Learning & artificial intelligence Wich statues to Humains in the era of Machines ?

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Abstract:

This research paper aims to examine how humans learn and acquire mental, psychological, and physiological skills, and to link these processes to recent developments in artificial intelligence technologies. It Aso focuses on the challenges facing the human learning process, particularly in light of (AI) systems whose outputs have become increasingly sophisticated and complex. Machines now learn rapidly and efficiently, ensablions them to acquire advanced decision-making capabilities and generate effective solutions, thereby helping humans address problems that were previously difficult or impossible to solve.

This paper approaches the concept of learning from multiple perspectives, including psychology, computer science, and philosophy. It relies on exploratory research methods aimed ait providing an initial overview of twis emerging topic and clarifying the differences between human learning and machine learning. In addition, the study seeks to offres a forward-looking vision of the future of human learning in light of the growing dominance and accelerated development of artificial intelligence, Viège through the lens of learning.

Keywords: Human learning, Machine learning, human intelligence, artificial intelligence.

1. INTRODUCTION :

According to psychologists, human being is lead by memory where he stores a considerable bulk of knowledjes and datas.He recalls them as experiences and precedent situations, that is to make profit in his life.

It also contributes in developing mental capacities to acquire thingfull skills, that is to adapt his behaviour coherently in an efficient way .According to these mental faculties owed to the man kind, intelligence become apparently as a trend in his span life which makes the difference in learning, understanding, analysing and exploring plans to solve different facing problems whetheher in his narrow space or the wide environnement.

Under the visible fourth industrial revolution noyade, It seems that the concept of intelligence & smartness is no more attributed to human being alone, as it was known before.The given technological pattern is taking place instead of human kind in his daily life.Still going ahead with learning capacities and acquiring dreadfull skills in an extraordinnary way in their available services confronting human mind as far as learning and memorising are concerned.Some sees that may overcome man kind's mind.

According to this illustrative cotext, the present papper aims trough the conceptual approach to the artificial axe, and cognitive linguistics, to deal with learning specificities as a fatal determinism to share with instinctive animals.This duality (Human- Animal) has been overpasssed to be shared with engine, competing human being faculties in learning , storing & momerising.this given postula will be explored analytically to the concept of human and artificial intelligence ; that is to explore the linked relationship between both.

Hence, the main question is : wich status to the man kind learning under the technological endeavours in the field of artificial intelligence & engeneering learning ?

2. Research concepts :

2.1 Human Learning .

From the earliest stages of his interaction with nature, human learning began in its traditional sense—through imitation of everything he saw and discovered in his natural or social surroundings. This skill endowed him with the ability to survive and adapt to various environmental changes, particularly harsh ones. Human learning is defined as a long-term change in mental representations and associations resulting from experience. It is a means through which an individual acquires not only skills and knowledge but also values, attitudes, and emotional responses. Learning can also lead to the emergence of entirely new behaviors in the individual. Learning is a continuous cognitive and psychological process—a cumulative outcome of experiences and practices. It involves multiple components such as maturation, readiness, and motivation. Numerous psychological theories have explained human learning, including classical conditioning theory and other theoretical approaches that describe this lifelong process—from birth to death (Aridah 2007) .

2.2 Machine Learning (Automatic Learning)

Machine learning is a subfield of artificial intelligence focused on developing software systems capable of learning or improving their performance based on the data they process. This means that every machine learning solution is a form of artificial intelligence, although not every AI system is a machine learning one. In short, the concept refers to "the ability of a machine to acquire learning" (Sloane 2020).

2.3 Human Intelligence and Artificial Intelligence.

2.3.1 Human intelligence

is the key determinant in the development and growth of human civilizations over millions of years and continues to shape their future. It may be defined as the ability and skill to devise and find solutions to the various problems faced by human beings, as well as the capacity to use acquired experience to foresee and construct new knowledge that helps in overcoming obstacles across different life and scientific domains. The

level of intelligence varies from one individual to another and from one environment to another (Dawidar et Al-Zayat 2023) .

2.3.2 Artificial intelligence :

on the other hand, refers to the ability of computers and machines to perform tasks that require human-like intelligence—such as image recognition, speech processing, and decision-making—based on available data. **Marvin Lee Minsky** defines it as "the construction of computer programs that engage in tasks performed satisfactorily by humans, because these tasks require high-level mental processes such as cognitive learning, memory organization, and critical thinking" (Abdullah et Habib 2019), Artificial intelligence is thus considered one of the most prominent features of the Fourth Industrial Revolution and the fourth generation of globalization. It encompasses a wide range of applications used across numerous fields .(Dalael Centre 2023) .

3. Research Objectives:

This paper aims to :

- Uncover how humans learn and develop the skill of intelligence in an era dominated by artificial intelligence technologies, where machines have become fierce competitors in the learning process—capable of finding solutions that humans struggle to reach as swiftly as machines do.
- Examine how humans and machines learn, and identify the fundamental differences between the two processes—as well as between human and artificial intelligence.
- Attempting to understand the nature of human learning (not education) as a fundamental topic in psychology and comparing it with the learning characteristics of machines.
- Determine the position of human learning and intelligence in comparison with machine intelligence and deep learning, which continue to evolve at a rapid and constant pace.
- Anticipate the future of human learning amid the ongoing global development of machine learning and artificial intelligence.

4. Methodology and type of study :

To answer the question posed, the study adopts the qualitative approach on which exploratory studies are based, and such research is usually used when there is a new topic that needs further clarification.

Accordingly, the study relies on the collection, analysis and synthesis of various available data and information related to both human learning and machine learning. In the same context, it also addresses the basic literature and concepts related to human intelligence and artificial intelligence, based on the assumption that learning is a central element in the development of both forms of intelligence and a decisive factor in shaping their future characteristics.

Studies of this type are usually classified as preliminary research, characterised by methodological flexibility and the use of non-rigorous research tools, given the novelty of the subject and the limited number of previous studies that have addressed it.

5 . Learning between humans and machines .

5.1 Human learning :

Learning is a central topic in psychology, forming a key element in understanding and predicting human behavior, Some theorists consider human learning primarily mental, while others view it as psychological or even dependent on external environmental factors. (Nasif 1983) .

5.1.1 The nature of human learning.

According to psychological studies, learning is not a purely human trait ; rather, it is a process shared by living beings in general, especially in terms of instinct. However, the distinctive human intellect has made this process uniquely human and more complex, as it involves the interaction of numerous internal and external factors. The learning process is characterised by vitality and dynamism, which are manifested in relatively permanent changes in human behavioural patterns and cognitive processes resulting from interaction with the physical and social environment. Learning is also the product of both intentional and

unintentional mental, psychological, and physiological processes in humans (Al-Zaoul 2010) .

5.1.2 Characteristics of human learning.

According to various studies and research in psychology, the learning process plays a crucial role in human life, as it enables individuals to acquire mental, psychological, cognitive, and experiential skills that help them cope with different situations and overcome the various challenges they face from birth. Learning has also made humans the most intelligent living beings, capable of survival and adaptation to their surrounding environment. Since the mind is the defining characteristic that distinguishes humans from other living creatures, human learning differs from that of many other beings in that it possesses several distinctive characteristics, the most important of which are highlighted in the following points :

- **Learning aims to change human behaviour :**
  Learning aims to modify human behaviour in order to overcome past mistakes and learn from them. This process enables individuals to make appropriate decisions that serve their life situations.
- **Learning occurs as a result of human interaction with the environment:**
  Since humans are products of both micro and macro environments in which they live, they interact with these environments through mutual influence. Consequently, individuals learn from their surroundings by acquiring behaviours, attitudes, and cultural values. In some cases, these environments shape their outlook on life and influence their future.
- **Learning is a dynamic and continuous process:**
  Learning begins at birth and continues until death. It is not confined to a specific time, place, or age; rather, it starts in the early stages of life and continues throughout an individual's lifetime.

- **Learning is a gradual and cumulative process:** Learning begins early in an individual's life and develops progressively through experiences that accumulate as a result of continuous interaction with various stimuli and situations. It encompasses all relatively permanent changes resulting from practice, training, and experience.
- **Learning is a comprehensive process:** Human learning encompasses a wide range of behaviours and experiences, including both desirable and undesirable ones. Learning may be intentional and goal-directed, or incidental and unintentional. It is a comprehensive process with multiple manifestations, including behavioural changes across mental, psychological, social, motor, linguistic, and moral domains (Al-Zaoul 2010) .

5.1.3 Theories of human learning:

Below is a brief overview of several theoretical interpretations that attempt to explain how humans learn :

a) Learning through Classical Conditioning (Stimulus–Response Reflex)

The principle of learning through conditioned reflexes traces back to Ivan Pavlov's experiments on dogs and John Watson's studies on children.

He observed the digestive process in dogs by measuring the amount of saliva produced when they were fed ; Pavlov realized that the sight of food alone could trigger the same response as actual feeding. From that observation, he dedicated his research to understanding this phenomenon as a form of learning. Eventually, he found that the dog would respond to the sound of a bell alone, even in the absence of food, due to the habit of expectation and the anticipation of feeding (Al-Askari , Saghir et Al-Obeidi 2012) .

Psychologists later attributed this interpretation to behaviorism, a school of thought led by Pavlov and John B. Watson, who extended his

experiments to children. According to this theory, learning is based on observable behavior, which can be objectively studied and measured.

Watson's famous "Little Albert Experiment" demonstrated that even human emotions, such as fear, could be learned through conditioning. Behaviorism thus sought to explain human behavior by emphasizing the importance of environmental stimuli in shaping it, while downplaying the role of genetic or internal, unseen factors (Al-Zagoul 2010).

b) Learning through Trial and Error (Connectionism)

Like animals, humans often rely on trial and error as a means of acquiring learning skills. This process occurs when an organism encounters a problem for the first time without prior experience or knowledge of how to respond. The initial responses may be incorrect, but through repetition and exposure, correct responses are eventually learned.

Thus, the presence of challenges is essential for learning; overcoming obstacles helps both humans and animals acquire skills. When a person faces a real-life problem, they strive to find solutions through repeated attempts — even if their first responses are wrong (Al-Malih 2024).

c) Learning through Insight

This theory arose as a critique of trial-and-error learning, rejecting its premise as meaningless and unrepresentative of genuine learning. Insight learning is based on the studies of the Gestalt School, founded by Max Wertheimer and later expanded by **Köhler, Koffka, and Lewin**. The Gestalt theorists proposed that learning through insight depends on the holistic understanding and perception of relationships among elements within a given situation. When these elements are clearly organized, humans (and even animals) can solve problems by rearranging components to discover new relationships that lead to the correct solution. The theory rests on several key principles:

- Learning is a highly exploratory and stimulating process.
- It involves gaining insight into the complex, interrelated structures we encounter in daily life.
- It is not a mechanical or blind process but one based on understanding internal relationships.

- Insight learning is developmental, as it relates to real-life problem-solving (Aridah 2007).

d) Operant (Instrumental) Learning

This theory, developed by the American psychologist B.F. Skinner, is also known as instrumental learning or radical behaviorism. The founders of this school considered behavior the cornerstone of the learning process.

According to Skinner, antecedent stimuli — those that precede a behavior — act as discriminative determinants that influence, though do not necessarily cause, a specific response (Al-Zagoul 2010).

e) Cognitive Field Learning

In contrast to Gestalt theory, which focused on perception and structure, Kurt Lewin's field theory proposed that learning is a dynamic process resulting from continuous interaction between the individual and the learning environment, which is filled with various stimuli. Through this interaction, insight emerges, and the cognitive field or structure of learning develops, allowing the individual to adapt to new situations. Before any behavior manifests as a response, it is built upon an existing cognitive structure — a "life space" — that influences how learning occurs, Lewin saw learning as a significant change in the following dimensions :

- Cognitive structure
- Motivation
- The individual's ideology in relation to the group.
- The ability to regulate voluntary behavior and behavioral skills (Anwar 2012) .

In this section, we have reviewed the major psychological theories addressing the question: How does a human being learn? We have approached the topic from behavioral, constructivist, cognitive, Gestalt, and psychoanalytic perspectives.

Yet, a crucial question arises: if human learning is so complex and multifaceted — with no single theory offering a complete explanation —

is the same true for machines? Or, put differently, how does a machine learn?

5.1.4 The nature of machine learning.

Machine learning (artificial intelligence) is related to computers and is a subset of artificial intelligence that relies on algorithms, which can process large amounts of data, identify patterns, and predict new relationships between previously unknown data. It can also perform classification and prediction tasks on documents, images, numbers, and other types of data) Abdulnour 2005(.

5.1.5 Characteristics of machine learning :

Numerous studies and research papers indicate that machine learning has several characteristics, which we will highlight in the following points :

- **Continuous training and learning from experience**:

French robotics researcher **Fabien Pinero** says that 'the main and primary goal of learning is to change behaviour based on experience.' Hence, continuous training emerges as one of the characteristics of machine learning, where artificial intelligence systems in machines benefit from the commands provided by humans, as well as big data, especially that linked to the internet, which gives them the ability to continuously train and benefit from previous experiences (memory) in which they responded to commands executed in previous stages of use. This experience and continuous training contribute to machines and artificial intelligence systems providing more accurate services in a fast and record time) . Azencott 2025 (

- **Automation** & **data analysis :**

One of the characteristics of machine learning is that it performs tasks automatically, without human intervention, and does so with a high degree of efficiency that exceeds human capabilities. Perhaps one of the things that gives machine learning models this characteristic is their great ability to analyse big data and use it in decision-making without resorting to humans. This is done by selecting the appropriate data and the most

suitable model, as well as evaluating the model and improving performance.

- **High-precision results** & **effective interaction with the environment:**

The abundance of information and big data that is stored and accessed via the internet allows artificial intelligence systems to extract results with high accuracy, which enables them to interact effectively with their environment, sometimes even without human intervention.

- Great flexibility and adaptability : Adaptation is the main goal of learning, which is why machine learning is characterised by this ability, especially in its advanced stages of technological development, where artificial intelligence systems have become capable of sensing their surroundings and making appropriate decisions in various situations they encounter (Masood 2021).

- Ability to discover complex patterns and relationships:

Big data and very large and complex information that even humans cannot connect between its multiple and numerous variables except over a long period of time, but machine learning and artificial intelligence systems have the ability to discover different patterns and connect complex relationships, which helps humans and saves them a lot of time, allowing them to make appropriate decisions based on the recommendations of machine learning techniques such as deep learning, image analysis, classification, aggregation and segmentation (Al-Kilani 2023).

- **Predictive and foresight capabilities:**

Based on the data and information that machine learning systems process, as well as experience, interaction with the environment, and continuous learning, trends in this data are identified, enabling the system to make predictions and forecasts (Abu Ghaida 2025).

6. Methods of machine learning : Machine Learning — or How Do Machines Learn ?

Researchers in the Dictionary of Cognitive Sciences indicate that artificial intelligence, as a branch of cognitive science, offers

unprecedented potential for understanding the mechanisms of thinking and learning—especially when integrated with neuroscience and cognitive psychology. Learning, , has now become the focal point for scholars across various disciplines. They study it not merely as a biological or human trait, but as a fundamental principle of machines that are programmed to learn as well (Arab National Centre 2025).

Many studies in computer science and neuroscience suggest that the neural network of artificial intelligence is an attempt to simulate human cognitive experience. From this perspective, the process of machine learning in the "artificial mind" of the computer is defined. These artificial neural networks learn how to recognize specific patterns from available datasets, thereby embodying the ultimate goal of artificial intelligence: to create intelligent machines capable of learning autonomously, without human intervention (Abdulnour 2005) .

At first, a machine is unable to recognize any type of data; it must learn how to recognize it This learning occurs through examples (Louridas 2020) .

The study of machine learning thus leads us to one of the principal branches of artificial intelligence, which grants machines the ability to learn and make decisions independently, without direct programming by humans (Magdy 2020). Data constitute the essential fuel of machine learning: from data, the machine extracts information. The process of machine learning can generally be categorized into three major groups, as follows :

6.1 Supervised Learning

Supervised learning closely resembles the way humans learn. Knowledge is acquired through new inputs and predefined outputs—much like how a child learns to identify fruits by memorizing their images in a picture book (phil 2017). This type of learning requires a human expert to provide correct answers by labeling data, allowing the algorithm to learn and make accurate predictions in the future .

In supervised learning, an artificial-intelligence model is trained on a set of previously known data (where both the inputs and corresponding outputs are defined). Human supervision monitors the model's

performance during training to ensure the desired outcomes are achieved (Al-Hadi 2022).

The goal is to construct a model that generalizes well beyond the training data. Supervised learning is widely used in numerous fields, including spam-email classification, image recognition, and stock-price prediction—applications that depend heavily on labeled historical datasets.

6.2 Unsupervised Learning.

In contrast to the previous type, which relies on human supervision and pre-labeled datasets, unsupervised learning is the second major form of machine learning. Here, the system is trained on data that are neither labeled nor encoded. In other words, the algorithm learns to identify patterns and relationships within the data entirely on its own, without any human guidance or prior knowledge. This property makes unsupervised learning a powerful tool for data analysis—especially in cases where labeled data are unavailable or prohibitively expensive to obtain. Its primary objective is to uncover hidden relationships and structures among data elements, extracting underlying patterns without explicit instruction. To illustrate, imagine again the student–teacher analogy: in supervised learning, the teacher guides the student; in unsupervised learning, the teacher is absent. The student—here, the algorithm—learns by observation alone, grouping similar characteristics together in what are called clusters (Nofal et Abbas 2022) .

Thus, unsupervised learning occurs when algorithms receive only input data without any predefined output labels. They autonomously identify internal relationships and patterns within the data.

6.3 Reinforcement Learning.

Reinforcement learning (RL) is a branch of machine learning (ML) that trains programs to make sequential decisions in order to achieve optimal results. It emulates the trial-and-error learning process used by humans to attain goals: actions that lead to success are reinforced, while those that hinder the objective are discarded.

Reinforcement learning is therefore a method of training algorithms based on a system of rewards and penalties, guiding them toward a predefined objective. Rewards and punishments are applied according to fixed criteria, encouraging desirable actions while discouraging undesirable ones. Through repeated trials, artificial-intelligence systems and robots learn the most effective strategies to maximize performance. The more training they undergo, the greater their efficiency. These algorithms are widely applied in robotics, delivery systems, gaming, and decision-making tasks that seek optimal future outcomes (Al-Hadi 2022).

6.4 Deep Learning.

Another advanced form of learning, deep learning, is a highly evolved subset of machine learning and represents a major step forward beyond traditional models. It relies on complex algorithms that include artificial neural networks—systems inspired by the neural cells of the human brain. These artificial networks consist of interconnected layers of neurons; the deeper and more numerous the layers, the more sophisticated the network. Deep learning requires a highly complex architecture that mimics the brain's neural networks to comprehend patterns, behaviors, and multidimensional contexts—even in the presence of disturbances such as noise, missing details, or other irregularities. Because deep learning demands massive quantities of data and probabilistic computation, it also requires tremendous computational power. This need has grown exponentially with the advent of Big Data.

Deep-learning models can recognize complex images, texts, sounds, and other data patterns to generate highly accurate insights and predictions.

They enable the automation of tasks that normally require human intelligence, such as image captioning or transcribing audio files into text (phil 2017) . These four principal methods constitute the core mechanisms through which machines learn. They represent distinct models by which the machine acquires the ability to learn—transcending biological and human learning to become an attribute of the inanimate (the machine). Through algorithms capable of processing input data and applying

statistical analysis to predict new outputs, these models operate upon a unifying element: data.

Sometimes machine learning occurs under human supervision; at other times, it unfolds independently. It may also be reinforced through feedback mechanisms based on trial and error to enable optimal decision-making. Deep learning, meanwhile, represents an exceptionally advanced stage of this process, capable of handling vast datasets to deliver remarkably precise outcomes and effective decisions across various fields where such applications are deployed. In essence, machine learning involves acquiring data and establishing multiple rules that determine how such data can be transformed into actionable information through algorithms and artificial neural networks—continually improving performance without explicit programming.

If learning is what has elevated machines (computers) to such astonishing levels of problem-solving, what, then, is the future of human learning in the age of machines and artificial intelligence?

7. Learning & its relationship to human intelligence and machine intelligence (Artificial Intelligence) .

Learning is a fundamental component in the acquisition of intelligence and knowledge in humans, as it enables individuals to adapt, persevere, and develop throughout the different stages of life, helping them overcome challenges and solve the many problems they face. Although humans are not the only creatures capable of learning, they are the only creatures that possess reason and intelligence beyond their instinctive nature. However, they sème surprise by their invention of a machine that learns quickly and possesses extraordinary intelligence. Based on all this, in this section we will tr to answer the pressing question: Wyat is the relationship between learning and human intelligence on the one hand, and learning and artificial intelligence (machine intelligence) on the other ?

7.1 The relationship between learning and human intelligen :

Humans are born with certain biological, psychological, and mental predispositions, but the ability to learn gives them new characteristics that

enable them to develop their skills and behaviors and face many challenges in their lives. If the simplest definition of learning is a change in an individual's behavior, this means that the impact of learning on humans affects various aspects of their personal and social lives. It is also linked to multiple mental and psychological abilities, such as intelligence, which appears to have a reciprocal relationship with learning. An intelligent person is quick to understand and learn, and learning contributes to the development of intelligence and gives it broad horizons compared to the limitations of human learning. For example, humanity has achieved this breakthrough technology thanks to learning and intelligence and by benefiting from its previous experiences in various sciences.

Learning, therefore, has a close relationship with intelligence. It may be a product of the latter, and its influence is reciprocal, being affected by intelligence and affecting it in turn) Nasif 1983(.

7.1 Learning and artificial intelligence (machine Learning):

The learning feature is a fundamental part of artificial intelligence. Machine learning, for example, is a subset of artificial intelligence that specializes in building systems that have the ability to learn from data and evolve with experience. If the criterion for intelligence is the ability to solve complex problems, then today's machines, through artificial intelligence, can find intractable solutions quickly and accurately that humans sometimes cannot. There is no doubt that the learning process has had a profound impact on strengthening the machine's capabilities, as it has benefited from data and information to the point that it is able to choose appropriate options, find solutions to complex problems, and adapt to them (Kaplan et Chabotier 2015) .

8. The Future of Human Learning in Light of Developments in (Machine Learning) Artificial Intelligence

Herbert Marcuse once stated that "the liberating power of technology, which turns things into tools, can turn into a constraint on freedom, transforming man into a tool" . This statement foresaw our current situation years ago, as the implications of technological power

today—particularly in the employment of advanced machines—are steadily increasing every day (Habermas 2003).

Human learning, has liberated humanity from ignorance, shaping the foundations of civilization over thousands of years. It has transformed humanity from a state of backwardness to progress, from simple to complex life, and from naïve thinking to advanced intelligence. The human being who now replaces his biological organs with mechanical ones—a form of biological penetration into the human self that relies on machines to sustain life—reflects the same logic we can apply to learning.

Artificial intelligence and machine learning have become an integral part of our lives. Consequently, many experts anticipate the development of powerful AI capable of emulating human intelligence more broadly in the future. Machine learning, as a subset of AI, is expected to become even more advanced and expansive than it is today. This presents humans with the challenge of reconciling their own learning with that of machines, which are predicted to develop at an extraordinary pace, especially given the increasing human reliance on intelligent technological tools in daily tasks (Calvin et Thérèse 2022).

Humans, who have created artificial intelligence and machine learning through their mental capacities for thinking, learning, and reasoning, possess the ability to determine humanity's future in light of these technological advances. This is because humans can exercise consciousness and moral responsibility—qualities absent in machines. Machines learn without awareness yet evolve at remarkable speeds, occasionally surpassing humans in intelligence and learning. This creates an existential dilemma: for the first time in history, humans share the Earth with entities that possess a form of intelligence resembling a nascent, embryonic state. Therefore, it is imperative today for humans to engage in the "learning of learning," enabling them to keep pace with rapidly evolving technologies (Qalamain, Sharqi et Qadi 2021).

The fears humans face today regarding artificial intelligence and machine learning are numerous and legitimate, primarily due to the uncertain future of these astonishing technological entities. In response,

many countries have implemented educational programs for their children, introducing AI learning at early stages of schooling. China, for example, incorporates AI learning across almost all educational levels, aiming to exert greater control over the future of this field, ensure global competitiveness, and keep pace with worldwide developments in AI and machine learning. In this regard, Beijing's Education Committee stated that "innovative teaching methods will be introduced, employing companion devices, AI-assisted research tools, and other intelligent support programs to facilitate learning through human-machine interaction (Al Jazeera Channel 2025).

Some concerns go even further. Pragmatists in the field foresee a strong trend toward merging human thinking with the AI and machine learning systems initially created by humans. They predict that by the second decade of the next century, it will become increasingly difficult to distinguish between human intelligence and machine intelligence. The advantages of computer intelligence, will become more apparent, while the distinctive features of human intelligence will be harder to discern. Discussing intelligence here inevitably involves learning, which is expected to become increasingly complex for machines. Humans will need to expand their cognitive capacities to cope with the unknown superiority of machines, particularly regarding future abilities in learning, data storage, and the analysis of massive datasets. This may render humans seemingly incapable of matching machine intelligence, especially given the advances in one component of machine learning—deep learning—based on neural networks that resemble the human brain (Ray , The Age of Spiritual Machines: When Computers Challenge Human Intelligence. 2009).

9. Conclusion

After examining human learning and its functional relationship with intelligence, it is evident that this duo has propelled humanity from a primitive and simple state thousands of years ago to an era in which human life appears far more complex than before, largely due to advanced technologies that surround humans on all sides. This is particularly true regarding the outputs of artificial intelligence, such as robots and highly

intelligent machines, which have shifted from tools designed to assist humans to autonomous entities capable of rapid learning, data storage, and the analysis of enormous quantities of information that humans cannot possibly assimilate. From this, we can deduce the following:

- Human learning, alongside AI-related learning (machine learning and deep learning), remains a product of the human mind, over which humans retain control. Consequently, humans are moving toward a state of functional integration with intelligent machines, given that humans need machines to assist in tasks that are otherwise difficult to accomplish, while machines still require human intervention for their development and for controlling future outputs.
- Artificial intelligence and its associated learning domains continue to face numerous technical, operational, and even ethical challenges to ensure alignment with positive human use, avoiding uncontrolled consequences that could compromise human authority over machines rather than the other way around.
- The advances in human learning and intelligence are immense, yet they now confront rigid machines of human creation, endowed with high intelligence and the capacity for rapid learning. By interacting with massive datasets, these machines can independently make appropriate decisions, potentially evolving into entities with superhuman intelligence compared to humans. This has prompted many philosophers, thinkers, and experts to sound the alarm, as for the first time, humans face a mechanical entity that “thinks” similarly, potentially placing humanity at risk in the face of the unknown future.
- Historically, human illiteracy was defined by an inability to read and write. With human progress and the invention of new technologies, this definition has shifted, linking illiteracy to those who cannot use modern Internet-connected communication tools. In the future, a new form of "human illiteracy" is expected to emerge, related to the inability to understand and interact with

rapidly evolving technologies, such as artificial intelligence and its various outputs, if humans fail to learn the fundamentals of engaging with them.

- Artificial intelligence has made tremendous progress in imitating some human abilities, but it lacks the deep awareness and understanding that humans possess, which limits machine learning in areas that require intuition or ethics.
- The future of human learning depends on the degree to which individuals understand and master these new technologies. The more humans can control them, the more integrated their learning becomes with machines, allowing them to acquire new skills and maintain conscious superiority over currently unconscious machine capabilities. No matter how advanced machine intelligence becomes, human intelligence retains flexibility, as well as connections to emotions, values, ethics, and morality - qualities machines currently lack.
- The development of AI learning is expected to accelerate continuously. Companies, developers, and other beneficiaries of these modern technologies will continue research to exploit them for delivering services humanity requires across various sectors. Moreover, these technologies represent a highly profitable economic domain, generating substantial revenue for the companies that develop them. Beyond commercial interests, there is intense global competition among major powers to dominate this field, aligning machine capabilities with national strategic interests. In this context, AI transcends the notion of learning alone, becoming a tool for exerting influence over humans in the service of powerful nations.
- The current Chinese educational model, which incorporates AI teaching across all educational stages, represents a pioneering and unique approach. It has the potential to create a generation of individuals with profound awareness of this technology, engaging in a state of “continuous learning” to establish effective dialogue mechanisms with machines. Furthermore, such models enable

humans to optimally exploit rapidly evolving technologies for human benefit, ensuring that humans remain in control rather than the reverse.

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