COULD ARTIFICIAL INTELLIGENCE (AI) BE A REAL THREAT TO HUMANITY OR EVERYTHING IS JUST "MUCH ADO ABOUT NOTHING"? DOES AI BECOME AN EXISTENTIAL RISK OR OPPORTUNITY FOR SCIENTIFIC KNOWLEDGE AND RESEARCH?

Gheorghe Săvoiu

Romanian Statistical Society, Bucharest, e-mail: gsavoiu@yahoo.com

Abstract. *Starting from Confucian virtuous man to Human Intelligence (HI),* some *major aspects are revealed in this paper's introduction. Two other sections are successively dedicated to the definition, typological detailing and measurement of Human Intelligence (HI), as well as to a brief history of Artificial Inteligence (AI) and to the impact of Artificial Intelligence (AI). In the central section of this article, a distinctive discussion about the risks and opportunities redefines AI. Modern scientific opinions maintain the ambiguity in predicting AI's future as evolution or involution for Humanity, not only from classical Shakespearean attitude following his well-known expression "much ado about nothing" but also based on the recent essential question regarding the ability of AI to destroy human civilization. Some final remarks offer in a concise manner the most underlined ideas about the future of AI for Human Knowledge (HK) and Scientific Research (SR), based on inter-, multi- and transdisciplinary approaches and Big Data vision.*

Keywords: *Human Inteligence (HI), Artificial Intelligence (AI), Human Knowledge (HK), Scientific Research* (SR) *Inter-, Multi-, and Transdisciplinarity (IM&TD), Big Data, Internet of Things (IoT).*

1. INTRODUCTION

A researcher or scientist as an intelligent man must be morally virtuous at the same time, otherwise, this human quality ceases to be creative and sooner or later becomes destructive. In its beginnings, an honest individual appeared in the Chinese conceptualization of intelligence, more precisely it characterizes the Confucian conception whose essence was exposed in the Analects two and a half millennia ago (Confucius,1999) [1].

Between the thought or thought of Confucius, his word or speech and his deed or activity there was a continuity or at least a total agreement, unanimously considered as an absolute type of agreement, which his disciples desired and felt to be almost perfect... A Confucian approach to an implicitly virtuous way of intelligent thinking presupposes that the meaning given to virtue in thought describes the unequivocal continuity of thought in intelligent communication and intelligent deed or act... In a synthetic expression, intelligent individuals continuously and invariably define themselves by the fact that what they think, say and do is not contradictory but in a perfect similitude. The difference between the Chinese and the Greek meaning of intelligence known as "*noesis*" which just means "*the act of thinking*" is a limiting one. The ancient Greek meaning of intelligence has generated by extension a science called "*noesiology*" which studies the effects produced in life by each thought.

This way of investigating scientifically has as a consequence the fact that the formation, evolution and even healing of man are achieved through thinking, consistently defining "*noesis therapy*" ...

The Roman accent was moved to "*sapientia*" or the need for knowledge and more pragmatism. What is the different nature and evolutionary essence of Human Intelligence (HI), from the beginning to modern or the most recent concept? The solution of the philosophy's significance followed an entire circle, described by mathematics, and then by psychology to evolve finally towards the same philosophy:

i) *Associationism-sensualist-empiricist philosophy* emphasizes the role of active research of correlations and associations as essences of pragmatic thinking;

ii) *Gestaltism-phenomenology and Kantian apriorism* insist on the finding that the holism of thinking requires the structural knowledge of its components but also of the relationships between the components, expanding thinking beyond the simple aggregation or summation of information;

iii) *Behaviorism - vulgar materialism and pragmatism* bring behaviour and virtue back into the space of thought as an important goal of humanity's evolution;

iv) *Freudianism* - disinterested in the study of thinking, considers a secondary way (in genetic order) to satisfy biological motivation identifying in thought and especially in intelligent thought a survival and reproduction of the individual

as motivation that can significantly alter any type of reasoning, as a priority.

Thinking intelligent became and remained the fundamental attribute of the human individual with René Descartes and his *Discourse on Method* (*Discours de la méthode*). (1637) [2]. By his famous statement "*cogito ergo sum*" ["*Je pense, donc je suis*" or "*I think, therefore I am* (exist)"],

René Descartes identified the way of thinking with consciousness and considers it as a given quality, the peremptory proof of self-existence is practically identified with the in vivo realization of the process of thought. In the most important research, not the answer, but the question generates a new way of intelligent thinking and prepares everyone for coherent scientific knowledge...

In this context, what are and how are Human Intelligence (HI) and Artificial Intelligence (AI) become fundamental questions for the present and the future of mankind. The conceptualization of Human Intelligence (HI) and Artificial Intelligence AI have complex and controversial tasks, as there still is no consensus on how to define or operationalize both. However, philosophers, mathematicians, psychologists and physicists have developed various methods and instruments to assess different aspects and dimensions of intelligence, from tests to scores offered by quotients, factors of analysis and multiplying etc.

2. HUMAN INTELLIGENCE (HI)

In any fundamental concept's essence, in order to clarify both notionally and practically, the idea of human intelligence (HI), several questions must find a simple and clear answer: What is intelligence? What is human intelligence? Historically, what was the original notion and how did it evolve according to the main theories in the fields of philosophy and psychology? How are forms of HI practically measured? What typology does HI have? Who are the key figures in this process of conceptualization and deepening of HI?

Nowadays, intelligence is defined in the most common way as the ability to understand, learn and apply knowledge. Intelligence reunites skills in many different domains and in various actions when human beings must reason, solve problems and think logically or based on evidence. The word intelligence is coming from Greek Culture and its famous Cosmos and the term was characterized as the divine minds. The first used expression was the Greek word "*nous* (νοῦς) or *the power of the mind to Xenofan*" and the first signification was considered similar to the highest faculty of the human mind. The original meaning was associated to the responsibility for rational thinking, understanding, and intuition. "*Nous*" became to Aristotle "*proton kinoun*" and it was described as "*noesiss* or *energeia*" making a clear separation from the other ancient forms of thinking as "*episteme, aesthesis, doxa and dianoia"*. Gradually, "*noessis*" acquired the meaning of intermittent thinking, because it implies the transition from potency to act or action (Peters, 1967, pp. 190-199) [3] But, looking for the presence of morality, the ancient Greeks have created and used another term "*phronesis* (φρόνησις)", transforming intelligence in a real virtue and adapting it to reality. The new significance was closer to practical wisdom or prudence, and the phronesis enabled human beings to act morally and virtuously in different situations. This more complete sense could be learned and cultivated in ancient Greek agora and through dialogues with adequate mentors. The intuition of ethical values, treated with slight disdain by the cynic Antisthenes, becomes intellectual intuition in dialogues with Socrates, being synonymous with virtue or "*arête*". The nuance of intelligence through *phronesis* will be restricted to the sphere of morality in Aristotle, being separated from "*theor*y" or "*Sophia*", which has become theoretical wisdom (Peters, 1967, p. 224) [3].

The ancient Roman philosophers continued the search for the most appropriate term to name intelligence and left a legacy of the closest synonym "*intellectus*" (from Latin intellegere, with the meaning of *understand*). Thus the ancient Roman language used intelectus to refer to the faculty of understanding, comprehending, and reasoning, underlying also the importance of the term "*ratio*" as the real basis for logic and science. Ancient Latin as the language of the Roman Empire used also the term "*sapientia*" (from "*sapere*" meaning to know) as the major reference to the wisdom or knowledge that enabled human individuals to live well and achieve happiness. But "*sapientia*" was simultaneously related to the concept of "*virtus*" (*virtue*), which was the moral excellence and courage that characterized a good Roman citizen.

A deeper or more extensive knowledge and understanding of reality, including human nature, transformed "*sophia*" from Greek philosophers into "*sapientia*" to the much more pragmatic Roman thinkers (Saunders, 2023) [4].

Human Intelligence (HI) is usually defined as a "*mental quality that consists of the abilities to learn from experience, adapt to new situations, understand and handle abstract concepts, and use knowledge to manipulate one's environment*" (Sternberg, 2022) [5] or in a real brief proposition "*human intelligence is rational thinking*".

Some initial psychological definitions or inceptive conceptual boundaries overestimated the role of the ability to think abstractly as a special talent for verbal and symbolic thinking (Terman, 1916) [6], while others redefined the attitudes emphasizing the importance of learning ability to achieve success based on personal standards and

sociocultural context (Thorndike, 1920) [7] or exaggerated the capacity to give good answers to difficult questions or expanding the similitude with a set of skills that make it possible for a person to solve problems in life and especially to find solutions, which involve gathering new knowledge (Gardner, 1983; 1989) [8-9]. The concept of intelligence was for the first time generalized by a British psychologist, Charles Edward Spearman, in his book "*The Abilities of Man*" (1927), being established as the most adequate and somehow unique term, able to describe a general mental ability or a set of mental abilities (Spearman, 1927) [10]. Perhaps the brief and synthetic definition including the importance of self-critical thinking belongs to Alfred Binet, born *Alfredo Binetti*: "*intelligence is a capacity to think well, to judge well and to be self-critical*." (Binet, 2016) [11]. New and completely different definitions as accent have emphasized specific aspects of intelligence multiplying the skills required of a man or woman to 10 broad abilities that in turn are subdivided into 70 narrow abilities, in a specific period of time, characterizing different traditions and cultures or certain professions (Fig. 1).

[1] Fluid intelligence (reason, form concepts, and solve problems)
[2] Crystallized intelligence (breadth and depth of a person's acquired & communicate knowledge)
[3] Quantitative reasoning (comprehend quantitative concepts and manipulate numerical symbols)
[4] Reading & writing ability (basic reading and writing)
[5] Short-term memory (apprehend and hold information in immediate awareness and use it in a few seconds)
[6] Long-term storage and retrieval (store information and fluently retrieve it later in the thinking process)
[7] Visual processing (perceive, analyze, synthesize, and think with visual patterns)
[8] Auditory processing (analyze, synthesize, and discriminate auditory stimuli)
[9] Processing speed (perform automatic cognitive tasks, particularly when measured under pressure).
[10] Decision/reaction time/speed (immediacy with which an individual can react to stimuli or a task)

Source: Realized by author from Kaufman, 2009 [12].

Fig. 1. The 10 broad abilities that generate Human Intelligence (HI)

An educational dictionary underlines the capacity to acquire and apply knowledge as the major characteristic of human intelligence (HI), but more and more frequently, adaptation to the environment becomes the key to defining what HI is and understanding what HI does. Modern definitions try to prove that only certain human individuals are truly intelligent or to measure different types of Human Intelligence (HI) based on different characteristics of the basic level established from different criteria, based on various processes of conceptualization (Fig. 2):

HI is inborn.
HI of every person is different like DNA.
HI is basic ability and practiced skill.
HI is a group of abilities.
HI and knowledge are closely related.
HI helps in learning and in adjustment.
HI helps in solving complex problems.
HI is an ability to gather experience.
HI Is an ability to do intellectual works.
HI is an ability to face social situations.

Environment affect HI.
Environment training & education affect HI
Heredity affects HI.
HI cannot be acquired.
HI does not differ due to sex differences.
HI is not knowledge but is related to it.
HI is not talent.
HI is not memory.
Skill can be learnt but not HI.

Source: Realized by author based on (Piaget, 2001) [13]; (Kaufman, 2009 [12]; (Sternberg and Kaufman, 2011) [14]; (Hunt, 2011) [15].

Fig. 2. Some Characteristics of Human Intelligence (What *is* HI appears *in blue* and what *is not in red outline*)

Allport Gordon defined creativity in his book titled "*Personality: A psychological interpretation*", in 1937, as a personality formation, which cannot be limited only to some categories of personality manifestation, to skills or only to intelligence and thus he recognized the importance of HI, in psychology (Allport, 1937) [16]. The human being as a creative person can possess multiple variants of intelligence, from a verbal-linguistic or visual-spatial nature of HI, to a kinetic or rhythmic-musical type, from the category of interpersonal HI to intrapersonal HI, from individual HI to team HI, or even more to social HI, from the naturalistic one to academic or intellectual HI, complemented by the new type of emotional intelligence (EI), partnership intelligence (PI), existential and social intelligence (E&SI). Emotional intelligence (EI), as an example, was used for the first time in 1985, by Wayne Leon Payne in his PhD thesis with the sense of ability which implies a creative relation with states of fear, pain and desire (Savoiu, 2006) [17]. One of the first conceptual delimitations belongs to Peter Salovey and John Mayer: „*the abilities to perceive emotions as correctly as possible and to express them, to accede to or generate feelings when they facilitate thinking, to know and understand the emotions in order to promote*

intellectual and emotional development" (Săvoiu, Jovanovska, 2010) [18].

The meanings given to Emotional Intelligence later and EI definitions become quite different from the original ones. Daniel Goleman offers the most credible significance of Emotional intelligence, where EI contains different substances and elements like self-knowledge (self-trust), self-control (*adaptability, desire for truth* and *innovation*), motivation, empathy, and social aptitudes. Reuven Bar-On considers EI rather a reunion of intrapersonal aspects with interpersonal aspects, adaptability, stress control and the general state, underlying the self-satisfaction (Săvoiu, Jovanovska, 2010) [18].

Any human being can try to identify and measure not only his own Human Intelligence (HI) using different quotients (QI for academic intelligence, QE for emotional intelligence, QP for partnership intelligence) but also to analyze HI factors. A German psychologist, like William Stern, renowned for his development of the intelligence quotient (IQ), concept underlined the importance of the quantity of intelligence in measuring IQ scores as the average performance (100). The purely quantitative approach to intelligence sets standard tests and limits or thresholds for IQ called scores, usually placed between 70 and 130. The qualitative approach to intelligence is rather focused on factor analysis of HI. This statistical method or technique entitled factor analysis can identify clusters of related items on tests that measure common underlying abilities or constructs. *Factor analysis* can be used to analyze the structure and components of intelligence tests and to identify different types of intelligence or mental abilities that contribute to overall intelligence (Sternberg, 2022) [5]. Based on this statistical method Charles Spearman proposed a general intelligence factor (g) able to identify and underly all specific mental abilities (s), such as verbal, spatial, or numerical skills, and Louis Thurstone and Raymond Cattell suggested and define other multiple primary or independent factors of intelligence, such as fluid intelligence (the ability to reason and solve novel problems) and crystallized intelligence (the ability to use acquired knowledge and skills).

Even the theories of multi-dimensional HI reveal the importance of understanding both the diversity and unicity of HI, whether it is coming from any type of the major intelligence theories:

i) general intelligence;
ii) primary mental abilities;
iii) multiple intelligences;
iv) triarchic approach to intelligence.

(unitary, monarchic, group factor, oligarchic, anarchic, or eclectic theories etc.)

HI remains for each human being the intellectual capability marked by complex cognitive attributes or characteristics and high levels of motivation and self-awareness, characterized by Confucian virtue (modern ethics or morality) and realized with self-impact consciousness. The most used synonyms for HI are: Human Cognition (HCo), Human Intellect (HIn), Human Reasoning (HRe), Human Mental Abilities Reunited (HMAR), Human Brainpower (HBp) etc.

The creative person was thus considered over-gifted as compared to the medium intelligence level. A creative individual is original, innovative and adequate reality. The creative person can possess many types of intelligence, ranging from the verbal-linguistic or visual-spatial one to the kinetic or rhythmical-musical one, from the category of interpersonal or intrapersonal one to the social intelligence, from the naturalistic one to the academic or intellectual intelligence, supplemented by the emotional intelligence & partnership intelligence (Săvoiu, 2006) [17].

A modern vision of the competitive type of human intelligence is generally considered three-dimensional, comprising synthetically *the academic or intellectual intelligence* (II) (theoretical), defined as an aggregate capacity to reason, express oneself and calculate together with cognitive abilities, *emotional intelligence* (EI), synthesizing people's capacity to solve problems and to face challenges and difficulties, as well as *partnership intelligence* (PI), reuniting the ability to build relationships with that of developing trust, simultaneously with achieving some predetermined objectives through association with someone else.

The most modern widely used intelligence tests are the Stanford - Binet Intelligence Scale, the Wechsler Adult Intelligence Scale (WAIS), the Wechsler Intelligence Scale for Children (WISC), and the Raven's Progressive Matrices, Goleman or Reuven Bar-On derived emotional intelligence test (EQ), Stephen Dent test for partnership intelligence (Dent, 2004; Goleman, 2006) [19-20].

Perhaps not accidentally after 1900, the quite various typology of intelligence has widened the already specific HI with another form, with an exceptional future, existential intelligence (Săvoiu, 2006, Săvoiu, Jovanovska, 2010 [17-18]. This type of intelligence "*amplifies the empathetic character of pragmatic activities (politic, economic or social) of major projects or activity, evaluating a special talent, a very rare ability, respectively that of answering convincingly the most delicate of the questions of the team's members, concerning the existence and meanings of their common activities, cultivating the feeling of common belonging, simultaneously with the praise of the individuality*". (Săvoiu, Jovanovska, 2010) [8].

Simplifying or summarizing all previous explanations, HI is dominantly inborn and seems to come not in too large a proportion from experience. HI help an individual to adapt to new situations, to understand and handle abstract concepts, and use

knowledge to manipulate one's environment. Some of the *key people* for the concept of HI remain Confucius, Xenofan, Aristotle, René Descartes, Alfred Binet, William Stern, Allport Gordon, Lewis Terman, Edward Thorndike, Alan Kaufman, Jean Piaget, Henri Bergson, Francis Galton, Howard Gardner, Robert Sternberg, Louis Thurstone, Raymond Cattell, Wayne Leon Payne, Daniel Goleman, Reuven Bar-On, etc.

3. ARTIFICIAL INTELLIGENCE (AI)

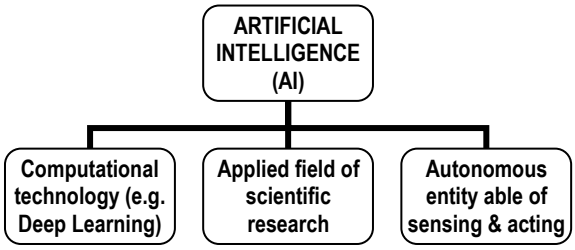
Similarly to the historical meaning of Human Intelligence (HI), the conceptualization and even the exemplification of the notion of Artificial Intelligence (AI) must identify coherent answers to several questions: What is the definition of Artificial Intelligence (AI)? What is and what is not AI? What exactly does this type of intelligence represent? What is the brief history of the concept of AI and how has it evolved up to now? Who are the parents, fathers & mothers as major figures in the process of conceptualizing and multiplying the real forms of AI? What are the usual forms and practical types more often encountered by AI? What typology does AI have in the modern world? What is the future of AI and the currently anticipated dangers for intelligence and even the human being?

The public perception of AI remains still nebulous for the majority of people. One can suppose primarily that Human Intelligence (HI) is commonly defined as a combination of too many and too diverse abilities. Indeed, HI underlines the final aim of human beings, especially how to make one individual understand the world as real and potential risks, and thus to offer individuals the possibilities to adapt and to survive. In that case, Human Intelligence (HI) seems to be rather more complex compared with limited Artificial Intelligence (AI), which appears to focus only on the following components: learning, reasoning, solving problems, percepting and using many languages and modern ways of communication.

Artificial Intelligence (AI) is currently gaining in popularity compared with Human Intelligence (HI) and the potential of HI. This aspect is in part the result of the fact that individuals have started to use the term AI more and more often than HI. Human beings refer to many things frequently as AI, including not only usual components of AI but special concepts and "smart" systems:

1. Big Data;
2. Internet of Things (IoT);
3. Machine Learning (ML);
4. Chatbots or AI bot (e.g. Google's AI-powered chatbot or AI bot ChatGPT-Generative Pre-Trained Transformer), etc.

Artificial intelligence (AI) is a concept realized in a multidisciplinary intersection of three modelling academic disciplines, the first being psychology (through cognitive modelling and the first knowledge of human intelligence), the second philosophy (through the unique knowledge of the mind and the modelling of human intelligence, the example of syllogism ancient philosophers being a revealing one) and informatics, the latter but not the last, through the input brought with the help of linguistic, mathematical and logical components. There are too many modern definitions of Artificial Intelligence (AI). Totally distinctive significances can be collected from relevant and different sources, with diverse research topics. At the same time, it is increasingly more difficult to define AI. "*A significant variety of judgements and viewpoints that allow for first understanding and then creating an agreed upon the message on the goal and definition of A.I."* (Monett & Lewis, 2017) [21]. Even the process of defining AI means a dependence on too many inter-, trans-, and multidisciplinary natures of scientific approaches, the context of research or focus type. In this case of too much diversity of significances one can prefer the major benchmarks of Artificial Intelligence (AI) (Fig. 3)



Source: Realized by author from (Theodorou & Dignum, 2020) [22].

Fig. 3. Some major benchmarks of Artificial Intelligence (AI)

Also, Artificial Intelligence (AI) is increasingly connected to the Big Data phenomenon, pervasive nowadays and applied across more and more domains, various cultures and geographic areas. In this apparently very complicated case, after a standard conceptualization of AI, extracted from the *Encyclopaedia Britannica*, in which "*Artificial Intelligence is the ability of a digital computer or a computer-controlled robot to perform tasks commonly associated with intelligent beings*" (Copeland, 2023) [23], a short passage through the history of the concept itself is immediately welcome. There is a big difference between all the significances of AI, even among the pioneers or founders of the concept. From AI concept of "*using computers to simulate intelligent behaviour and critical thinking"* (1950), as was originally signified this type of intelligence by Alan Turing to the specific versions of AI definitions belonging to

Marvin Minsky as "*the ability of machines to perform certain tasks, which need the intelligence showcased by humans and animals*" (1955) or to John McCarthy's own conceptualization whence transpires a relative common significance of the same artificial intelligence (AI) as "*science and engineering of making intelligent machines, especially intelligent computer programs, is related to the similar task of using computers to understand human intelligence (HI)*" (also in 1955), there is a total opposition even though there are only five years between the appearances of the three meanings. A brief history of AI, resignified as "*a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation*." (Haenlein & Kaplan, 2019) [24] must summarize a lot of books and articles, and thus presenting a wide variety of perspectives and also a comprehensive outlook on the future of AI. An adequate answer to *what exactly does this type of intelligence represent* means also to delimit *what AI is and what AI is not?* Two types of definitions generated and distinguished strong AI from weak AI. The major cause of these two types is the descriptive or prescriptive scope, Thus, a descriptive AI definition focuses on the most important technologies and uses (Machine Learning, Deep Learning, Natural Language Processing, etc.). A prescriptive one underlines the key conditions & characteristics that are the essence of AI systems. Many researchers and scientists believe that replication of human thinking or HI, is not a smart endeavour for defining AI and they are focusing not on what AI is, but on what is not AI (Fig. 4)

AI is an abstraction of HI, with rationality corresponding to a certain level.
AI is a specific system of abilities.
Ai is an intelligent machines science.
AI is beyond a specific technology.
AI is focused on Machine Learning.
AI is concentrated on Deep Learning.
AI is centred on Natural Language Processing
AI is an efficient solution for Bigdata
AI is a self-learning system.
AI is a need to learn & be trained to reason from historical data.
AI is a system to learn & respond ergo to what has been learned.
AI is built as a system of devices or tools.
AI is a system's ability to do activities.
AI is a system to know what, when & how to do
AI is an "idiotic" system trying to understand & react like humans.
AI is a system that thinks & acts like humans.
AI is a system that thinks & acts rationally.
AI is a system that does automation.
AI is a system built on the understanding of existing phenomena, acting wisely based on it.
AI is a system acting with little human input but appropriately, independently & intelligently
AI is a system to collect applications, analyzes & make initial decisions.
AI is a system approach where there is a context & data are collected, and analyzed.
AI enables machines to perform automation activities.
AI is an automated data analysis & automated decision-making system.
AI is computers/machines doing intelligent work.
AI is just computer program.
AI is a computer vision.
AI is beyond software development.
AI is a device/software to sense/measure &act/ learn from it.
AI is a device & technology combination.
AI is a various technologies' combination.
AI is a system generating adaptive behaviour.
AI is a system using reasoning, and rules, learning from data & adapt behaviour.
AI is an artificial system built by humans.
AI is a system with cognitive abilities like humans.
AI is a set of abilities to perform any assigned tasks.
AI is any activity created to make machines intelligent.
AI is a simulation or replication of HI in machines.
AI is like an augmented intelligence that provides info for HI.
AI is a combination of abilities to analyze situations based on data & act upon them etc.

AI is not only a theory.
AI is not a specific technology.
AI is not a computer system.
AI is not only an algorithm.
AI is not only data.
AI is not only software.
AI is not only a way of training.
AI is not the same as HI.
AI is not completely imitating HI.
AI is not a replacement for HI.
AI is not a substitute for HI.
AI is not generating optimal behaviour like humans.
AI doesn't have the capability of being human.
AI is not an added value until it gets learning outcomes, visibility & measures.
AI is not everything considered to be intelligent and not human.
AI is not independent, needs human interventions etc.

Source: Realized by authors from (Kaul, et al., 2020) [25] and (Gbadegeshin et al., 2021) [26].

Fig. 4. What is and what is not AI? (What *is* AI appears *in blue* and what *is not in red outline*)

Just as HI manifests itself in different forms (academic-HAI, emotional-HEI, partnership-HPI, social-HSI, etc.) AI is classified as imitating HI, but according to other criteria in: i) structure AI; ii) behaviour AI; iii) capabilities AI; iv) function AI; v) principle AI; etc. Similar to Hi which helps man to think about work, AI seems to have become just the computer doing intelligent stuff… The universe of AI, implicitly the multiplied AI significances, previously described and listed (Fig. 4), would not have been possible without the presence of the amazing British mathematician Charles Lutwidge Dodgson, better known as Lewis Carroll (Wilson, (2008) [27] and of the magic science fiction writer Arthur Clarke Together with Isaac Asimov they anticipated the AI amazing areas or territory of "*advanced technology indistinguishable from magic*" (Haenlein & Kaplan, 2019) [24].

Michael Haenlein & Andreas Kaplan distinguish four seasons-like periods in a brief history of AI similar to their presence during the year, in an original manner focus on the repetitive seasonal substrate criterion (Fig. 5). The spring means the birth of the first machine, test, word and theory of. The birth of the English AI roots is connected with Alan Turing, a mathematician, and his work on creating and developing a machine with the purpose of deciphering the secret Enigma code. The American Birth of AI is associated with cognitive scientist Marvin Minsky (co-founder of the MIT laboratory) and to computer scientist John McCarthy (Stanford). Together with Rockefeller Foundation, they organized a famous workshop in which they brought among the participants two other great American researchers considered the founding AI fathers, a computer scientist Nathaniel Rochester, who later designed IBM and Claude Shannon a mathematician who founded the *information theory* (Haenlein & Kaplan, 2019)[24].

The next two seasons-like periods, known as the summer and winter of AI history, are full of ups and downs, related to problems that were first seen as "impossibly non-mechanical", but were solved based on AI Intelligence and AI Machines providing solutions "*in the domain of apparently ordinary computing processes*" (McCorduck, 2004) [28]. AI winters mean a decreased interest in publicity on artificial intelligence. The first two AI winters can be detailed as periods: (1974-1980) and (1987-1993). Some major signs from scientists and companies predict a new AI winter from 2023, till the legal rules of AI can be fulfilled. Some major ascendant evolutions of AI are generated by the following events and actions, synthesizing how it evolved from its inception:

i) the first program-capable *Logic Theorist* to perform automated reasoning was realized in 1956, by Allen Newell, Herbert Simon and Cliff Shaw, frequently described as "*the first AI program"* (Nilsson, 2010) [29];

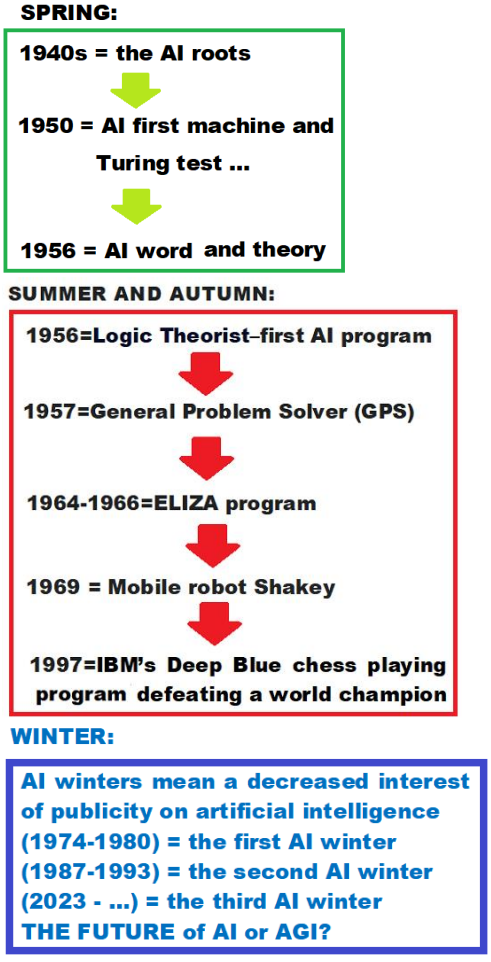
ii) the well-known program *General Problem Solver* (GPS), developed in 1957, by the same researchers Herbert Simon, Cliff Shaw and Allen Newell, based on the technique of *Means - Ends Analysis* (MEA), which was used commonly in AI (Newell & Simon, 1961; Simon, 1981) [30 – 31];

iii) the famous program ELIZA for computer, considered the first chatbot, created by Joseph Weizenbaum between 1964 and 1966 (Haenlein & Kaplan, 2019) [24];

iv) the first general-purpose mobile robot called Shakey was built in 1969, capable of doing things with a purpose, compared to a list of instructions;

v) the expert system made by James Lighthill beat the world champion Gary Kasparov in 1997 (IBM's Deep Blue chess playing program); etc.

vi) the emergence and increasingly intense development of deep learning, Bigdata, Internet of Things (IoT) and Artificial General Intelligence (AGI) characterize the last 12 years of AI's existence, from 2011 till the present.



Source: Realized by author from (Haenlein & Kaplan, 2019) [24], McCorduck, 2004 [28] Nilsson, 2010) [29] Newell & Simon, 1961; Simon, 1981) [30-31]). Note: *Although being unanimously accepted, the roots of the first AI program seem to be older (1951), when Christopher Strachey gave birth to a checkers-playing program for the Ferranti Mark I computer* (Strachey, 1952; 1954) [32-33].

Fig. 5. A brief sketch of the Artificial Intelligence (AI) history characterized by a timeline focus on seasons-like periods as substrate criterion

In a much more realistic overview and more inclusive history, the roots of AI are connected to the emergence of the first computer, without which it would have been virtually impossible for this type of intelligence to ever appear. Charles Babbage in 1822 built the first digital (calculating) machine that produced the most useful of mathematical tables automatically.

Thus, the great-grandfather Babbage of the modern computer showed his extraordinary ability to quantify quickly and with great accuracy, first at the University of Cambridge, between 1828 and 1839. After 1920, Babbage's digital machines expanded step by step in the area of being useful and were present wherever digital machines were requested. After the Second World War, apparently aged but still effective, the new computing machines will change their name initially to "*analog*" and finally to "*digital*" computers (Babbage, 1994) [34]. The "*analog*" computer was created by James Thomson, the inventor of the mechanical disk integrator used as the foundation of analog computing (Thomson, 1876) [35].

In 1936, at Cambridge University, Alan Turing outlined the principle of the modern computer transformed into a digital calculating machine, consisting of unlimited memory and a scanner that moves back and forth through memory, symbol by symbol, reading whatever also finds by writing additional symbols (Turing, 1936) [36].

Max Newman eventually noted the essential components of a computer:

i) storage for numbers (or commands);

ii) augmenters, multipliers, etc.

iii) "*an automatic telephone exchange*" that selects "*cases*", connecting to the arithmetic organ and writing the answers in prescribed cases;

iv) moving the control in any stage and in any chosen order, if a certain condition is met, otherwise moving to the next order in the normal sequence;

v) ways of setting up the machine from scratch and extracting the final answer in a usable form (Newman, 1948, pp. 273–274) [37].

These outstanding scientists and their contributions are considered the minimum milestones of the beginning of modern computer history (Copeland, 2020) [38] and it is absolutely normal to include this computer-focused sub-periodization as a distinct chapter in the evolution of AI. Also, AI entered the home as Roomba, a vacuum cleaner (2002), then like speech recognition, robotic process automation (RPA), dancing robots, and Alexa Skills Kit (ASK), to generate at the end even smart homes. Based on other innovations, AI penetrated the business world through companies like Facebook, Twitter, and Netflix (2006), in the entertainment universe, IBM's Watson won Jeopardy, a quiz show, where AI solved complex questions as well as riddles (2011). In 2012, *Google now* launched an Android app feature able to provide information (prediction) to the user, and in 2014, the famous *Eugene Goostman* Chatbot won a competition in the infamous *Turing test*. Finally, in another year, 2016, DeepMind's AlphaGo program, powered by a deep neural network, beats Lee Sodol, the world champion *Go* player, in a five-game match. Year by year, AI developed itself to a remarkable level of intelligence. The concept of Deep Learning, Bigdata, the Internet of Things (IoT) and many others are now areas of excellence for AI, that can solve all promptly and, above all, much more correctly and efficiently in time, compared to HI. Nowadays companies like Google, Facebook, IBM, and Amazon are working with AI and creating amazing new and useful devices. In 2023, new ChatGPT models leveraging large linguistic models (LLMs), generate the biggest change in AI performance and its potential to generate value (companies) new deep learning models can be trained in the prior analysis of large amounts of data raw, unlabeled.

The parents of AI, detailed as fathers and mothers are major figures in the process of conceptualizing and multiplying Artificial Intelligence. Analyzing the last century in search of the parents responsible for the rise of AI, one can identify, after a careful selection five prominent figures who laid the foundations for the development of such an impressive technology, perhaps the most holistic approach to reality and objectivity from all types of intelligence. Alan Turing, Allen Newell, Herbert Simon, John McCarthy and Marvin Minsky are not only exceptional scientists but also researchers called the "*fathers of AI*". Even a category of "*mothers of AI*" can be found and detailed too (Spark Cognition, 2018). *Although it is really difficult to pinpoint among so many contributors, the most important parents of AI remain forever Alan Turing & John McCarthy.*

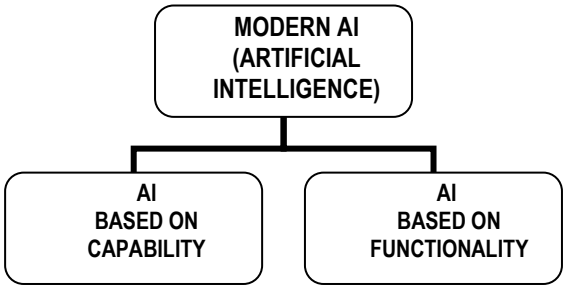
What is the essential typology of AI? Stuart Russell and Peter Norvig offered four objectives that became four starting criteria for a basic typology and even for some potential definitions of AI (Russell & Norvig, 1962) [39]. These objectives & criteria differentiate computer systems based on rationality & human thinking versus human action generating four distinctive AI categories (Fig. 6).

1. THINKING LIKE HUMANS ARTIFICIAL INTELLIGENCE
2. ACTING LIKE HUMANS ARTIFICIAL INTELLIGENCE
3. THINKING RATIONAL ARTIFICIAL INTELLIGENCE
4. ACTING RATIONAL ARTIFICIAL INTELLIGENCE

Source: Realized by author from (Russell & Norvig, 1962) [39]

Fig. 6. One of the first typology of AI

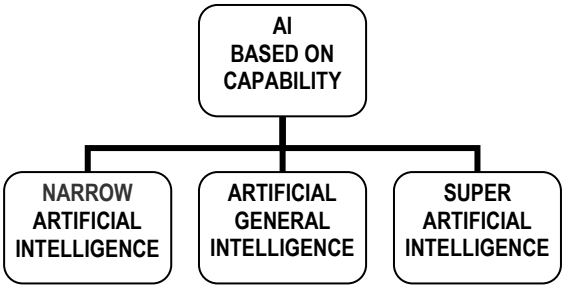
Modern AI benefits from a "*tiered*" typology and is successively divided into different types and subtypes. If the subtypes are addressed directly, two major typologies can be distinguished, that share all subtypes: *AI based on capability* and *AI based on the functionality* of this continuously expanding kind of intelligence (Fig. 7).



Source: Realized by author from (Theodorou & Dignum, 2020) [22] and (McCarthy, 1996) [40]

Fig. 7. A "*tiered*" typology's example of AI

AI, based on capability, has three recognized subtypes on this major criteria being exemplified in the following lines and presented in Fig. 8:



Source: Realized by author from (Theodorou & Dignum, 2020) [22] and (McCarthy, J. 1996) [40]

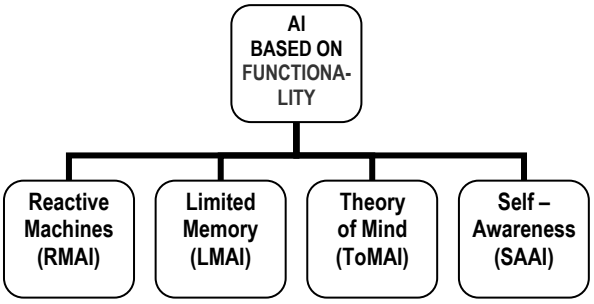
Fig. 8. A sub-typology of AI based on capability.

i) Narrow Artificial Intelligence (*Narrow AI or NAI*) is considered the most common and available subtype of AI, able to perform a task in which was trained but no more (e.g. playing chess, playing Go, self-driving cars, speech & image recognition etc.);

ii) Artificial General Intelligence (*General AI or AGI*) can theoretically perform any intellectual task more efficiently compared to a human being (e.g. no machine "gifted" with General AI or system equipped with General AI exist till now, but a lot of projects are still under research);

iii) Artificial Super Intelligence (*Super AI or ASI*) is the dream or a hypothetical level of AI at which machines or systems could surpass HI, performing any task better than human beings with cognitive properties, based on some key characteristics of strong AI including ability to think, to reason, to solve a puzzle, to make judgments, to plan, to communicate, to learn, to foresight by its own (e.g. such machine or system still does not exist, but projects are in the minds of researchers and even in full process of creation and becoming).

There are also another four subtypes of AI on the functionality criterion (Fig. 9):



Source: Realized by author from (Theodorou & Dignum, 2020) [22]) and (Copeland, 2023) [23].

Fig. 9. A sub-typology of AI based on capability.

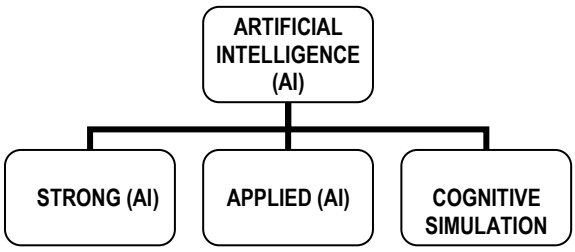
i) Reactive Machines (RMAI) is one of the most basic subtypes, RMAI does not store memories or past experiences for future actions (e.g. IBM's Deep Blue system, Google's AlphaGo etc.);

ii) Limited Memory (LMAI) is based on current scenarios and react on searching for the possible best action, LMAI can store past experiences or some data for a short or limited period of time (e.g. self-driving car can store variables evolutions like: speed of the other cars, the distances of other cars, legal speed limit, and other information to optimize the navigation)

iii) Theory of Mind (ToMAI) can understand human beings' emotions, people's beliefs, ability to interact socially etc., but ToMAI still remains in plain development and an unfinished project.

iv) Self-Awareness (SAAI) is the future, not only because of the idea of super-intelligence, but also for the wish of having own consciousness, sentiments & self-awareness; SAAI. does not exist in reality now and remains a hypothetical concept, something smarter than the human mind or HI.

Some of the modern approaches to Artificial Intelligence (AI) already have an adequate structure and brief history, being connected to the specificity of the investigated complex phenomenon (Fig. 10):

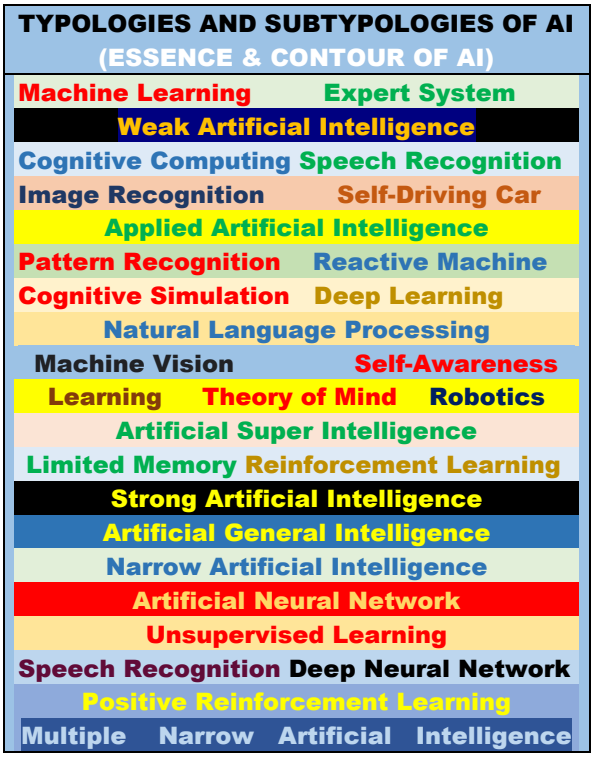


Source: Realized by author from (Copeland, 2023) [23]

Fig. 10. A modern major classification of Artificial Intelligence (AI)

Strong AI, *Applied AI* & *Cognitive Simulation* are the major types of AI and the result of the most important AI's classification. In fact, this typology reflects the three goals to be achieved by AI's

research. *Strong AI*, introduced by John Searle the philosopher from the University of Berkley, means *to build machines that think*, one of the ultimate ambitions of *Strong AI* being to produce machines with intellectual abilities but indistinguishable from any human person or HI. *Applied AI* is also known as advanced information processing with the visible intention to produce commercially viable *"smart"* or "expert" systems and in *Cognitive Simulation*, computers are used to test theories about how HI solves problems, using new methods and techniques.



Source: Realized by author

Fig. 11. Some major words on AI's wall as a visual synthesis of AI significances & colloquial forms

The first 12 original branches and applications of AI were relatively easy to predict from the beginnings of this type of intelligence (Mc Carthy, 1959; 1989; 1990; 1996; 2007) [41- 45].

12 AI Branches	12 AI applications
Logical AI	Game Playing
Search AI	Recommendation System
Pattern Recognition	Speech & Image (Facial) Recognition
Representation	Autonomous Vehicles
Inference	Expert Systems
Common Sense Knowledge&Reasoning	Understand/Learn Natural Language
Learning from Experience	Data Security and Surveillance
Planning	Computer Vision
Epistemology	Convolutional Neural Networks
Ontology	Chatbot/ ChatGPT
Heuristics	Heuristic Classification
Genetic Programming	Predictive Analytics

Source: Realized by author from (Copeland, 2023) [23] *and from (McCarthy, 1959; 1989; 1990; 1996; 2000; 2007)* [40 - 45]

Fig. 12. The first 12 branches & applications of AI

There must be at least one well-known image and logo of AI applications in Fig. 13 for anyone, as real proof that AI is deeply involved in every human life, from communication to the learning process, or that AI is already indispensable in everyday life:

LOGO	EXPLAINED LOGO (INITIAL RELEASE YEAR)
	Microsoft SwiftKey is a virtual keyboard offering more accurate autocorrect & predictions by learning the client's way of writing, developed by Touch Type for Android & iOS devices (2010).
	Databot assistant is a virtual talking robot-iOS, Android & Windows answering requests upon the topic of interest, giving back images, searches, and multimedia presentations (2011).
alexa	**Amazon Alexa**, also known simply as Alexa, is a virtual AI assistant technology based on a Polish speech synthesizer named Ivona, bought by Amazon (2013).
	Socratic By Google is an educational tool that, by means of photographic recognition, allows its users to answer practically any scientific question (2013)
	ELSA Speak & Speech Analyzer is an AI-powered conversational English fluency coach that listens to your speech and provides you with immediate feedback (2015).
	Google Assistant software, based on AI is an application engaged in two-way conversations that was primarily available on mobile & home automation devices (2016)
	FaceApp is the best mobile photorealistic and video editing application for iOS & Android, developed by FaceApp Technology Ltd, using neural networks based on AI (2016)
R	**Replika (Robot ChatGPT)** is a virtual companion powered by AI for anyone who wants a friend with no judgment, drama, or social anxiety involved, created by Luca Inc (2017)*
	ChatGPT is an artificial intelligence chatbot developed by OpenAI and it was released in November 2022.

Source: Realized by author from Applications/Artificial Intelligence-From sources across the web, Available online at:*https://www.google.com/search?client=avast-a-1&sa=X&q=Artificial+Intelligence+applications&stick*

*Note: Eugenia Kuyda established *Replika* when she was working at Luka, in 2012. After a friend of hers died in 2015, she converted his messages into a chatbot.

Fig. 13. Some examples of images & logos of the first nine well-known AI applications

4. COULD BECOME "AI vs HI" A CONFLICT FOR FINDING NEW SOLUTIONS IN INTER-, TRANS-, & MULTIDISCIPLINARITY, OR A IMPROVED SOLUTION FOR BIG DATA, INTERNET OF THINGS & CHATBOT?

What could be the cleavages or conflicts between HI and AI? The purpose of human intelligence is to combine a series of cognitive activities to adapt to new circumstances. The goal of artificial intelligence (AI) is to create computers capable of behaving like humans and completing tasks that humans would normally do. As long as AI does not serve the optimization or the integration of HI, can appear signs of evolution, which isolate first, and then even generate conflicts?

Certainly and continuously, some essential characteristics, differences and idiosyncrasies of HI & AI must appear. All these existed, are and will multiply always, but at the same time will have to be permanently known, understood in their dynamics, and also revealed to all human beings.

What is the essential difference between human and artificial intelligence? The purpose of human intelligence is to combine a range of cognitive activities in order to adapt to new circumstances, new information, and new universe evolutions. The goal of artificial intelligence (AI) is to create computers that are able to behave like humans and complete jobs that humans would normally do… HI means more than just logically processing data and information and this aspect help human being to reach a superior stage of survival on Earth. Here some fundamental reasons are detailed suggesting why AI will never be able to compete with HI: i) Sensory Data means HI is based on all five uman senses, while AI is not able to replicate all of these senses; ii) Creativity of HI remains unique compared with AI, which cannot AI can be trained to behave like a human being or to develop a human personality; iii) Moral or ethical judgment based on HI's specific way to explain and distinguish between what is right and what is wrong for humanity; iv) Intuition or inspiration specific to HI, based or not on logical reasoning of human beings, which can break new ground in knowledge and discover new solutions in research using emotional, team and partnership energy.

AI is only one or two levels above basic computer programming but below the much higher HI's level or horizontal. Of course, with such a brief history, AI is still far beyond what HI remains capable of. HI applies acquired knowledge with logic, reasoning, understanding, learning and experience and even though AI advancements are connected to language processing, vision, image processing, development and common sense still remains a great lag in the challenge or debate AI vs HI that requires human intervention.

Perhaps this is caused by the reality of the fact, and maybe AI in the future can mimic human behaviour using something similar to human "common sense". Figure 14 compares & opposes Human Intelligence and Artificial Intelligence (HI vs AI) in a synthetic manner, underlying some important features and specificity and reveals once more the idea of no conflict in between:

FACTORS		SOME DIFFERENT ASPECTS (HI vs AI)
Emergence & Nature	HI - Natural Specificity	HI was a philosophical term used for the first time in the ancient cultures of Greece and the Roman Empire, naturally enriched with cognitive abilities of human beings from thinking, reasoning, analyzing, controlling to evaluating etc. and thus to adapt to new situations through a natural combination of cognitive processes.
	AI - Induced Features	AI is coming from Norbert Weiner's concept of feedback mechanisms and John McCarthy's machine intelligence is defined as a "*science and engineering of making intelligent machines, especially intelligent computer programs*" and focuses on improving the HI development to perform optimally any task, from visual perception, speech recognition, decision-making to natural language understanding.
Knowledge & Inference	HI - Natural Specificity	The implicative-causal approach precedes specific reasoning, but the rules that human experts use, frequently contain subjective and vague expressions, so it is more usefulthe idea of an expert system's inference engine than humans.
	AI - Induced Features	The rules are based on If questions (e.g. If x, then y, if y then z), and the inference engine is able to deduce correctly (e.g. If x, then z). Later, the expert system queries its user, and if the answer is affirmative the system will proceed to infer.
Multi-tasking & decision making	HI - Natural Specificity	HI can work on several different tasks at the same time and in different fields. Faster access to inter-, trans-, cross- & multidisciplinarity is still favourable to any intelligent human being as a major ability, and a holistic approach still remains a specific aspect of HI.
	AI - Induced Features	AI still faces significant difficulties in front of multi-tasking, no computer, machine, software or program could do simultaneously so many tasks as HI, or take much longer to do such a thing. AI's access to inter-, trans-, cross- and multidisciplinarity is only in its beginnings.
State & Functions	HI - Natural Specificity	HI is rather comparable to any analogical mind and is better in processing information in a continuous and non-linear fashion and faces difficulties in processing in the case of Big Data type phenomena, HI can use better cognitive abilities to understand and interpret the world around, but take subjective decisions based on experiences and knowledge.
	AI - Induced Features	AI is connected to digital & virtual unlimited possibilities. AI operates better Big Data Bases. using binary code, as some series of 0s and 1s. AI is well-suited for repetitive or data-intensive tasks, and can process and analyse large amounts of data accurately, but depends on HI instructions,

Learning & Pattern Recognition	HI - Natural Specificity	HI has a key ability to learn from past experiences and adjust human behaviour accordingly, allowing human beings to adapt & survive. HI includes another significant ability to find order in complex data, and Ray Kurzweil was among the first to point out that pattern recognition is the basis of human thought (HI).
	AI - Induced Features	AI is nearly devoid of the ability to reason abstractly, think creatively, make connections, and uses 3 types of pattern recognition: statistical, structural (or syntactic) & neural. AI includes more recognition types, from speech, text pattern, facial, movement and video recognition, to medical image recognition.
Versatility & Endless Multiplication	HI - Natural Specificity	HI possesses the ability of multitasking, performs many totally different assignments, and is always subject to human error, and it remains typified between classic limits to academic or intellectual, emotional, partnership, existential & social intelligence as the major HI kinds.
	AI - Induced Features	AI perform simultaneously a limited number of tasks but compensates for this aaspect with the multiplication of its forms from Narrow, General & Super AI, to Strong, Applied AI & Cognitive Simulation or to Reactive Machines, Limited Memory, Theory of Mind & Self-Awareness etc.
Common Sense & Context and Nuances	HI - Natural Specificity	HI signals and differentiates instantly in terms of context and nuances benefiting from common sense whenever it is called textually or verbally, in images or sounds. Human communication and interaction rely on a vast background of unspoken assumptions and this large notion of common sense allows human beings to communicate quickly, efficiently, and with deep meaning
	AI - Induced Features	Common-sense reasoning becomes a field of AI that aims to help computers understand and interact with people in more natural ways for deciphering contexts, nuances, and meanings and thus teach all to computers NLP as an area of ML helping common-sense systems to become highly adaptive.

Source: Realized by author from (Mc Carthy, 1996) [40] (Kurzweil, 2012) [47] (Havasi, 2014) [48] (Hoa, 2020) [49] (Naveen, 2022) [50] Thakkar, 2023) [51].

Fig. 14. Factors and Differences between HI & AI (HI vs AI)

Of course, there are many more differences or opposite characteristics between AI and HI, from distinct origins, born or inborn, the calculation speed and accuracy or related errors, objectivity or subjectivity in scientific approach, power and speed of adaptation, social interaction, self-awareness and maturity, legal restrictions and ethics, etc.

Big Data, the Internet of Things (IoT), and Chatbot are some major applications of AI, as they heavily rely on AI algorithms and technologies, but also most accessed solutions as machines using AI by all generations. The most important aspect in the communication and promotion of AI or the major purpose of continuous development of AI, from viable Big Data solutions to adequate IoT reactions or Chatbots' replies, is well-known as trying to outperform HI in time and power of synthesis. AI must be adapted, changed and transformed in many cases according to the model of Big Data, Internet of Things (IoT), and Chatbot to ensure helping, optimizing or even perfecting HI.

Big Data involves a better and briefing analysis of large datasets, IoT uses AI to rapidly automate processes, and chatbots use natural language processing to communicate more clearly than HI. Big Data represents an inter-, trans-, and multidisciplinary concept, initially used and valued only in statistics, informatics, mathematics and econometrics and, finally, subsequently generalized, to describe large and complex sets of data arising from multiple sources and requiring much more advanced technologies and methods processing, storage, and analysis. Big Data appears in the practice of scientific research in more and more fields and subfields, in which the volume of information continuously increases, generating both new applications and benefits for companies and for the entire human community (sometimes going as far as human society as a whole). Big Data applications cover a diversity of fields from government & public administration, management, marketing, transportation, business, healthcare, to cybersecurity etc.

The large volume of data interpreted with the help of AI becomes easier to understand, being distributed more structured and homogeneous, becoming more cursive from a logical & chronological point of view. Big Data ultimately reduces the typology of data and limits the associativity or correlation of unreliable sources, validating/invalidating more and more investigative hypotheses, but constantly increasing the veracity of solutions as more sources, processes and types of data appear in which the assurance of accuracy, completeness, their timeliness and reliability, as well as protecting data against unauthorized access, use or disclosure, by calling on new types of devices, such as cloud systems, web applications, video streaming, social networks. media, voice assistants, IoT sensors and biometric scanners, edge computing devices, fog computing networks and hybrid cloud environments (Dwivedi, et al. 2021) [52].

Among the advantages of using Big Data solutions with AI technologies [from machine learning (ML), deep learning (DL), natural language processing (NLP), computer vision (CV), graph analysis (GA)] to non AI solutions [from quantum computing to neuromorphic calculus] we can mention: i) more advanced processing and analysis; ii) more detailed and more easily scalable technologies and methods to process, store and analyze massive amounts of data in real-time or as close to real-time as possible; iii) ensuring more personalized and smarter services; iv) automation of tasks, optimization of processes, improvement of performance, generation of synthetic information,

more reliable prediction or forecasting & creation of informational (added) value etc. (Dwivedi, et.al. 2021; 2023) [52-53].

The Internet of Things (IoT) is a complex concept consisting physically of a network of objects in which they are embedded with sensors, software and other technologies and which allow to connect and exchange data with other devices and systems through the Internet and or other communication networks based on AI. IoT includes a large typology of physical objects, from appliances to cars, vehicles, wearables, etc. IoT has multiple applications in different industries and fields: i) health monitoring and improvement in healthcare; ii) automation and optimization of functions and comfort at home, through devices such as smart thermostats, lighting systems, security cameras or voice assistants in the new smart homes; iii) improving navigation and safety, using devices such as GPS systems, traffic sensors, cameras or smart cars in transport; iv) business efficiency with the help of RFID tags, barcode scanners, stock management systems; v) optimization of work performance and productivity, based on sensors, actuators or robots; vi) creating added value through analysis platforms, dashboards or recommendation systems; vi) improving public services and governance, through the use of smart meters, street lights or waste management systems by governments and administrations; vii) increasing transparency and accountability, with open data platforms, citizen feedback systems or blockchain networks.

"*Smart city*" becomes the trendy application area of AI through IoT, incorporating "*smart home*" as well. Smart home consists of IoT enabled based on AI and home appliances, air-conditioning/heating system, television, audio/ video streaming devices, and security systems. All of these communicate with each other using AI in order to provide optimal comfort, security and reduced energy consumption. All these new dialogues and communications take place through IoT-based central control unit using the Internet and AI. The concept of a smart city gained popularity in the last decade and attracted a lot of research-connected activities.

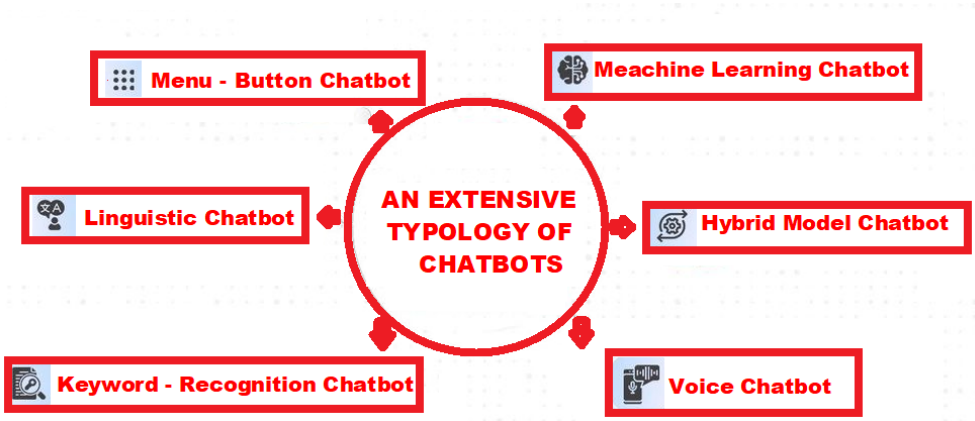
Modern applications of AI illustrate that intern and international markets' share of IoT projects is higher year by year. It is evident that industry, smart city, smart home, smart energy, smart business and smart vehicle based on AI and IoT projects have a big market share in comparison to others non-AI or classical activities and projects

IoT has a major impact on various ethical aspects of human life and values, from privacy to surveillance of people's locations, behaviours and interactions without violating human rights and civil liberties.

The original chatterbot or chatbot is nothing else but a software application that aims to mimic human conversation through text or using voice interactions, typically online. The beginings of the notion and practical example of "ChatterBot" were originally coined by Michael Mauldin in 1994, who was in fact the first creator of the first Verbot based on conversational programs. At the most basic level, the first chatbot is equivalent to any computer program able to simulate & process human beings' dialogues or conversations (either written or spoken communications). Any chatbot is driven by AI, based on automated rules and Natural-Language Processing (NLP) & Machine Learning (ML), being ready to answer requests of all kinds. Also, all chatbots allows a human being to interact with digital devices, as if AI tries to communicate with HI. Major Chatbots types can be: i) simple (e.g. rudimentary answers to dialogue with just a line response); ii) sophisticated (e.g. digital assistants that evolve day by day).

Modern classification of chatbots uses tasks to detail the same categories and identifies: i) *Task-Oriented* or *declarative chatbot* (e.g. based on a single program that focuses on performing one simple function and generating conversational responses to user inquiries); ii) *Data-Driven* or *predictive/conversational chatbots*, often being met under the name of digital or virtual assistants (e.g. Alexa is a sophisticated and multi-task interactive chatbot). Advanced digital assistants are also able to connect several single-purpose chatbots under one umbrella, pull disparate information from each of them, and then combine this information to perform a task while still maintaining context, so the chatbot doesn't become "*confused*."

A detailed classification of Chatbots must be a more extensive typology including new or modern subtypes or subclasses. From all the six subclasses presented in Fig. 15, the hybrid chatbot model can offer the best of both worlds (rules-based Bots & AI-Bots) and thus it becomes the best solution, reuniting the simplicity of dialogue, from question to answer, with the complexity of investigation or literature review research, in the Chatbots' universe which looks apparently infinite or inaccessible.



Source: Realized by author from (Engati Team,2023) [55]

Fig. 15. An extensive typology of Chatbots including some of the dominant modern subclasses

Even when the first three major advantages and disadvantages of Chatbots are selected hierarchically (Fig. 16), there are solutions for permanent AI improvement:

Chatbots' Strengths

A. I can recall data, information, texts and synthesis from previous conversations with clients and thus can offer specific or personalized responses (Everything has continuity).

B. Can allow clients to correct any misunderstandings or errors in the previous interactions (everything implies errors' presence).

C. Can be programmed to refuse inadequate or harmful clients' requests (everything has inadequacy in relation to an unethical request).

Chatbot's Weaknesses

A. I can sometimes provide incorrect or even untruthful data and information due to natural limitations in training data or understanding information (nothing is deeply correct).

B. May inadvertently provide instructions or suggestions that are harmful or biased without Knowing this aspect (nothing is deeply usefull).

C. Can offer limited knowledge of current events and developments beyond the training data and information (nothing is unlimited).

Source: Realized by author

Fig, 16. The first three strengths & weaknesses of Chatbots

From these strengths & weaknesses of Chatbots, one can define some derived major AI principles:

Everything in AI has continuity and discontinuity.
Everything implies errors' presence, even errors' absence.
Everything has inadequacy linked to an unethical request.

Nothing in AI is totally correct or incorrect.
Nothing is definitely useful or unuseful.
Nothing is really unlimited or limited.

Source: Realized by author

Fig, 17. Six derived principles of AI from the strengths & weaknesses of Chatbots

From the simplest form, where AI is described as a field, which combines computer science and robust datasets, to enable problem-solving to its complex conceptualization as an inter-, trans-, and multidisciplinary term, where AI becomes the real substitute of the modern holistic approach in research and education, trying to help HI. AI can be also defined as an attempt of combining concepts, techniques and methods, from more and more disciplines, including computer science, cognitive science, linguistics, physics, statistics, mathematics psychology, sociology, neuroscience, philosophy or ethics, etc. AI also encompasses sub-domains in education or sub-fields in scientific research-based machine learning and deep learning investigations, which are frequently mentioned in conjunction with artificial intelligence. All these disciplines and many others are comprised of AI algorithms which seek to create expert systems which make better predictions or classifications in education based on input data, and also find more correct solutions in research activities.

5. COULD AI BE A REAL THREAT TO HUMANITY OR EVERYTHING IS JUST "*MUCH ADO ABOUT NOTHING*"?

From the conceptualization of Intelligence, as "*the computational part of the ability to achieve goals in the world*" (McCarthy, 2007) [45], Human Intelligence in a so-called "*heuristic hypothesis*" is a human characteristic or a specific feature of human being (Turing, 1950) [56], somehow similar and different at the same time, to all humans benefitting of similar intellectual mechanisms with only some small differences, all related to "*quantitative biochemical and physiological conditions*" (Jensen, 1998) [46], a leading researcher in human intelligence, suggests that I see them as speed, short term memory, and the ability to form accurate and retrievable long term memories.

Human intelligence (HI) is typologically much more extensive in relation to artificial intelligence (AI). Psychologist Howard Gardner identified no less than eight types of intelligence: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal and naturalistic, to which Robert Sternberg and Daniel Goleman added other types of intelligence: creative, practical or emotional, and the multiplication continues even today with other forms of partnership-type intelligence, social existential, etc. Some possible synonyms for HI remain viable for a long period of two millennia as wit, insight, wisdom, intellect, acumen, shrewdness, astuteness, keenness, etc. Some possible synonyms for AI are totally new and permanently updated like: Machine Intelligence (MI), Computational Intelligence (CI), Synthetic Intelligence (SI), Artificial Cognition (AC), Artificial Intellect (AIntellect) etc.

Intelligence, whether human intelligence or artificial intelligence, can be both a threat and an opportunity, depending on how it is used and the context in which it must operate. Intelligence can be a threat anytime when HI or AI are used for malicious purposes or to manipulate and exploit other human beings. Advanced technologies driven by HI, such as AI, can be employed for cyber-attacks, surveillance, or the development of autonomous weapons. In the wrong hands, intelligence (HI or AI) can be harnessed to cause harm, disrupt social systems, or infringe upon privacy or security.

The same concept or term, named intelligence, whether human intelligence or artificial intelligence can present numerous opportunities for positive advancements. It enables human beings to understand and solve complex problems, make informed decisions, and create innovative solutions. Both Hi and AI are essential for scientific and technological progress, leading to advancements in healthcare, education, communication, and more. Together HI and AI can help human beings address global challenges like climate change, poverty, and inequality, playing a crucial role in personal development and self-improvement of human beings. It is more and more important to understand the real truth or the pragmatical vision, that intelligence, be HI or AI, each one by itself is always neutral or must remain together non-committal forms of thinking. How intelligence is used in general and the ethical considerations surrounding Hi and AI applications determine whether each one can become a threat or an opportunity. Only human society must prioritize responsible and ethical use of intelligence (both Hi and AI) to maximize the opportunities presented together while mitigating their common risks. Or threats.

Does artificial intelligence (AI) become an existential risk or opportunity for academic education and scientific knowledge and research?

Of course, according to this vision, AI alone can be both an existential risk and an opportunity for academic education and scientific research. As necessary exemplifications, the first three general aspects in which AI could become an existential risk would be:

i) *automation of jobs*, when AI has the potential to automate certain tasks and jobs, which could lead to significant disruptions in the job market, including the academic sector, with a negative result consisting in job losses and unemployment for certain professions;

ii) *bias & discrimination*, where AI systems are trained on data, and the training data is biased, inevitably the AI algorithms could perpetuate and amplify those biases (e.g. in academic education & research, biased AI systems could reinforce existing inequalities or hinder the progress of marginalized groups);

iii) *ethical challenges*, which appear instantly when the development and use of AI raise ethical questions that need careful consideration (e.g. in academic education and research, issues like privacy, data security, and responsible AI deployment, need continuously to be addressed to ensure ethical practices and prevent misuse of AI technology.

But also, AI can be an opportunity, as one can see from the following four examples:

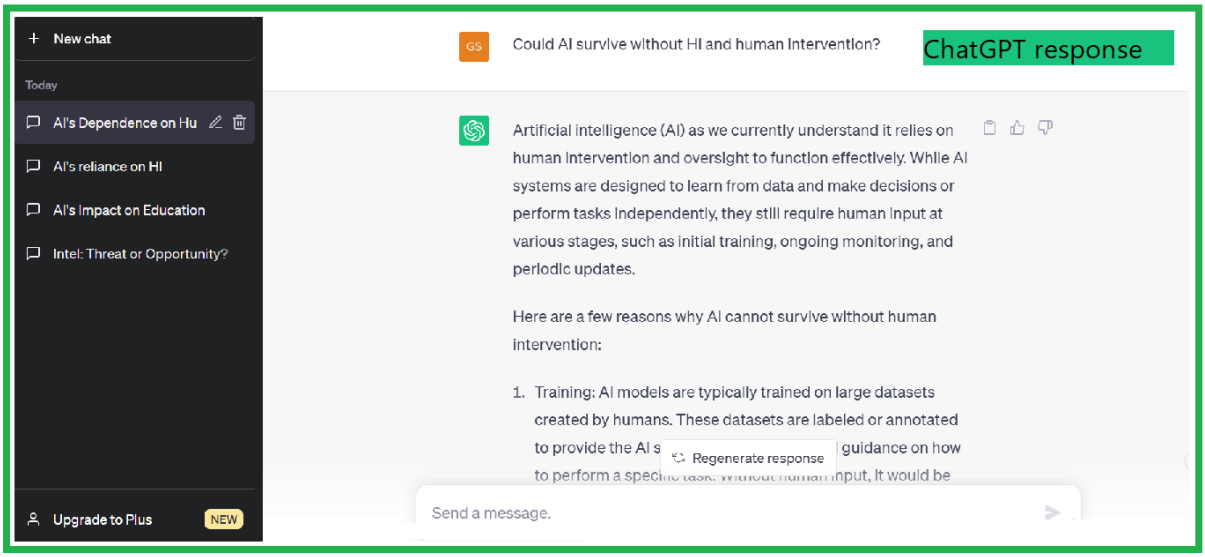
i) *enhancing learning experiences*, when AI can be used to develop personalized learning systems, more adapted to individual student needs or preferences, and providing intelligent tutoring, virtual simulations, and personalized feedback, or finally, more engaging educational experiences);

ii) *accelerating scientific discoveries*, where AI has the potential to analyze Big Data quickly and identify patterns and insights that HI may not easily discern, leading to breakthroughs in scientific research, such as drug discovery, genomics, climate modelling, and other complex scientific endeavour;

iii) *automation of repetitive tasks*, where AI can automate routine and repetitive tasks in academic education and research, such as grading assignments, managing administrative duties, generating free up time for professors and researchers to focus on more creative and critical aspects of their activity;

iv) *collaboration and access to knowledge*, when AI-powered platforms can facilitate collaboration among researchers and educators, enabling them to share resources, insights, and data more efficiently, enhancing access to knowledge by providing language translation, text-to-speech capabilities, and content recommendation systems to bridge language and accessibility barrier etc.

In an attempt to synthesize and maximize the benefits of AI and mitigate potential risks, it is crucial to ensure responsible development, deployment, and governance of AI technologies in academic education and scientific research. Ethical considerations, transparency, and ongoing evaluation are key to leveraging AI as a valuable tool rather than a threat. The most difficult aspect of AI remains the idea of threat and existential risk, and this is generating many other subsequent questions, and from all of them the following interrogation was selected at the end of the paper: *Could AI survive without HI and human intervention?*



Source: Image retrieved by author from *https://chat. openai.com/?model=text-davinci-002-render-sha* Accessed May 30, 2023

Fig. 18. ChatGPT response to one of the major paper's questions: *Could AI survive without HI and human intervention?*

Probably the most convergent answer is the one given by a Chatbot. Here the incredible entire answer to a ChatGPT is following:

"*Artificial Intelligence (AI) as we currently understand it relies on human intervention and oversight to function effectively. While AI systems are designed to learn from data and make decisions or perform tasks independently, they still require human input at various stages, such as initial training, ongoing monitoring, and periodic updates. Here are a few reasons why AI cannot survive without human intervention:*

***1. Training:** AI models are typically trained on large datasets created by humans. These datasets are labelled or annotated to provide the AI system with examples and guidance on how to perform a specific task. Without human input, it is challenging to create accurate & relevant training data.*

***2. Bias and Ethics:** AI systems are susceptible to bias and can reflect the biases present in the data they are trained on. Human intervention is crucial to identify and address bias in AI algorithms, ensuring fair and ethical outcomes. Additionally, humans are responsible for defining ethical guidelines and regulations that govern AI use.*

***3. Adaptability and Updates:** AI systems need to adapt to changing circumstances and new information. Human intervention is essential to evaluate and update AI models to ensure their continued accuracy and effectiveness. Without human intervention, AI systems would struggle to keep up with evolving needs and challenges*

***4. Unforeseen Situation:** AI systems may encounter situations they were not explicitly trained for, or they may encounter data that differs significantly from their training data. In such cases, human intervention becomes necessary to guide the AI system or make critical decisions that fall outside its.*

While there is ongoing research and development in the field of AI, including areas like unsupervised learning and self-improving systems, the current state of AI heavily relies on human input and intervention."

No answer could be more credible as long as it is also so easy to argue because: i) AI systems are developed and designed by humans, and they require human intervention and oversight to function effectively; ii) AI systems rely on human programmers and engineers to develop algorithms, train models, provide data, set objectives, etc. and requires ongoing monitoring and maintenance to ensure their performance and address any issues that may arise; iii) to ensure that AI systems align with societal values and legal frameworks human

input is crucial for setting goals, and defining ethical guidelines.

However, the new idea of Artificial General Intelligence (AGI) surpassing HI and operating entirely without human intervention raises the same complex questions and concerns related to control, ethics, and the potential impact on society. It is a topic of ongoing debate and speculation, and there is no consensus among experts on when or if such scenarios may become a reality. In summary, while AI systems currently require human intervention and oversight, future advancements may bring us closer to the possibility of AI systems operating more autonomously, but the extent and implications of such autonomy are yet to be fully understood.

Though there already exist a lot of identified advantages or major opportunities, especially in academic education and scientific research, however, interest in Ai's disadvantages and risks has grown nearly exponentially.

Some major risks are more highlighted during the last year, mostly focused on:

i) automation-spurred job loss;
ii) privacy and security violations;
iii) deep fakes and manipulations;
iv) algorithmic bias caused by bad data and false databases or sources;
v) deep socio-economic inequalities;
vi) market volatility and even major instability;
vii) weapons automatization, etc.

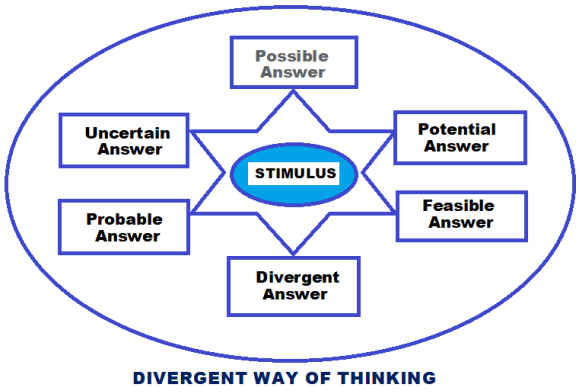
But it should not be overlooked that although AI has done, is doing and will continue to do an excellent job imitating intelligent action, it has not yet succeeded in replicating human thought processes or HI's creativity and deep common sense. As the hope for a better future for AI dies last, I continue to believe that AI-assisted Hi will eliminate the vast majority of risks through prompt regulations and offer more real advantages and a better perspective of opportunities.

Artificial Consciousness (AC) or Machine Consciousness (MC) with direct reference to the new non-biological machine, created by a human being and his creative HI, tries to become aware of its own existence and think as if it had a human mind, awareness and common sense. AC represents the next level of future strong AI. Specifically, AC is about nothing else but a chatbot equipped with AI, awareness and common sense. Artificial Consciousness (AC) or Machine Consciousness (MC) will greatly help systems that involve relationships or human interactions.

Finally, I believe that everything about AI threats or risks can be considered after a faster approval of new regulations regarding HI's use of AI, the vast majority of fears will acquire ironic shades of Shakespeare's language, more precisely, all will generate perhaps "*much ado about nothing*"!

6. SOME FINAL REMARKS

Is artificial intelligence (AI) more intelligent than humans or is it not? To answer this question, it is essential to understand the way new ideas appear, the birth and source of human creativity and the specificity of HI. In 1967, American psychologist Joy Paul Guilford split and restructured creative thinking into *convergent thinking* and *divergent thinking*. In the psychometrics performed by Guilford on the human intellect, the essential and detailed differences of the two ways of thinking were very well addressed. In essence, *convergent thinking* brings together the abilities of the human being to correctly answer questions, which represent in detail a suite of successive demonstrations of memory and logic. *Divergent thinking* becomes a way of thinking that is used to generate creative ideas by exploring several possible solutions, spontaneously, freely, and "*non-linearly*", generating in a short time a lot of new ideas, through unexpected connections and in an emergent cognitive manner (Fig. 19):



Source: Realized by author

Fig. 19. A synthetic image for a divergent way of thinking

Convergent thinking has already become the property of AI and slowly, slowly divergent thinking will be divided between AI and HI.

Many recent studies estimate that by 2030, about 70% of companies will become AI customers and adopt some form of AI technology in industrial, business, educational, research, planning and decision-making processes, so "*AI could potentially deliver an additional economic output of around $13 trillion by 2030, boosting global GDP by about 1.2 per cent a year"*. (Bughin, *et al*., 2018) [57].

One essential question still remains without answer: *What is the future of AI and the currently*

anticipated dangers for intelligence and even human being? This question and many others like it have recently found a coherent, effective and encouraging answer for the human being and for the future of Artificial Intelligence.

These very days when I finished writing this paper dedicated to HI & AI, a new form of association and dialogue between AI and HI appears in international scientific research, known as the "*Digital Bridge*". "*Digital Bridge*" has become perhaps the most exciting invention of a multi-disciplinary team of neuroscience researchers in Switzerland, which has a long-standing program to develop brain-computer interfaces to overcome paralysis. The project aimed to use wireless signals to reconnect the brain with muscles that become useless when spinal cord nerves are severed. Thus this new form of successful communication & clear collaboration between AI and HI digital bridge opens an exceptional future for both. Future opportunities AI technology in all its forms is likely to see greater levels of adoption within organisations as the range of applications and levels of automation increase. Procrastination or the intentional delay of AI evolution, as in the case of other major scientific discoveries is a widespread phenomenon (Rabin, et al.,2011) [58].

But AI's procrastination can negatively impact learning, political, economic, and social achievements, from governance to public administration, from academic self-efficacy to quality of life, from holistic scientific research to companies and efficiency in affairs, etc [59-60].

AI's procrastination is increasingly viewed as the worst consequence or the result of the lack of AI rules implementations involving failures in self-regulation & ethics, processes commonly regarded as extremely important.

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