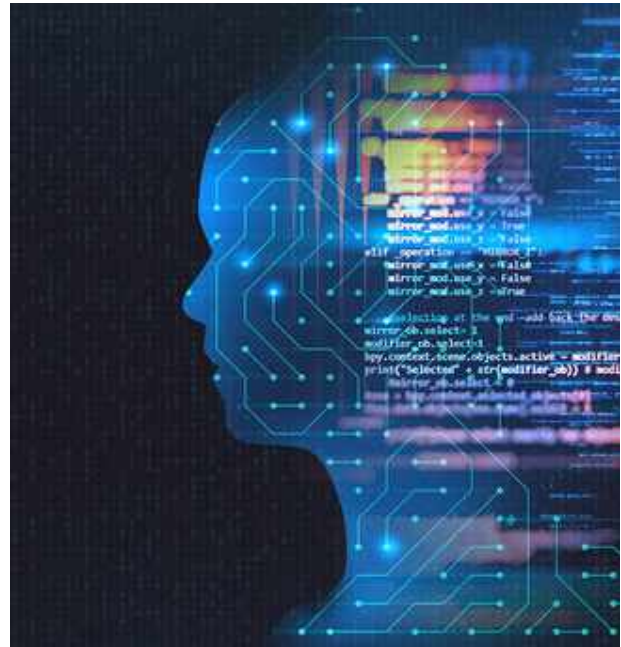
AI relies on a vast quantity of data in order to function and improve. It is unavoidable that such data would contain personal data. The protection of data privacy has been a hotly debated topic in the field of AI. The data collected by the AI could be used to identify or profile individuals. They could be used to predict, influence, or manipulate human behavior which would have a dangerous impact on the rights and freedoms of individuals. Many countries have enacted legislation to combat this issue.

For example, the EU issued the General Data Protection Regulation (GDPR) in 2018 for the explicit purpose of protecting the personal data of individuals by stipulating the rights of data subjects, obligations of data controllers and processors, and sanctions against violations.

In the recently passed EU's AI Act, AI systems with “unacceptable risks” such as those that manipulate the cognitive behavior of people or specific vulnerable groups, classify people based on behavior, socioeconomic status or personal characteristics would be banned.[67] This is to further protect the personal data of data subjects from being misused or taken advantage of by AI for risky and dangerous operations.

Discrimination by AI

AI can also be used to make decisions on humans, such as evaluating, and profiling people. This creates a risk of discrimination since the algorithms of the AI could have inherent racial, gender or ethnic biases, either intentional or unintentional. This could be particularly destructive in many different situations since many countries have laws prohibiting the discrimination of certain characteristics and groups of people. For example, discrimination based on race and gender in employment would be illegal in most countries. As such, using AI to screen applicants may result in discriminatory employment practices if the AI is biased toward a certain race or gender.



Some countries have already taken precautions against this method of automated decision-making. For example, the EU's GDPR states that the data subject shall have the right not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her.[68]



Regulations on AI

- The speed of judicial advancement can not quite keep up with that of AI. This has left the AI scene, largely unregulated and is forcing the judicial branch to rely on outdated regulations that were not designed to accommodate AI.
- The regulation has to be broad enough to cover future advancements in the field of AI instead of constantly playing catch up. This is an endeavor that few nations can hope to tackle by themselves and is one of the greatest challenges that AI poses to governments around the world.

European AI Act - most notable effort in regulating AI

- Like with GDPR for personal data protection, this AI Act was expected to become the first and most comprehensive legal framework for AI. The proposal aims to ensure that AI systems used in the EU are safe, transparent, traceable, non-discriminatory, environmentally friendly and overseen by humans rather than fully automated.
- The proposed law would classify the AIs by the risks they pose to the public and provide corresponding levels of control to mitigate such risks.[69]
- At the end of May 2024, the EU's AI Act was officially approved by the Council of the EU,[70] and it has officially entered into force on August 1, 2024.



Labor challenges

85

million jobs globally would be taken away by AI by 2025

97

million new jobs in the IT sector would be generated by 2025 [71]

Higher entry requirements for workers

Naturally, when entry-level jobs can be replaced by AI, it means that in order to secure a position in the labor market, the worker must be skilled. However, gaining skills is an often time and resource-consuming task that creates an entry barrier for new workers. This in turn creates more unemployment and further exacerbates the situation of income inequality. While AI is also expected to create new jobs, the barrier to entry into these positions would be too great for less privileged workers with no access to higher education.



Job displacement

AI has the processing power that no human can hope to achieve. What used to take weeks or even months of work by a team of humans can now be accomplished in minutes by a single AI. This makes them especially proficient in low-level, repetitive jobs, and unlike humans, AIs require no break and they do not make demands or unionize. While the price of entry is high, AI automation is one of the modern trends to cut labor costs. However, this trend also leads to widespread job displacement, though not all services and industries are hit the same. Positions such as customer service, simple data analysis, content creation, etc. would be most vulnerable to replacement.

Instability in the workforce

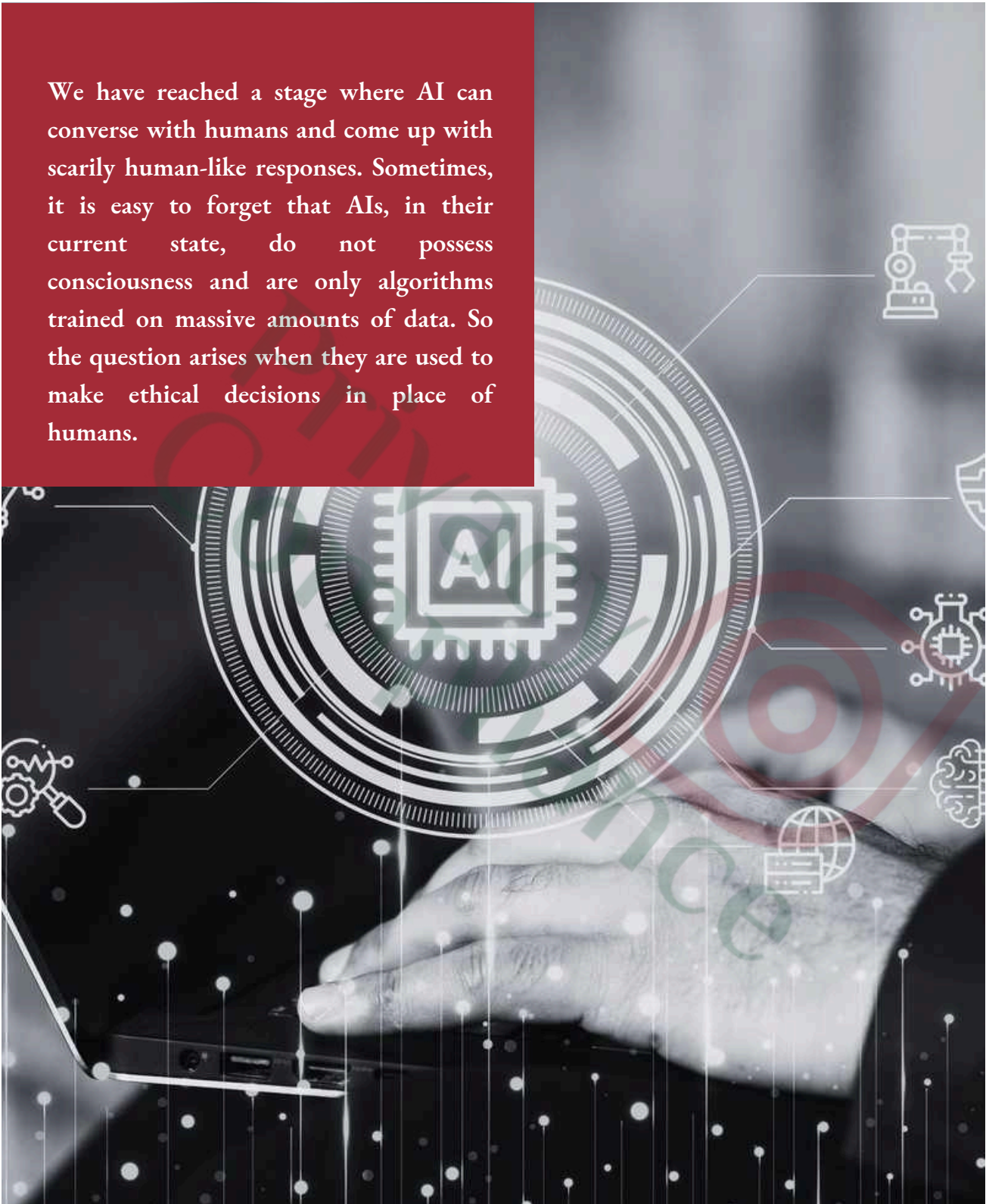
The displacement of a massive number of workers in one sector can lead to a massive influx of workers into other sectors causing further instability in the workforce as a whole. While it may be easy for new workers to learn new skills, expecting experienced workers to learn new skills, move to a different economic sector and be competitive is unrealistic.

Worsening labor conditions

The possibility of being replaced by AI and becoming unemployed could create stress for the workers leading to worsening mental and physical conditions. Also, the employer could capitalize on this fear of being replaced of the workers in order to perpetuate bad working conditions and drive down wages.

Ethical challenges

We have reached a stage where AI can converse with humans and come up with scarily human-like responses. Sometimes, it is easy to forget that AIs, in their current state, do not possess consciousness and are only algorithms trained on massive amounts of data. So the question arises when they are used to make ethical decisions in place of humans.



Responsibility of making ethical decisions of AI

An example of this is self-driving cars using AI. Should the car prioritize the life of the driver or that of bystanders? This question is becoming more and more prevalent given that self-driving cars are becoming more and more advanced. As of 2022, car makers have been able to produce cars that can perform all driving tasks and monitor the driving environment without needing attention from the drivers.[72] This means that the AI can almost drive the car itself. The ethical dilemma of self-driving cars has been around for a while and thankfully, we have never had to deal with such a situation in real life. However, there has been an example where overreliance on AI has had fatal consequences.

Fatal consequences due to overreliance on AI-powered self-driving car

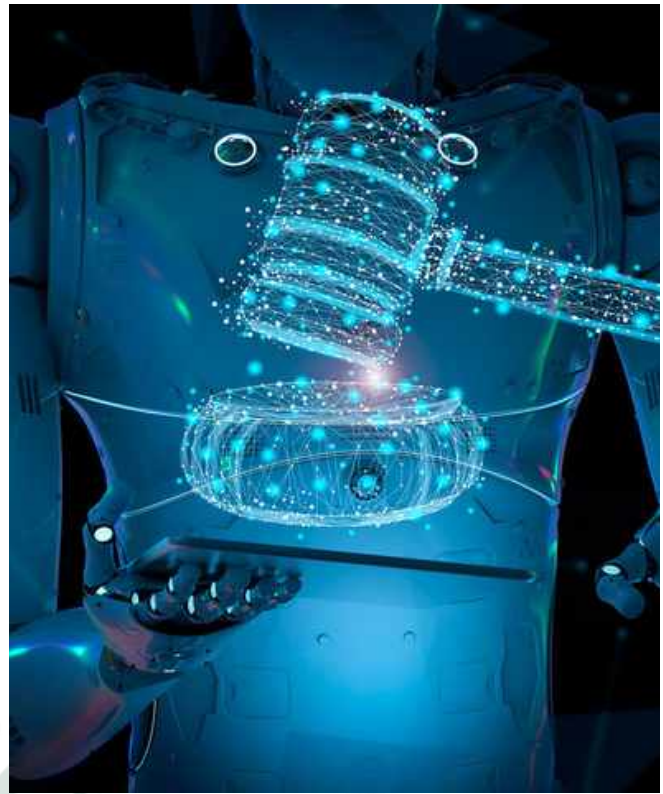
In 2018, an Uber self-driving car struck a pedestrian resulting in the first fatality in a crash related to a fully-autonomous vehicle. The AI detected the victim but failed to determine that she was a person or that she was moving in the path of the vehicle. In the end, the driver of the car was charged with negligent homicide because she was using her phone at the time of the incident and failed to apply the brake in time.[73]



“Ultimately, the human must still be responsible for the actions of AI, especially when there are real risks involved”

Bias

As AI learns from its training materials, its output is determined by the materials it is fed. Much like humans being fed misinformation, an AI can be provided with false information which, in turn, results in false responses. Aside from illegal forms of discrimination, AI could also further social discrimination by outputting discriminatory content. For example, the training materials of AI could be filled with racist content, either by accident or intentionally. The users could ask AI questions about racial issues and receive answers that are racist. Sometimes, it could be also due to algorithmic errors. This could have long-lasting and widespread impacts on society. For example, if an AI that has biases against people of a certain skin color or gender is used to screen applicants for a company, it could result in unfair and discriminatory hiring practices.



Examples of AI biases in certain sectors:[74]

Health care	Advertising	Art
Underrepresented data of women or minority groups can skew predictive AI algorithms, in some cases, computer-aided diagnosis (CAD) systems have been found to return lower accuracy results for black patients than white patients	Independent research at Carnegie Mellon University in Pittsburgh revealed that Google’s online advertising system displayed high-paying positions to men more often than to women	When asked to create images of people in specialized professions, Midjourney showed both younger and older people, but the older people were always men, reinforcing the gender bias of the role of women in the workplace



All in all, AI, while advanced as they are, should not be entirely relied upon to make decisions on behalf of humans. There are still many uncertainties in the application of AI that necessitate human oversight.

Environmental challenges

AI is a powerful tool and with great power comes great energy consumption. As AIs become more and more complex, the energy they require to function also increases to the point that the carbon footprint of AI can no longer be considered negligible.

14% of the global emissions by 2040 is the expected emissions from Information and Communications Technology (ICT). [75]

626,000 pounds of carbon dioxide is produced by AI Training which is the equivalent of around 300 round-trip flights between New York and San Francisco. [76]

50,000,000 tonnes of electronic and electrical waste (e-waste) is produced each year with only 20% formally recycled.

120,000,000 tonnes of e-waste is expected be produced each year by 2050.[77]

In all, it is clear that handling electronic waste has been an ongoing issue in recent years. However, the rapid advancement of AI is further exacerbating the situation since more and more resources are being used to fuel AI development and usage. It is paramount that a sustainable solution is reached to ensure an equilibrium between technological advancement and environmental protection.



Malicious uses of AI

Phishing attacks

Firstly, AI techniques can be used to create a social media bot, an automated or semi-automated program designed to mimic human users' behaviors and used to engage in social media. Secondly, some machine learning techniques can generate text to be posted on Twitter as a method of building trust for an account.

Hackers also utilize AI to develop chatbots to lure users of chat rooms into sharing personal information or clicking on fraudulent links.[78] An example is a dating chatbot known as "CyberLover". The artificial intelligence of CyberLover's automated chats is good enough that victims have a tough time distinguishing the "bot" from a real potential suitor.

Disinformation

With modern AI tools, especially generative AIs such as ChatGPT or Midjourney, one person can easily create fake articles, audio, videos, or images in vast quantities in little to no time at all. In 2023, the US's Republican National Committee released an advertisement attacking the current US President Joe Biden that was made up solely of AI-generated images. The ads show images of migrants flooding across the US border, an impending world war and soldiers patrolling the streets of America's gritty cities - what they want people to believe the country will look like if President Biden gets reelected. There were also fake images of Pope Francis created by Midjourney wearing a stylish puffer jacket that went viral, suggesting incorrectly that the religious leader was modeling for an outfit from the luxury fashion brand Balenciaga. A TikTok video of Paris streets littered with trash amassed more than 400,000 views and all the images were completely fake.[79]

Behaviour manipulation

AI can also be used to influence or even manipulate the actions of individuals to a certain degree on a massive scale. For example, social bots have the potential to influence public opinion and impact electoral outcomes. They can manipulate perceptions by retweeting specific content or replicating hashtags, creating a false sense of popularity for a candidate or political movement on social media platforms. There have been claims of bot involvement in the 2016 Presidential Election in the United States. Most of Donald Trump's tweets and some of Hillary Clinton's tweets were amplified using duplicate retweeting. These bots were not only amplifying but also spreading candidates' messages, helping them reach new audiences because some bot accounts had many followers.

Forgery

Deepfakes is a prominent example of forgery in the AI area. Such synthetic media leverages powerful techniques from machine learning to portray a person saying or doing things that did not happen.[80]

There are a lot of cases in which, after fraudsters take control of an account on a social network, they video call or send audio messages with the face and voice of the account's owner to borrow money or persuade others to access malicious links or websites. Many scammers use deepfakes to impersonate celebrities participating in fake advertisements or make fake political statements. This January, AI-generated video spots featuring the likeness of Taylor Swift endorsing a fake Le Creuset cookware giveaway have duped some fans into falling for the scam.[81]

Regulations on AI

Current AI regulations

European Union



In April 2021, the European Commission proposed the first EU regulatory framework for AI or the “AI Act” with the goal of ensuring that AI systems in the EU are safe, transparent and traceable, non-discriminatory and environmentally friendly. It says that AI systems will be analyzed and classified according to the risks they pose to users. The different risk levels will correspond with more or less regulation. The AI Act was recently passed in late May 2024 and has been published in the EU’s Official Journal. The Act officially entered into force on August 1, 2024 with a 02 years grace period before being applied, with exceptions for specific provisions. As with GDPR, it would seem that the EU is once again, the leading force in global legislative effort.

The Handbook will further go into the details of the AI Act/Regulation below:

Scope [82]

The Regulation applies to:

- a) providers placing on the market or putting into service AI systems or placing on the market general-purpose AI models in the Union, irrespective of whether those providers are established or located within the Union or in a third country;
- b) deployers of AI systems that have their place of establishment or are located within the Union;
- c) providers and deployers of AI systems that have their place of establishment or are located in a third country, where the output produced by the AI system is used in the Union;
- d) importers and distributors of AI systems;
- e) product manufacturers placing on the market or putting into service an AI system together with their product and under their own name or trademark;
- f) authorised representatives of providers, which are not established in the Union;
- g) affected persons that are located in the Union.

The Regulation does not apply:

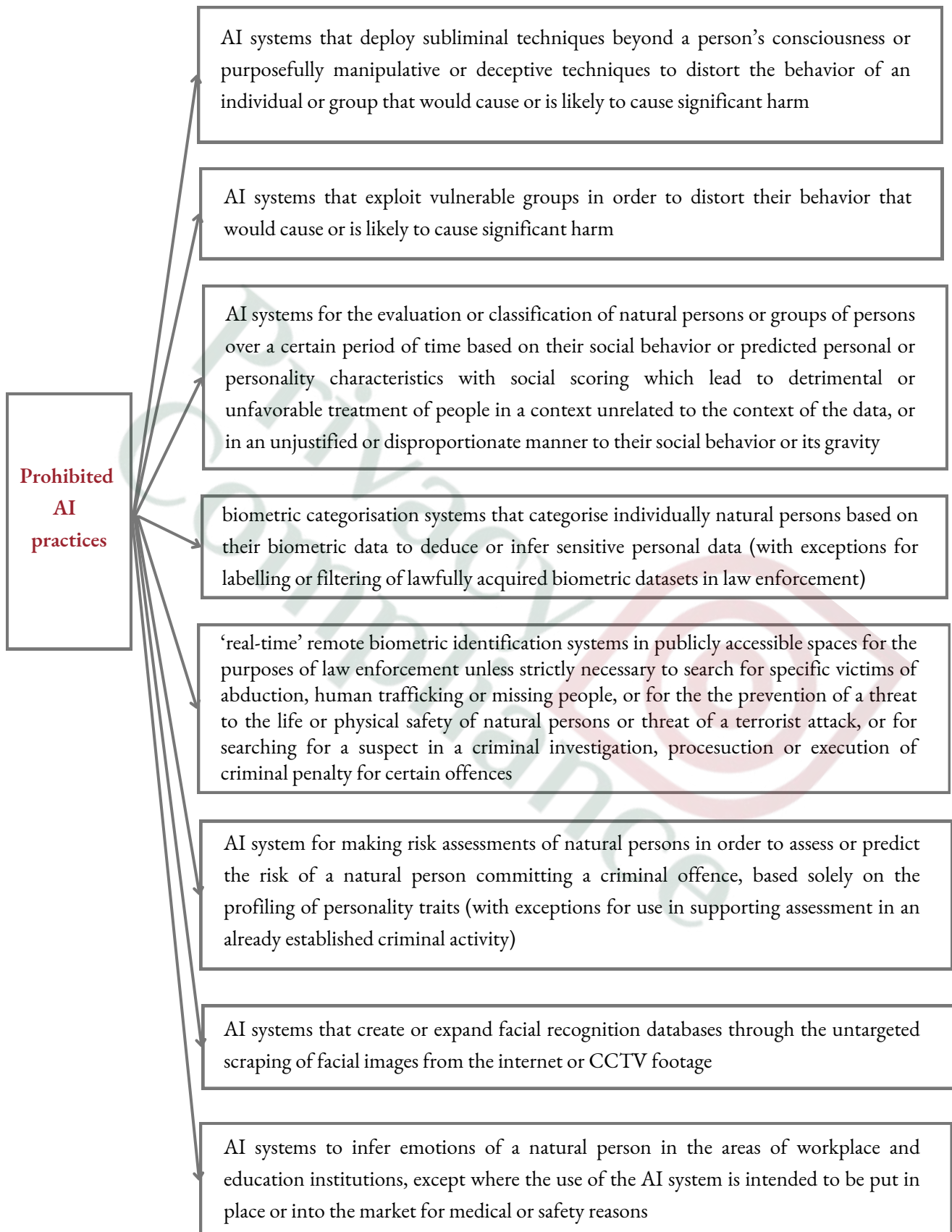
- a) outside the scope of Union law and shall not affect the national security of the Member States;
- b) to AI systems used for military or national defense purposes;
- c) to public authorities in a third country nor to international organisations who use AI systems in the framework of international cooperation with Member States or the Union, provided there are adequate safeguards for fundamental rights and freedoms of individuals;
- d) AI systems used for the sole purpose of scientific research and development;
- e) Research, testing of AI systems prior to them being placed on the market or put into service;
- f) natural persons using AI systems in the course of a purely personal non-professional activity;
- g) AI systems released under free and open-source licences, unless they are placed on the market or put into service as high-risk AI systems or prohibited AI systems.

Definitions [83]

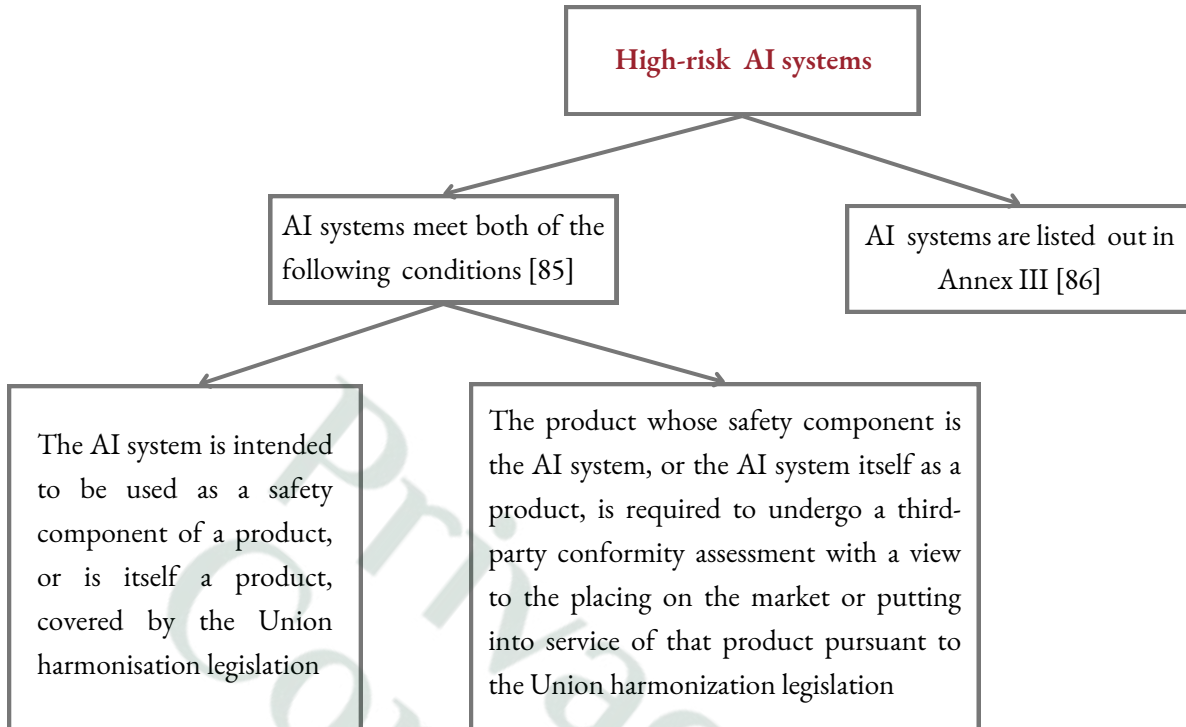
AI system	means a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments
Provider	a natural or legal person, public authority, agency or other body that develops an AI system or a general-purpose AI model or that has an AI system or a general-purpose AI model developed and places it on the market or puts the AI system into service under its own name or trademark, whether for payment or free of charge
Deployer	a natural or legal person, public authority, agency or other body using an AI system under its authority except where the AI system is used in the course of a personal non-professional activity
Importer	means a natural or legal person located or established in the Union that places on the market an AI system that bears the name or trademark of a natural or legal person established in a third country
Distributor	a natural or legal person in the supply chain, other than the provider or the importer, that makes an AI system available on the Union market
Operator	a provider, product manufacturer, deployer, authorised representative, importer or distributor; etc



Prohibited AI practices [84]



High-risk AI systems



Requirements for high-risk AI systems:

- Establish, implement, document and maintain a risk management system;[87]
- High-risk AI systems which make use of techniques involving the training of models with data shall be developed on the basis of training, validation and testing data sets that meet the quality criteria detailed in the Regulation;[88]
- The technical documentation of a high-risk AI system shall be drawn up before that system is placed on the market or put into service and shall be kept up-to date;[89]
- High-risk AI systems shall technically allow the automatic recording of events (‘logs’) over the life time of the system;[90]
- High-risk AI systems shall be designed and developed in such a way to ensure that their operation is sufficiently transparent to enable deployers to interpret a system’s output and use it appropriately;[91]
- High-risk AI systems shall be designed and developed in such a way, including with appropriate human-machine interface tools, that they can be effectively overseen by natural persons during the period in which the AI system is in use;[92]
- High-risk AI systems shall be designed and developed in such a way that they achieve an appropriate level of accuracy, robustness, and cybersecurity, and that they perform consistently in those respects throughout their lifecycle.[93]

Obligations of subjects related to high-risk AI systems

<p>Providers</p>	<ul style="list-style-type: none"> • ensure the compliance of their AI systems; • indicate their information and contact details on the AI systems packaging or documentation; • have a quality management system; • maintain documentation (technical, quality management, etc.); • keep logs automatically generated by the AI systems (for a period appropriate for the purpose, of at least 06 months); • conform with relevant conformity assessment procedures; • draw up an EU declaration of conformity; • affix marking to indicate conformity with the Regulation; • comply with registration obligations; • take the necessary corrective actions and provide information as required; • demonstrate the conformity of the high-risk AI system and cooperate upon reasonable request from a competent authority; • ensure compliance with accessibility requirements in accordance with regulations;[94]
<p>Importers</p>	<p>The importer of high-risk AI systems shall ensure that the system is in conformity with the Regulation by verifying that:</p> <ul style="list-style-type: none"> • appropriate conformity assessment procedures have been carried out by the provider; • technical documentation has been drawn up by the provider; • the system bears the required marking and is accompanied by the EU declaration of conformity and instructions for use; • authorised representative has been appointed by the provider.[95] <p>The importer shall not place on the market an AI system where it has reasons to believe the system is not in conformity with the Regulation and inform the provider of the system, the authorised representative and the market surveillance authorities where the system presents a risk. There are also other obligations such as indicating information of the importer on the packaging or documentation of the system, keeping a copy of the certificate issued by the notified body, the instructions for use, EU declaration of conformity, demonstrating compliance and cooperating with relevant authorities, etc.</p>

Obligations of subjects related to high-risk AI systems

<p>Distributors</p>	<ul style="list-style-type: none"> • verify that the high-risk AI system bears the required conformity marking, and that it is accompanied by a copy of the EU declaration of conformity, instructions for use and that the provider and importer of the systems have complied with their obligations; • shall not make available on the market high-risk AI systems that it reasonably believes are not in conformity with the Regulation; • inform the provider or importer of the system where the system presents a risk; • take corrective actions if it has reason to consider that a high-risk AI system that has been made available on the market is not in conformity with the requirements under the Regulation; • demonstrate the conformity of the high-risk AI system upon reasonable request from a competent authority; • cooperate with the relevant competent authorities. [96]
<p>Deployers</p>	<ul style="list-style-type: none"> • use the systems in accordance to the instructions; • assign human oversight to natural persons who have the necessary competence, training and authority, as well as the necessary support; • ensure that input data is relevant and sufficiently representative in view of the intended purposes; • monitor the operation of the high-risk AI system; • inform the provider or distributor and relevant market surveillance authority when there is a risk when using the system in accordance with instructions and suspend the use of the system; • Where deployers have identified a serious incident, they shall also immediately inform first the provider, and then the importer or distributor and the relevant market surveillance authorities of that incident; • keep logs automatically generated by that high-risk AI system for a period appropriate to the intended purpose, of at least 6 months; • Before putting into service or using a high-risk AI system at the workplace, deployers who are employers shall inform workers’ representatives and the affected workers that they will be subject to the use of the high-risk AI system, etc.[97]

Transparency obligations for certain AI systems

Aside from high-risk AI systems, certain AI systems also have to comply with certain transparency obligations:[98]

- Providers shall ensure that AI systems intended to interact with natural persons shall inform its users that they are interacting with an AI system;
- Providers of AI systems, including general-purpose AI systems, generating synthetic audio, image, video or text content, shall ensure that the outputs of the AI system are marked in a machine-readable format and detectable as artificially generated or manipulated;
- Deployers of an emotion recognition system or a biometric categorization system shall inform the operation of the system to the natural persons exposed thereto;
- Deployers of an AI system that generates ‘deep fake’ shall disclose that the content has been artificially generated or manipulated.

General-purpose AI models

- General-purpose AI model means an AI model, including where such an AI model is trained with a large amount of data using self-supervision at scale, that displays significant generality and is capable of competently performing a wide range of distinct tasks regardless of the way the model is placed on the market and that can be integrated into a variety of downstream systems or applications, except AI models that are used for research, development or prototyping activities before they are placed on the market.[99]
- A general-purpose AI model shall be classified as a general-purpose AI model with systemic risk if it has high impact capabilities evaluated on the basis of appropriate technical tools and methodologies, including indicators and benchmark; or based on a decision of the European Commission, ex officio or following a qualified alert from the scientific panel.[100] Where a general-purpose AI model with systemic risk is identified, the provider shall notify the Commission without delay and in any event within two weeks.[101]



Obligations of a general-purpose AI model's provider

<p>Normal Providers</p>	<ul style="list-style-type: none"> • draw up and keep up-to-date the technical documentation of the model; • draw up, keep up-to-date and make available information and documentation to providers of AI systems who intend to integrate the general-purpose AI model into their AI systems; • cooperate as necessary with the European Commission and the national competent authorities;[102] • appoint an authorised representative which is established in the Union by written mandate, prior to placing a general-purpose AI model on the Union market (applied to providers established in third countries).[103]
<p>Providers with systemic risk [104]</p>	<ul style="list-style-type: none"> • perform model evaluation in accordance with standardised protocols and tools reflecting the state of the art; • assess and mitigate possible systemic risks at Union level, including their sources, that may stem from the development, the placing on the market, or the use of general-purpose AI models with systemic risk; • keep track of, document, and report, without undue delay, to the AI Office and, as appropriate, to national competent authorities, relevant information about serious incidents and possible corrective measures to address them; • ensure an adequate level of cybersecurity protection.

Penalties

<p>Non-compliance with the prohibition of AI practices and data governance</p>	<p>administrative fines of up to 35,000,000 EUR or, if the offender is a company, up to 7 % of its total worldwide annual turnover for the preceding financial year, whichever is higher.[105]</p>
<p>Other non-compliance related to operators or notified bodies under the Regulation</p>	<p>administrative fines of up to 15,000,000 EUR or, if the offender is a company, up to 3 % of its total worldwide annual turnover for the preceding financial year, whichever is higher.[106]</p>
<p>The supply of incorrect, incomplete or misleading information to notified bodies and national competent authorities in reply to a request</p>	<p>administrative fines of up to 7,500,000 EUR or, if the offender is a company, up to 1 % of its total worldwide annual turnover for the preceding financial year, whichever is higher.[107]</p>

United Kingdom



As a neighbor of the EU, the UK is also aware of the importance of AI in the coming age and thus, it has also made some legislative moves of its own. One of the more notable actions taken by the UK was in the spring of 2023 when the Department for Science, Innovation and Technology published its White paper on “A pro-innovation approach to AI regulation”. The consultation period of the policy paper ended on 21 June 2023. The UK government has also set out five principles that will underpin the UK’s AI regulatory approach:

- Safety, security and robustness;
- Transparency and explainability;
- Fairness;
- Accountability and governance;
- Contestability and redress.[108]

On 6 February 2024, The UK government published its response to the consultation on the AI white paper, ‘A pro innovation approach to AI regulation’ (the Response). The Response outlines key investment initiatives and regulatory steps. The government proposed to use existing laws to regulate AI, with regulators leading to implement a “pro-innovation” “outcomes-based” approach to AI regulation. This approach is supported by the Artificial Intelligence (Regulation) Bill which was introduced to the the UK’s Parliament’s House of Lords on 22 November 2023.[109]

On 22 November 2023, the AI (Regulation) Bill was introduced into the UK’s Parliament’s House of Lords. The Bill generally focuses on the creation of an “AI Authority”, regulatory sandboxes for AI which would allow businesses to test their AI innovations. The Bill also imposes certain obligations on the UK Secretary of State. Currently, the Bill is still in the legislative process,[110] though it has passed the 3rd reading on 10 May 2024, however, given that this is a private member’s bill, it is unlikely that it will be passed, despite this, it could spark an interesting debate on AI regulations in the UK.[111]



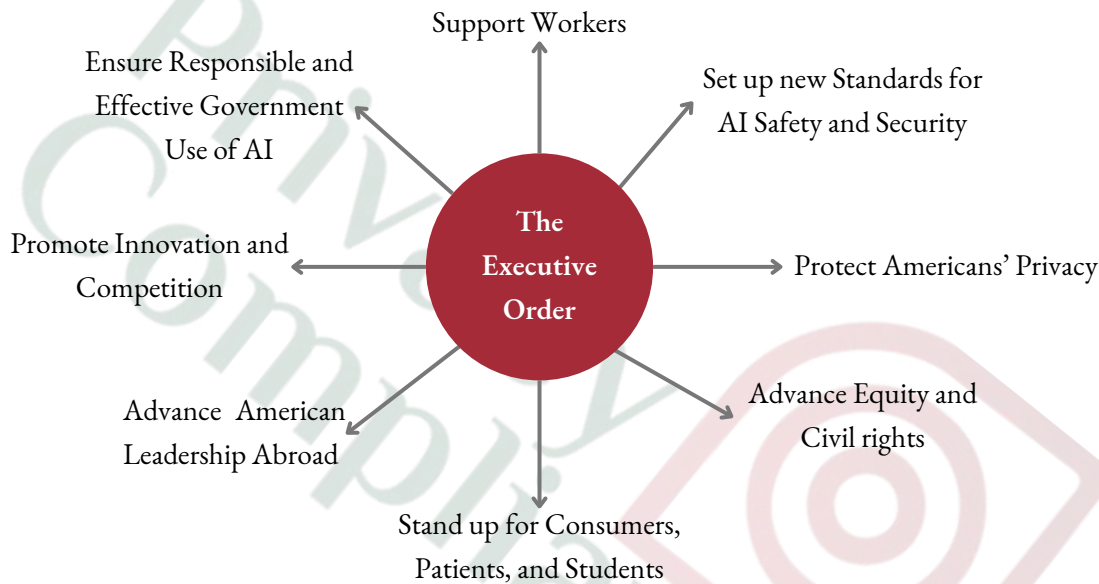
To go into details, the proposed Bill stipulates the following contents:[112]

- **Establishment of an AI Authority** that is designed to ensure regulators take into account AI, and ensure alignment of the approach of regulators regarding AI, coordinate review of legislation to address the challenges and opportunities of AI, monitor and evaluate the overall regulatory framework's effectiveness and the implementation of the principles, support testbeds and sandbox initiatives, etc.
- **Transparency, IP obligations, and labeling.** Any person involved in training AI must— (i) supply to the AI Authority a record of all third-party data and intellectual property (“IP”) used in that training; and (ii) assure the AI Authority that they use all such data and IP by informed consent and that they comply with all applicable IP and copyright obligations; (iii) any person supplying a product or service involving AI must give customers clear and unambiguous health warnings, labeling and opportunities to give or withhold informed consent in advance; and (iv) any business which develops, deploys or uses AI must allow independent third parties accredited by the AI Authority to audit its processes and systems.
- **Regulatory sandboxes** shall be constructed by the AI Authority in collaboration with relevant regulators which will allow businesses to test innovative propositions in the market with real consumers.
- **Public engagement.** The AI Authority must implement a program for meaningful, long-term public engagement about the opportunities and risks presented by AI, and consult the general public and such persons as it considers appropriate as to the most effective frameworks for public engagement, having regard to international comparators.
- **Regulatory principles** which include principles for AI regulations, AI businesses, and AI applications such as transparency, compliance, safety, and anti-discrimination.
- **AI responsible officers** shall be designated by businesses that develop, deploy, or use AI to ensure the safe, ethical, unbiased, and non-discriminatory use of AI by the business and that the data used is unbiased.

The proposed Bill serves as a good starting point for the UK to refine its regulations on AI, however, the road ahead is still very long and hard. This is an especially crucial period since the EU has already passed its comprehensive AI act. The UK would have to speed up its legislative process if it wishes to be relevant in the AI scene in the coming time.

United States 

Unlike the EU, the AI legislative process in the US usually takes longer despite the US having some of the most cutting-edge AI technologies. This is partially due to the partisan political climate of the US. As of the writing of this Handbook, the US has not passed any federal legal framework regulating AI despite numerous bills that have been proposed by both the Senate and the House.[113] However, in October 2023, President Biden issued an Executive Order on Safe, Secure, and Trustworthy Artificial Intelligence which establishes new guidelines for AI safety and security, safeguards Americans' privacy, improves civil rights and equity, defends the interests of workers and consumers, encourages innovation and competition, advances American leadership globally, among other things. [114]



It should be noted that an executive order should not be mistaken for legislation since it requires no approval from Congress. An executive order is a directive by the President of the United States directing the operations of the US federal government.[115] However, this is a clear sign that the Biden administration is very concerned about the issue of AI. It would not be far-fetched to assume that sooner or later, Congress would have to follow suit and issue a legal framework to address AI on a federal level.



US AI Road Map

A group of bipartisan senators called the Bipartisan Senate Artificial Intelligence (AI) Working Group (Working Group) released the "Driving U.S. Innovation in Artificial Intelligence: A Roadmap for Artificial Intelligence Policy in the United States Senate" (Roadmap) in May 2024. The Roadmap presents bipartisan measures that the US should take in order to address the impacts that AI may have on the US economy and security.

The Roadmap contains eight main sections:[116]

a) Supporting U.S. Innovation in AI

The Roadmap suggests an increase of federal investment in AI, with a minimum of \$32 billion annual investment in non-defense AI R&D. The amount will be distributed among various agencies, programs, and frameworks on the development of AI, especially for those in the area of national security. The Roadmap also promotes private-public partnerships in AI regulations and business development.

b) AI and the Workforce

Regarding the concerns of work displacement due to AI, the Roadmap suggests that the development and implementation of AI tools in the workplace should be carefully considered, the workforce should be given training in order to work in an AI-driven world and US immigration should be improved to attract highly skilled STEM workers to foster AI security and development.

c) High Impact Uses of AI

The Roadmap also touches on the issue of AI infringing on existing laws, either by accident or intentionally, and the far-reaching consequences such infringements could have. The Roadmap encourages the setting up of standards for AI use in critical infrastructure, the development of legislation ensuring accurate, representative data and transparency in the use of AI in important sectors such as finance, housing, procurement, etc. Legislation should also be in place to address AI in media and protect children in an online environment. There are also suggestions for AI controls in other sectors such as autonomous vehicles, healthcare, etc.

d) Elections and Democracy

The Roadmap also recognizes the impacts AI could have on elections given their ability to produce content rapidly. The Working Group suggests lawmakers and AI developers to implement the use of watermarking or signs to indicate AI-generated election content. The Working Group also suggests finding a way to balance objectively falsified AI-generated content and the right to free speech. Further scrutiny is advised regarding this sector considering the impact AI could have on elections.

e) Privacy and Liability

Since AI training data includes personal data, it is important that AI users and developers implement measures to ensure data protection and privacy and be held accountable for the harm done by the AI. The Working Group also proposes that the storage and use of private personal data by AI be limited, as such, the Group also supports the issuance of a federal personal data protection and privacy law to address this issue in its entirety.

US AI Road Map

f) Transparency, Explainability, Intellectual Property, and Copyright

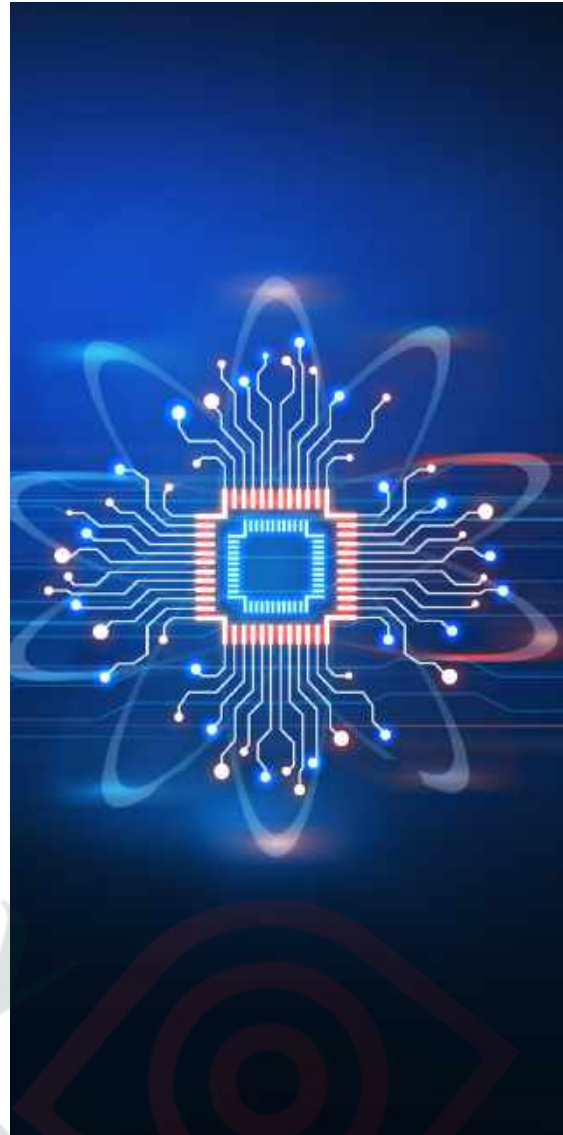
The Roadmap also includes suggestions regarding the development of legislation requiring transparency for AI systems. There is also the issue of protecting individuals against the unauthorized use of their personal data (face, name, voice, etc.) in AI. The Working Group suggests that reports from the US Copyright Office and U.S. Patent and Trademark Office on how AI impacts intellectual property law should also be reviewed and considered.

g) Safeguarding Against AI Risks

The Roadmap includes recommendations for companies must understand the risks their AI could pose and properly test the AI before release as to weed out any that do not meet industry standards. The Working Group encourages the development of AI standards and the standardization of risk testing and evaluation such as testbeds and sandboxes. It is important that AI risks are well-understood and handled prior to being released.

h) National Security

The Working Group encourages the Office of the Director of National Intelligence, the Department of Defense and the Department of Energy to work with commercial AI developers to prevent large language models and other frontier AI models from inadvertently leaking or reconstructing sensitive or classified information. This could be done by strengthening US cyber capabilities, procuring a hi-tech workforce, monitoring AGI developments and conducting more research into AI.[117]



On a state level, many states have enacted their own regulation regulating AI however, there has not been any AI-specific law that provides a comprehensive legal framework as a whole. Most regulations on AI at the state level are embedded in privacy acts such as the California Privacy Rights Act, Colorado Privacy Act, Connecticut Data Privacy Act, Virginia Consumer Data Privacy Act, etc. The main attentions of these acts are still privacy and personal data protection which include protection against automated decision making and profiling. [118]

In essence, the legislative landscape of the US on the issue of AI is still very much barren with sparse effort and little concrete direction for a holistic legal framework. However, considering the efforts of other economic hubs such as the EU and the rapid advancement of AI on its very soil, there is a high chance that the US will have to soon make its move to capitalize and regulate this technology of the future.



China



The People's Republic of China (PRC) is currently emerging as one of the most technologically advanced countries in the world with great attention being paid to the development of the new technologies. AI has not escaped the attention of the PRC's leaders and in recent years, the PRC government has issued multiple first-of-its-kind AI-related legislation. This is an indication that China recognizes and understands the importance of AI and is ready to face it head-on. In the past two years, the PRC has passed a number of AI-related regulations which include:

- The Administrative Provisions on Algorithm Recommendation for Internet Information Services which came into force on March 1, 2022 (Algorithm Recommendation Regulation) focuses on the use of algorithm recommendation technologies (including, among others, generative and synthetic algorithms) to provide Internet information services in the PRC;
- The Provisions on Management of Deep Synthesis in Internet Information Service (Deep Synthesis Regulation), which came into force on January 10, 2023 focuses on the use of deep synthesis technologies (a subset of generative AI technologies) to provide Internet information services in the PRC;
- The Provisional Provisions on Management of Generative Artificial Intelligence Services (Generative AI Regulation), published on July 13, 2023, which came into force on August 15, 2023, broadly regulates the development and use of all generative AI technologies that provide services in the PRC;
- Measures for the Review of Scientific and Technological Ethics (for Trial Implementation) published on October 08 2023 ("Trial Ethics Regulation"), effective from December 1, 2023 focuses on the ethical review of, among others, the research and development of AI technologies in the PRC. The regulation mandates that entities conducting AI research in "sensitive areas of technology" (currently undefined) form a scientific ethics review committee, with more detailed implementing rules to be formulated by relevant authorities, including local authorities. [119]

These regulations impose obligations on service providers, technical supporters, and users, as well as certain other entities, including online platforms. They ultimately aim to address the risks related to AI-generated content and to protect national and social security in China. There is also an AI law that is currently in the works which could be released soon.[120] There can be no doubt that the PRC has its sight set on conquering this legal behemoth.

Among these regulations, the Handbook would like to focus on the Generative AI Measures ("Measures") since it is the latest and its provisions are most relevant in today's AI landscape. The Measures applies to *"the use of generative AI technology (refers to algorithms, models or other rules) to provide services for generating text, pictures, sounds, videos and other content within the territory of China"*. The Measures has extraterritorial effect meaning it applies to both domestic and overseas generative AI service providers that offer generative AI services to the general public in China. This also means that the Measures does not apply to generative AI services offered to enterprises.[121]

Obligations of generative AI service providers [122]

In the development and use of generative AI services

- not generate illegal, false or harmful contents;
 - take measures to prevent the generation of discriminatory contents;
 - not use advantages in algorithms, data, or platforms to gain monopoly or engage in unfair competitive behaviors;
 - not infringe on others' portrait rights, reputation rights, honour rights, privacy rights and personal information rights;
 - take effective measures to increase the transparency of generative AI services and the accuracy and reliability of generative AI content.
-

Regarding training data for generative AI

- use data and foundation models from legitimate sources;
 - not infringe on others' intellectual properties;
 - obtain personal data with consent or under situations prescribed by the law or administrative measures;
 - take measures to increase the quality, truthfulness, accuracy, objectivity and diversity of training data.
-

When providing generative AI services

- bear cybersecurity obligations as online information content producers and personal information protection obligations as personal information handlers;
 - enter into service agreements with registered generative AI service users which specify the rights and obligations of both parties;
 - guide users on the legal use of generative AI technology and take measures to prevent users from over-reliance on or "addiction to" the generated AI service;
 - not collect non-essential personal information, not illegally retain input information and usage records which can be used to identify a user and not illegally provide users' input information and usage records to others;
 - receive and settle data subjects' requests;
 - tag generated content such as photos and video as pursuant to the Administrative Provisions on Deep Synthesis of Internet-based Information Services;
 - if illegal content is discovered, take measures to stop the generation and transmission of and delete illegal content, take rectification measures such as model improvement, and report to the relevant competent authorities;
 - where users are found to use generative AI services to conduct illegal activities, take measures to warn the user, or restrict, suspend or terminate the service, retain the records, and report to the relevant competent authorities;
 - establish a mechanism for receiving and handling users' complaints.
-

In relation to other legal obligations and enforcement supervision

- if the generative AI service comes with a public opinion attribute or social mobilisation ability, carry out a safety assessment obligation and (within ten working days from the date of provision of services) go through record-filing formalities pursuant to the Administrative Provisions on Algorithm Recommendation for Internet Information Services;
- cooperate with, explain the source, size and types of the training data, tagging rules and the mechanisms and principles of the algorithm and provide necessary technology and data, etc. to the relevant competent authorities when they perform supervisory checks on the generative AI service.

It is clear from the above that the Generative AI Measures of the PRC was created to protect social order and individual privacy. The specific selection of generative AI to regulate shows that the PRC understands the security and privacy risks that generative AI and its applications such as deepfakes pose. The Generative AI Measures also provides protection for copyrighted works. There can be no doubt that this regulation will have profound impacts on the AI scene, in both China and around the world due to its extraterritorial effect. The effect and actual impacts, however, remain to be seen.

On the international scene, there are already standards for AI management such as:

ISO/IEC 42001: 2023 Artificial Intelligence Management System (AIMS)

ISO/IEC 42001 is an international standard that specifies requirements for establishing, implementing, maintaining, and continually improving an Artificial Intelligence Management System (AIMS) within organizations. It is designed for entities providing or utilizing AI-based products or services, ensuring responsible development and use of AI systems.

ISO/IEC 42001 is the world's first AI management system standard providing valuable guidance for the rapidly changing field of technology. It addresses the unique challenges AI poses, such as ethical considerations, transparency, and continuous learning. For organizations, it sets out a structured way to manage risks and opportunities associated with AI, balancing innovation with governance.

Benefits of ISO 42001:

- Framework for managing risk and opportunities;
- Demonstrate responsible use of AI;
- Traceability, transparency and reliability;
- AI development cost savings and efficiency gains.[123]

Artificial Intelligence Governance Professional

With the expansion of AI technology, there is a need for professionals in all industries to understand and execute responsible AI governance. One of the first credentials for this field is the Artificial Intelligence Governance Professional (AIGP) credential issued by the International Association of Privacy Professionals (IAPP). It demonstrates that an individual can ensure safety and trust in the development and deployment of ethical AI and ongoing management of AI systems by:

- Establishing foundational knowledge of AI systems and their use cases, the impacts of AI, and comprehension of responsible AI principles;
- Demonstrating an understanding of how current and emerging laws apply to AI systems, and how major frameworks are capable of being responsibly governed;
- Showing comprehension of the AI life cycle, the context in which AI risks are managed, and the implementation of responsible AI governance;
- Presenting awareness of unforeseen concerns with AI and knowledge of debated issues surrounding AI governance.[124]

The emergence of this credential further highlights the need for personnel who can facilitate effective and ethical AI development and deployment.



Case Studies of AI

Case studies of AI

Authors Guild v. OpenAI

In September 2023, the Authors Guild and 17 authors filed a class action lawsuit against OpenAI in New York for alleged copyright infringement of their works which were used to train OpenAI's ChatGPT. The plaintiff claimed that the copyrighted works of the plaintiff contributed greatly to the defendant's AI yet they did not give permission for such utilization of their works nor did they receive any compensation for such contributions. The plaintiff also reasoned that the AI should only be trained on information in the public domain, if copyrighted materials are used then the authors must be paid royalty.

The suit came after the Authors Guild's realization of the existential threat that AI poses to the livelihood of human authors.[125] The suit is still ongoing and is currently one of the biggest lawsuits against generative AI. On 4th December 2023, the Authors Guild filed an amended complaint naming Microsoft as a defendant as Microsoft has been in close partnership with OpenAI and invested significant amounts of money in OpenAI therefore it has "significant rights" in OpenAI.

Anderson v. Stability AI

A number of artists banded together to make a case against generative-AI companies Stability AI (creator of Stable Diffusion), and defendants namely Midjourney (creator of Midjourney), DeviantArt (creator of DreamUp), and Runway AI (involved in creating Stable Diffusion) whose generative AI systems incorporate Stable Diffusion technology, for copyright infringement, DMCA violations, and related state law claims. The plaintiffs alleged that the art AI of the company used copyrighted images from the internet to produce new images without asking for permission or crediting the artists. The artists also argued that this practice in turn unfairly profited the company while depriving the artists of their commission.[126]

In October of 2023, the judge was inclined to dismiss the IP infringement case except for the direct copyright infringement claim asserted by Anderson against Stability on the grounds that the creations of the AI bear no "substantial similarity" to the works of the artists and that it is implausible that the artists' works were involved since the systems have been trained on "five billion compressed images".[127] The court allowed the plaintiffs an opportunity to amend their complaint and deferred ruling on the motion to strike until the plaintiffs' right to publicity claim is realleged.

On February 8, 2024, the court denied the renewed motion to strike and the defendants filed motions to dismiss the plaintiffs' amended complaint[128].

Doe v. GitHub

In November 2022, two developers filed a putative class action lawsuit claiming that Copilot (a programming AI by GitHub) and Codex (a programming AI by OpenAI) were trained on their copyrighted computer code.

The plaintiffs were unable to claim that using their code as training data violated their rights because it was made available under open-source licenses, which typically do not impose restrictions on usage. This means that other copyright holders whose works are licensed under proprietary licenses could make the same claim and use the plaintiffs' code as training data without permission. Instead, they argued that developers on GitHub have the option to utilize open-source licenses, which mandate that every derivative work or copy of the licensed work must include attribution to the owner, a copyright notice, and a copy of the open-source license that licenses the code. The plaintiffs claimed such attribution was missing when their code was utilized as training data and that some of their copyrighted code was also included.

J.L. v. Alphabet Inc.

In July of 2023, Google was accused in a class action lawsuit of misusing vast amounts of personal data and copyrighted materials to train its AI systems. The complaint was filed by eight people seeking to represent millions of internet users and copyright holders claiming that Google's data scraping practices violated privacy and property rights. The complaint also claimed that the company could owe at least \$ 5 billion.

The claims of the suit range from violations of the Digital Millennium Copyright Act (DMCA), GitHub terms of use to unfair competition; as well as claims of sensitive personal data violations.

In the Court Decision in May 2023, the Court dismissed the claim on privacy violations since the plaintiff failed to identify the sensitive or private information in the claim. On the claim of property rights, the Court found that there was insufficient basis for injury since the plaintiffs cannot demonstrate that their code had been included in the output of the AI.[129] The Court also dismissed other claims of the plaintiffs, however, the Court allowed the claims of DMCA violation, breach of OSS licenses, unjust enrichment, and unfair competition to proceed, some with amendments by the plaintiffs. On June 8, 2023, plaintiffs filed an amended complaint.[130]

Google pushed back by saying that it uses data from public sources — like information published to the open web and public datasets – to train the AI models behind services like Google Translate, responsibly and in line with its AI Principles, and that US laws support the fair use of information.[131] The case is still in the judicial process and is unlikely to reach a conclusion soon.

EEOC v. iTutor

August 2023, an applicant of a tutoring company suspected the company of discrimination and took their complaint to the US's Equal Employment Opportunity Commission (EEOC), which filed a lawsuit against the employer on behalf of more than 200 applicants, alleging age and gender discrimination. The lawsuit claimed the company illegally screened out women applicants over 55 and men over 60 using AI.

The company denied the claims, however, it eventually entered into a voluntary settlement with the EEOC. The company would pay \$365,000 to a group of more than 200 rejected applicants and agreed to adopt antidiscrimination policies and conduct employee training to ensure compliance with equal employment opportunity laws. The company also must consider anew all the applicants who were purportedly rejected because of their age.[132]

China: A landmark court ruling on copyright protection for AI-generated works

The plaintiff named Li used Stable Diffusion (a text-to-image generative AI model) to generate an image. Later, the plaintiff named Liu discovered that the defendant used and published the image on another platform without permission, and brought a claim against the defendant for copyright infringement[133].

In November 2023, the Beijing Internet Court examined the facts of the case and ruled that the image reflected the plaintiff's intellectual input and original judgment, thus the plaintiff is the rightful author and copyright owner of the image. This ruling suggests that Chinese courts may recognize the copyrightability of AI-generated works, setting a precedent for future cases[134].

On this issue, in a more recent case decided in February 2024, the Guangzhou Internet Court ruled that an AI company has infringed on the copyright of the iconic Japanese superhero, Ultraman, through unauthorised copying and adaptation, as some images generated by the company's AI service were found to be substantially similar to the character. This case illustrates the potential liability of service providers for the output of their AI tools, and sparks discussion on their responsibilities regarding IP protection.

While this case brings clarity to the proposition that AI-generated content may be copyrightable in China, there are still legal uncertainties surrounding AI and IP, including on the possible liability of AI service providers for copyright infringement. And it will depend on the court to take into consideration the factual circumstances on a case-by-case basis and its own analysis.

From the examples above, it could be observed that the legal battles on the issues of AI are still very much raging across all fronts without a decisive conclusion. However, it would seem that judges are leaning toward the side of AI in the copyright battle since several judges have dismissed the claims of copyright violation. In the future, we are bound to see even more disputes raging over the various aspects of AI implementation. Furthermore, the uncertainty of the outcomes of these legal battles once again highlights the need for a solid legal framework in order to adequately and fairly judge new advancements in AI instead of relying on older legislation that is not equipped to deal with them.

Vietnam's outlook and perspective on AI

Vietnam's outlook and perspective on AI

State of AI in Vietnam

While not as technologically advanced as other nations in the West, Vietnam is very proficient at adapting to changes in the international scene. AI is also no exception with various signs in both the public and private sectors.

Vietnam already has a **national strategy for the research, development and application of AI until 2030** in which AI is recognized as a field in the 4.0 industrial revolution which will create great developments in production capacity, and national competitiveness and promote economic growth. Vietnam's objective is to be within the top 4 leading countries within the ASEAN sector and top 50 leading countries worldwide regarding the development, research, and application of AI by 2030. To achieve this, Vietnam plans to create a legal framework to regulate AI, build data infrastructure, develop an AI eco-system, push for the application of AI and encourage international cooperation. This will require a comprehensive effort from all ministries and the private sector.[135]

Applying AI technology to production and service provision is classified as high technology application encouraged for development according to Decision No. 38/2020/QĐ-TTg of the Prime Minister. Accordingly, **businesses applying AI will enjoy many incentives related to tax policies, capital mobilization**, etc.

There have also been mentions of AI in recently issued legal documents of Vietnam.

In the Consumers' Rights Protection Law of 2023, it is stated that in online transactions with consumers, traders that establish and operate large digital platforms have the responsibility to periodically evaluate the implementation of regulations on the handling of fake accounts, use of artificial intelligence, and fully or partially automated solutions.[136]

In the 2018 Law on Cybersecurity, it is recognized that AI is a part of the national cyberspace infrastructure.[137] The law also stated that a national security information system shall have technical measures for monitoring and protecting cybersecurity and measures for protecting the automatic monitoring and control system, the Internet of Things (IoT), mixed reality systems, cloud computing, big data, rapid data, and artificial intelligence systems.[138]

Decree No. 91/2020/ND-CP on fighting spam messages, emails, and calls also mentions that providers of telecommunications services, Internet services and organizations establishing private telecommunications networks have the responsibility to establish and operate anti-spam systems that apply artificial intelligence, big data, and technological advances. [139] While not explicitly mentioning AI, the Law on Insurance Business 2022 sets out requirements for IT applications in the insurance industry.[140]

Guidelines on the responsible development of artificial intelligence

On 11 June 2024, Vietnam's Ministry of Science and Technology issued Decision 1290/QĐ-BKHHCN providing guidelines on the responsible development of artificial intelligence (AI) systems ("Decision") [141]. This Decision, which came into effect immediately upon issuance, is a voluntary standard included with Version 1.0 of the Guide on Principles for Researching and Developing Responsible AI Systems ("Guide") and will continue to be updated to align with actual practices in the field.

The Decision emphasizes a human-centric approach, stressing the importance of balancing the economic benefits of AI with ethical considerations and legal compliance. It urges specialized agencies to establish standards and guidelines for responsible development, including non-binding provisions, promoting information sharing and best practices among stakeholders to enhance consensus and mitigate risks.

9 key principles stipulated in the document include the following:

1. **Collaboration and innovation:** Encouraging cooperation among AI developers to ensure interoperability and compatibility between different AI systems, promoting the sharing of information and best practices, and contributing to sustainable economic development
2. **Transparency and explainability:** Emphasizing the need for AI systems to be transparent and their decisions explainable, especially for systems that can significantly impact human lives, privacy or property
3. **Controllability:** Performing pre-assessment to guarantee the system meets the technical requirements and relevant standards, paying attention to system monitoring and response measures are performed by humans or other reliable AI systems.
4. **Safety:** Ensuring that AI systems are designed and tested to minimize risks to human life, health and property
5. **Security:** Complying with applicable regulations, ensuring the system's outputs and any changes caused by training are reliable and resilient to cyberattacks or manipulation, guaranteeing the confidentiality, integrity and availability of data
6. **Privacy:** Protecting the privacy rights of users and third parties, identifying and evaluating potential privacy risks and impacts to prevent privacy infringements upon deployment.
7. **Human rights and dignity:** Ensuring that AI systems do not discriminate or violate ethical principles resulting from biased training data
8. **User support:** Providing users with the necessary information and support to understand and use AI systems effectively
9. **Accountability:** Ensuring accountability of AI developers for the systems created

The Decision establishes a framework for the responsible and ethical development of AI. This framework emphasizes harnessing AI for the betterment of society while mitigating potential risks and harms. This initiative represents a significant step towards fostering responsible growth within the Vietnamese AI industry and serves as a valuable reference point for stakeholders within the country's AI landscape[142].

Vietnam's Draft Digital Industry Law

Recently, on the 3rd of July, 2024, the Vietnamese government released a draft of the Digital Industry Law for public consultation. The draft law promises to bring about a fresh change in hi-tech areas such as AI, big data, cloud computing, Internet of Things, etc. The law encourages the development of the digital sector of the economy through governmental policies and incentives for the private sector such as funding for R&D programs, exemptions from certain taxes, development of a hi-tech workforce, sandboxes, etc.

Especially, the draft also dedicates a section to the regulation of AI. In this section, the draft encourages the development and application of AI. At the same time, it also asks the Ministry of Information and Communications to issue ethical principles in the development, implementation, and application of AI.

A notable aspect of the AI provisions in the draft law is the banning of certain AI activities. The placing on the market, implementation or usage of some specific AIs that pose risks to the user or the public is prohibited.[143]

The draft law also mentions that AI systems must be classified based on the risks they pose to the health, legitimate rights and interests of organizations, and individuals, the safety of people or property, the safety of important national information systems, critical infrastructure, etc so that management and technical measures to control the risks according to the risk levels can be applied.[144] On another note, it is also required that digital products generated by artificial intelligence must be labeled to ensure that the output of the artificial intelligence system is marked in a machine-readable format and that artificial creation or manipulation can be detected.[145]

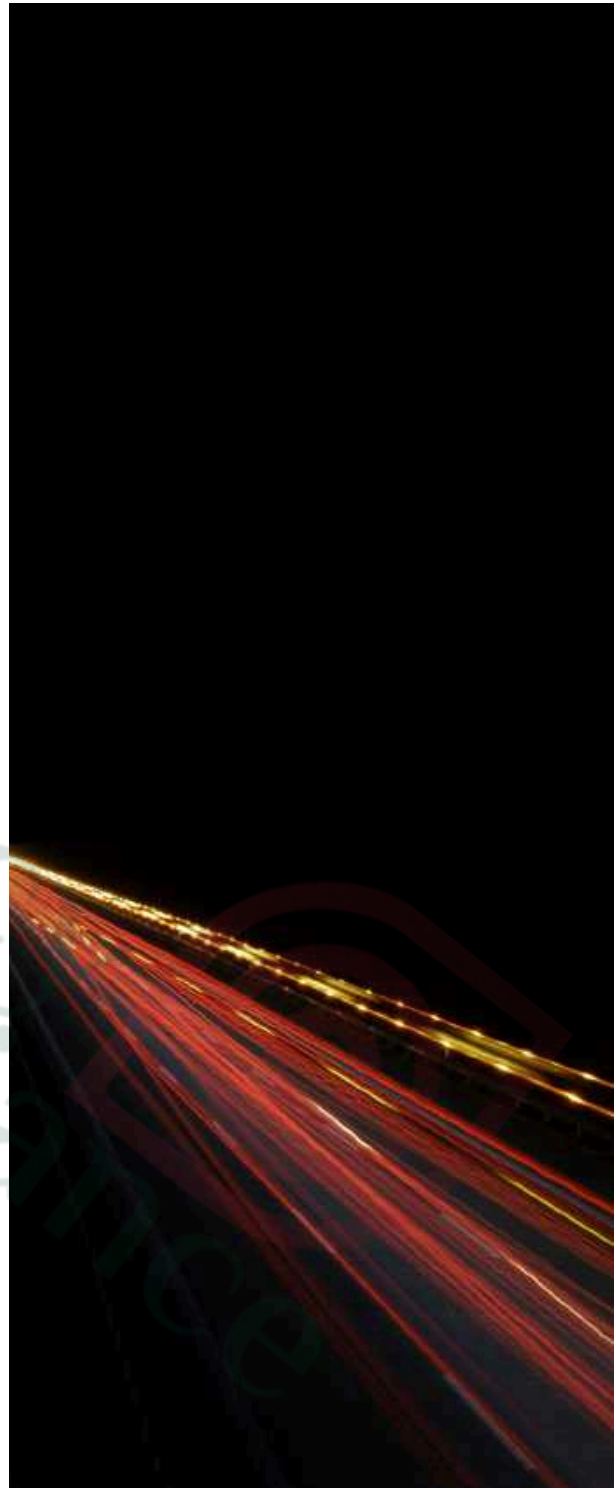
All of the above provisions regarding AI create some of the first foundations regarding AI regulation in Vietnamese laws. Also, when compared to the EU's AI Act, one can notice a great number of similarities between the two, this could mean that the Vietnamese government has been keeping a close watch on the international AI scene.

In all, the draft Digital Industry Law shows that Vietnam is very interested in the development of its digital sector and hi-tech applications. Considering the rise of new and innovative technologies in recent years, especially AI, the passing of a law to regulate and support the development of the digital sector is much needed. However, it remains to be seen how the final draft of the law will be and what impacts it will have once implemented.

These are signs that the Vietnamese legislators have taken notice of the rise of AI and are currently in the process of integrating AI into the legal system.

All of the above are evidence that Vietnam is moving forward with AI in mind and has devised a plan to develop the country's AI sector. While the pace of new developments may be slow, there is no doubt that Vietnam has a long-term plan for the development of AI. **Some public institutions have already implemented AI assistants** to provide information and help citizens with carrying out procedures. However, according to the Government AI Readiness Index 2023, Vietnam ranks 59 globally, lower than Thailand, Malaysia and Indonesia.[146] This shows that Vietnam's capacity to utilize the recent development of AI is still lacking. The government must, therefore, immediately begin to develop a legal framework to create a stable and sustainable basis for the growth of AI.

In the private sector, AI is already a highly sought-after item given its popularity and utilities. The application of AI is not new, however, recent developments have enabled new applications such as in the banking industry where chatbot assistants are being used to provide certain services to clients or eKYC technology is being used for credential certification. In the medical field, VinGroup – one of the biggest corporations in Vietnam has introduced VinDr – an AI that assists doctors in medical diagnosis. In December 2023, VinAI also introduced “Phở GPT” a new AI large language model developed by Vietnamese.



PhoGPT

VinAI trained the PhoGPT model from scratch using Mosaicml llm's llm-foundry library and a pre-trained Vietnamese data warehouse with a capacity of up to 41GB. This corpus includes 1GB of Wikipedia text and a 40GB deduplicated variant from the news dataset (version 05/21/2021). The research team at VinAI adapted PhoGPT by using a dataset containing 150,000 Vietnamese command and response pairs.

This dataset was built by combining from sources such as: 67,000 pairs of words from the Vietnamese subset of Bactrian-X, 40,000 pairs of ShareGPT words without codes and mathematical formulas, translated from English to Vietnamese based on to VinAI Translate, adding to the data set are 40,000 prompts focusing on awareness of hate, insults, harmful content and safety issues, with the majority compiled in Vietnamese and in addition are 1,000 data pairs used to train the PhoGPT model on a variety of tasks. There are 500 pairs of data to answer questions based on context, 500 pairs to create poetry, 500 pairs to write essays, 500 pairs to check and correct spelling errors and finally, 500 pairs to summarize content of documents.[147]

The Technology Director of FPT – one of Vietnam's leading high-tech companies has stated his belief that there is not a great gap between the levels of AI research and application in Vietnam and other countries in the region.[148] FPT has long been investing hundreds of billions of VND in AI technology by developing its human resources, infrastructure, and data sets.

A prominent AI product of FPT is FPT.AI - a well-rounded AI platform that provides an AI chatbot, automated customer care center, smart document control, eKYC, human resources management and development. The AI ecosystem has been implemented in 100 enterprises in 15 countries in many sectors such as finance-banking, insurance, etc. [149]

Dr. Andrew Ng – a top 100 AI expert in the world shared at the 2023 FPT Techday that he is very optimistic about the future of AI in Vietnam. He stated that Vietnam is a very promising destination for AI development and application.

“The AI market has enough opportunities for everyone, from big players to startups. AI applications will certainly be successful, and famous and bring in huge profits for enterprises in the future” – said Dr. Andrew Ng.[150]





VinBrain is a subsidiary of Vingroup, a major Vietnamese conglomerate. They focus specifically on applying AI to healthcare challenges. Their AI-powered platform for medical imaging analysis, DrAid, one of its flagship products, is an AI-powered assistant designed to revolutionize healthcare through diagnostic radiology and digital healthcare transformation by analyzing X-rays, CT scans, etc. It aims to help radiologists and healthcare providers improve the quality of care for patients. Also, this is an advanced AI solution for storing, analyzing, and managing healthcare data based on Big Data, using AI-generated technology and computer vision. Recently, DrAid™ Enterprise Data Solution was one of the three technology solutions of VinBrain honored with the Sao Khue Award 2024 in Digital Transformation category. This award is a stepping stone for DrAid™ Enterprise Data Solution to reach more nationwide hospitals and to drive comprehensive digital transformation in healthcare, meeting the increasing demand for data ownership. It also enhances the efficiency of healthcare service delivery and management, research and training activities[151].



Besides the giants in the tech industry, Vietnamese start-ups are also jumping into the race to develop AI and make this field more exciting than ever. Some names that can be mentioned include:

- AIV's Mindmaid virtual assistant development platform,
- AICycle - an AI application in insurance,
- Vbee.ai - a conversational virtual assistant,
- Legback - an AI legal assistant,
- PrivacyChatbot - an AI privacy assistant.

AIV's Mindmaid

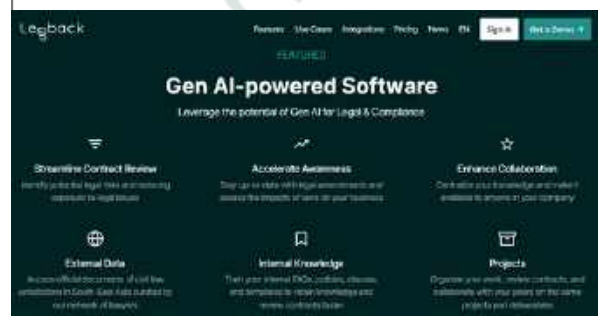
Mindmaid is a virtual assistant AI chatbot designed by the AIV Group. Mindmaid allows users to create their own customized AI chatbot by feeding it specific training data. The AI platform provides a wide selection of AI applications such as personal virtual assistant, customer service virtual assistant, enterprise virtual assistant, etc. The AI can perform a wide array of tasks such as data analysis and information provision. Mindmaid also supports integration into many different platforms and messaging apps for easy and convenient access. The implementation of the AI can have many benefits such as improved working efficiency, better time management, faster workload processing, etc.[152]



AIV's Mindmaid

Legback

A new AI tool focusing on the legal field, Legback is an AI legal assistant that facilitates document review and legal research for legal professionals. Trained on laws and court decisions, reviewed and published in the Legal Hub by a team of accredited lawyers, Legback can perform multiple functions relating to the legal field such as reviewing contracts, conducting legal research, summarizing and analyzing legal documents, cases, etc. With a focus on Vietnamese jurisdiction, this is a tool that promises to supercharge the legal practices of Vietnamese lawyers. Legback also seems to pay great attention to data protection, considering it is certified to be in compliance with ISO 27001:2022 and SOC 2 Type II. [153] The provider of the AI also boasts an impressive host of partners and a well-designed user interface. It would seem users can expect quality service from this AI assistant.



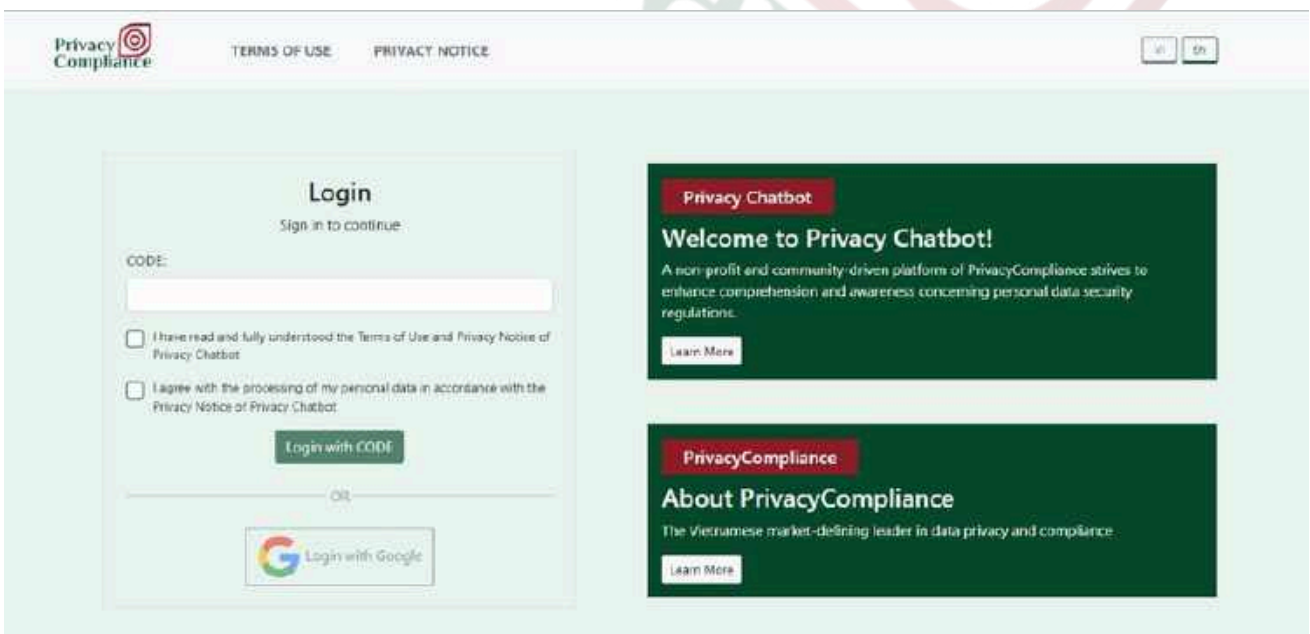
Legback



PrivacyChatbot Interface

PrivacyChatbot

As Vietnam's first product in the field of privacy and personal data developed by the PrivacyCompliance team, Privacy Chatbot applies AI to provide users with free background knowledge and understanding on personal data security as well as provide examples for specific issues, especially issues related to Decree No. 13/2023/ND-CP effective from July 1, 2023 ("PDPD") – Vietnam's most complete and comprehensive legal document ever on the collection, processing, and exploitation of personal data. Privacy Chatbot is currently designed to be able to respond in both English and Vietnamese. The application is expected to improve each individual's understanding of their privacy and data rights as well as support businesses in training and raising awareness about protecting the organization's information "resources".[154]



Challenges



Intellectual property

Vietnam's current IP laws make no mention of AI, as such, questions regarding using copyrighted works as training data for AI, and the copyrightability of AI works are still very much in the air. Moreover, there have not been any legal precedents regarding the issue. This, in essence, makes the AI sector very much a free-for-all zone with very little oversight based on outdated regulations.

Personal data and privacy

Vietnam has just made some considerable progress with the enactment of PDPD which provides general protection for data subject rights and stipulates obligations for personal data controllers and processor. This is a good starting point to ensure that the personal data of individuals is well-protected, especially against the processing by AI. However, it seems that the PDPD does not have any provisions specifically regulating automated decision-making. In all, the PDPD is a step in the right direction, however, there is much to be done in anticipation of AI data processing.



Civil liability

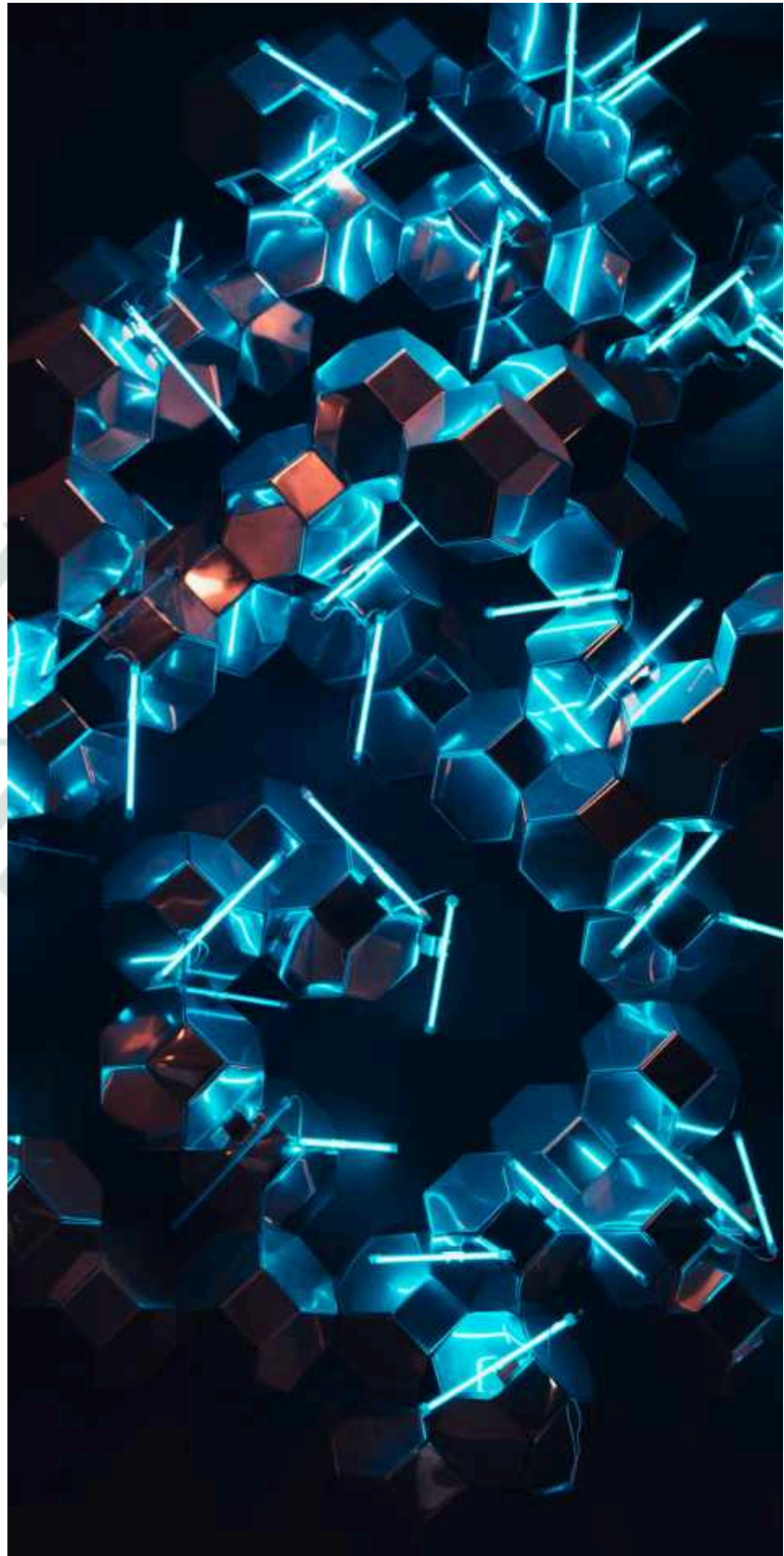
Vietnam also has no provision specifically regulating AI. However, if we view AI as a product then under the Law on Product and Goods Quality 2007, producers and importers shall pay compensation to sellers or consumers when their goods cause harm to the latter due to their failure to ensure the goods quality.[155] However, this only applies in cases where the goods quality was not ensured, leading to damage. In the case of AI, it would be very hard to prove that the AI was of “bad quality” leading to faulty results. Moreover, in reality, the situation would be much more complicated and with no precedent to draw from, the issue of AI liability remains an uncertainty.

“AI is largely unregulated in the legal field of Vietnam”

Labor force

Vietnam's labor force is still largely unskilled,[156] and thus, prone to automation. As such, if unregulated, AI could cause widespread labor displacement or unemployment. Especially with recent advancements, AI can now perform tasks such as data entry and analysis, content creation, and marketing, threatening the livelihood of a sizable portion of workers. Even though the rate of replacement is slow now, the government must be able to anticipate the future and take appropriate actions.

On the side of AI development, this also means that Vietnam is in need of high-tech workers. This shortage of AI workers is one of the reasons why Vietnam is lagging behind other countries in term of AI development. To be competitive in this age of technological advancement, Vietnam must cultivate skilled workers, especially in the fields of IT and AI.



Recommendations

Legal oversight

- 1 Vietnam must clearly **determine the legal nature of AI** and from there, **construct a legal framework that covers all aspects of legislation** such as civil, IP, etc. Perhaps an AI Decree or an AI Law might be necessary to clearly stipulate the issues surrounding AI such as development, implementation of AI, prohibited AI models, etc.
- 2 Vietnam could **update and further strengthen its regulations on data protection to protect the privacy of users of AI and owners of AI training data**. Vietnam can refer to other AI-related regulations around the world to get a better understanding of the current legal landscape and update its own legislation appropriately.
- 3 Vietnam could **construct a regulatory sandbox for AI**. A regulatory sandbox allows for the development of new ideas in the field of AI in a controlled environment and thus, also minimizes the risks. Such a system could attract domestic and foreign investments and encourage innovations in Vietnam.

Labor

- 1 Vietnam must **accelerate the transition of the labor force** from a physical, unskilled labor force to a more skilled one to ease the impacts of AI. This can be done by **improving the education system, investing in vocational training for workers, and creating new jobs**.
- 2 The government could direct the private sector to **promote the training and education of high-tech workers by providing more incentives for AI-driven companies and startups**. Such efforts would help to boost investment in AI development and application.

The road to proper regulation of AI is long and hard but Vietnam must be able to balance both opportunities and risks and move forward in a sustainable manner.

Closing remarks

As we reach the end of the Handbook, a journey through the intricacies of Artificial Intelligence (AI), it is only fitting to reflect on the profound insights gained and the vast landscape we have traversed together. The Handbook has gone over the definition, history, applications, challenges, and global regulatory frameworks that shape the realm of AI. As we conclude, let us take a moment to distill the essence of our exploration and cast our gaze toward the future.

At its core, AI represents the pinnacle of human innovation, a technological marvel that mimics and, in some cases, transcends human intelligence. Whether it be machine learning, natural language processing, or robotics, the overarching goal of AI is to augment human capabilities and solve complex problems.

The historical narrative of AI is a tale of resilience and breakthroughs. From the initial conceptualization of AI by visionaries like Alan Turing to the AI winter and subsequent resurgence, the journey of AI has been marked by a relentless pursuit of understanding and harnessing the power of intelligent machines. Each chapter in AI's history has contributed to the intricate tapestry of innovation we find ourselves immersed in today.

Yet, our exploration has not been without its challenges. Legal challenges, ethical dilemmas, biases in algorithms, job displacement, and autonomous vehicles are among the hurdles that demand our careful consideration. As we advance, it is imperative that we approach the development and deployment of AI with a keen awareness of these challenges, fostering responsible and ethical practices.

Turning our attention to the global stage, the varied regulatory landscapes governing AI encapsulate a spectrum of approaches. From the comprehensive frameworks of the European Union to the more flexible models in the United States, and the evolving policies in other regions of the world, our understanding of the regulatory framework underscores the need for a harmonized, yet adaptable, approach to AI governance.

As we stand at the precipice of an AI-infused future, it is essential to recognize the transformative potential that lies ahead. AI will continue to redefine industries, revolutionize healthcare, and reshape the way we live and work. However, this potential must be harnessed responsibly, with a commitment to transparency, accountability, and inclusivity.

To you, the reader, we extend our heartfelt gratitude for embarking on this journey with us. Your engagement and curiosity are catalysts for the dissemination of knowledge, fostering a collective understanding of AI's multifaceted landscape. May this Handbook serve as a beacon, illuminating the path forward as we collectively shape the future of AI.

In closing, let us carry forward the lessons gleaned from these pages as we navigate the ever-evolving landscape of AI. With responsibility as our compass, we embark on a future where AI enriches our lives, empowers humanity, and contributes to a world that is both innovative and just. The chapters of AI's story are far from over; they unfold with the promise of a future where our endeavors and advancements reflect the very best of our shared humanity.[157]

About Us

About PrivacyCompliance

At **PrivacyCompliance**, we believe what is good for society is good for business.

We were founded on the idea that people today want to buy from, work for, and invest in companies that demonstrate a positive impact on people and the planet. These societal shifts, spurred by new generations and amplified by modern technologies, redefine what good business looks like. We believe every company can thrive in this new era.

That's why we built **PrivacyCompliance**, the Vietnamese market-defining leader in privacy rights.

We partner with our customers on their trust transformation. Our technology platform connects privacy, governance-risk compliance (GRC), ethics, and ESG teams, data, and processes so companies, whether big or small, can collaborate seamlessly and put trust at the center of their operations and culture.

This means we help customers adopt better privacy practices so they can be trusted with customer data and deliver more valuable user experiences. We help companies and supply chains stay resilient when facing cyber threats, global crises, natural disasters, etc. so they can stay operation as usual with confidence. We empower ethical cultures so companies can uphold the highest standards of trust with their teams. We help you centralize your ESG data so you can prioritize initiatives, set goals, and track progress.

PrivacyCompliance stands out by our teams that seamlessly combine technology and legality to provide efficient, accurate, and cost-effective solutions that ensure smooth data flows and compliance with both local and international regulations. Our team comprises seasoned professionals, well-versed in cybersecurity, legal protocols, data protection, and risk management, who have undergone rigorous training across various regions such as Vietnam, the UK, the US, and the EU. Therefore, we possess unwavering assurance in our ability to cater to our customer's requirements and successfully resolve any concerns regarding privacy and data protection.

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Our services

Compliance

We offer a comprehensive range of services to ensure your organization's compliance with applicable laws in a timely and effective manner.

Risk Management

We provide evaluation and mitigation of data security threats, as well as assist you and your organization in earning reputable credentials.

Technology

Our suite of technological products provides comprehensive support for your organization's fundamental security and data privacy requirements.

Compliance solutions

Privacy Review and Assessment

Conduct a review of the basis for the data processing to ensure the compliance of your data system with legal requirements

Policy Management

Upgrade and complement your privacy document arrangement with our drafting and review of Data Privacy Framework, Privacy Policy, Privacy Notice, Technical and Organizational Measures Application (TOMs)

Privacy Impact Assessments (PIAs)

Personal data protection impact assessment (DPIA) and oversea data transfer impact assessment (DTIA) are legal obligations that your organization must comply with, and we can help to facilitate your completion of such assessments

DPO Outsourcing Service

Our outsourced Data Protection Officer (DPO) helps you with managing personal data flow – a highly specialized task that requires a specialist with data protection expertise

Training and Awareness

Build your privacy-prioritized team with a profound understanding of data protection via courses designed by privacy & data governance experts

Risk management solutions

Enterprise Risk Management

Assess and manage the existing and potential risks to the confidentiality, integrity, and availability of your information assets to help you achieve an acceptable risk level among operations

Second-Party Audit

Second-party audit helps to assess and mitigate the information security risks posed by your suppliers and their compliance level – a confirmation of their suitability and compliance with your requirements set out in the contracts

Certification consultation

Provide you with the preparation, establishment, and continual improvement of your privacy information management system to meet the demands of the ISO standards for managing information security risks, which can generally boost your internal energy as well as external reputation

Certification training

The training courses on The Certified Information Systems Auditor (CISA), Certified Information Security Manager (CISM), and Certified in Cybersecurity (CC) would help you to prepare for the exams for these three credentials which are some of the most respected in the cybersecurity industry

Technology solutions

Data Privacy Management Platform

Our product suite assists your organization in all foundational aspects of security and privacy compliance. We systematically investigate your security posture and provide in-depth recommendations for improvement

Intelligent Data Discovery

Our Intelligent Data Discovery Framework allows your organization to assess and prioritize assets for protection, particularly data such as credit cards, bank account info, with close to zero false positives

Privacy-preserving Technologies

We help your organization with privacy-preserving data processing technologies and offer expertise in advanced cryptographic techniques to protect and preserve the security and privacy of your data

Privacy Compliance Virtual Assistant

Our advanced AI-based virtual assistant provides you with consultancy regarding the security and privacy aspects of your organization. It enables your organization to quickly comply with security & privacy standards and regulations

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