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# A critical overview of the "Ancient Artificial Intelligence" science, today's AI, and its relation to the Pandora's myth!

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## Abstract

The concept of what defines Artificial Intelligence (AI) has changed over time, since the ancient periods. The history of Artificial Intelligence (AI) began in antiquity, with myths, stories and rumors of artificial beings endowed with intelligence or consciousness by master craftsmen. A critical historical overview of ancient Greek Intelligent technologies is provided. With the fast-growing integration of advanced AI methods and powerful AI systems into core social institutions in our everyday lives, we are confronted with an electronic world where digital bots or electronic 'agents' are already representing us in our human and social interactions. AI's technological aptitude for the design and production of intelligent software and artefacts, is in fact the greatest intellectual challenge of our time. A lot of treats and risks emerge with many of the AI technologies and methods. These threats and risks are compared with the myth of Pandora's box arriving to some interesting conclusions. The possibilities and limitations of designing creative intelligent systems that are shaped by purpose and judgment, transcending instrument reason of the causal model. Given the nature of this AI technological progress is unpredictable, there is a need to undertake proactive policy measures and a regulatory framework to mitigate the threats and risks of current and/or future innovations and breakthroughs.

## 1. Introduction

The title of this paper should make us wonder: was Artificial Intelligence (AI) known in the Ancient periods? What is AI today? The answer depends on how scientific events have been historically interpreted since the down of civilization. Thus, what is its relation to today's Artificial Intelligence? How is Edge Intelligence related to AI? Is there any similarity of AI to the myth of Pandora's box? In this paper all these issues are briefly considered, and some very interesting remarks and conclusions are made.

Everybody believes that Artificial Intelligence (AI), was born in the modern scientific world, when officially started in 1956 at Dartmouth College[1]. But even before this workshop that gave birth officially to AI there are other related studies that can be considered as the front runners of the AI. In 1308 Catalan poet and theologian Ramon Llull publish Ars generalis ultima (The Ultimate General Art), in an effort to further create new knowledge from combinations of concepts [2]. In 1666 mathematician and philosopher Gottfried Leibniz publishes Dissertatio de arte

combinatorial (On the Combinatorial Art), following Ramon Llull above publication. Leibniz is proposing an alphabet of human thought and arguing that all ideas are nothing but combinations of a relatively small number of simple concepts [3].

Humankind has perfected its industry over the years by not only depending on "technical evolutions" but also by recreating them taking into consideration new resources which have reinventing new technical means. Science in classical antiquity encompasses inquiries into the workings of the world or universe aimed at both practical goals as well as more abstract investigations regarding "natural philosophy". The period between 8th century BC and the 6th century AD is traditionally defined as the Classical Hellenistic Period. In this period the ideas regarding nature that were theorized were not limited to science but included myths as well as religion. Some of the more widely known "personalities" active in this period include Aristotle, Plato, Socrates, Hippocrates, Confucius, Euclid, Archimedes, Hipparchus, Galen, Ptolemy, and some others. Their contributions and commentaries spread throughout the Eastern, Hellenic, Islamic, and Latin worlds and contributed to the birth of modern science. Their works covered many different categories including mathematics, cosmology, medicine, and physics [1,2].

The scope of this paper is an attempt to overview some of the ancient scientific developments that can be related to some specific characteristics of artificial intelligence (AI) that are significant to scientific practice today. A comparison to ancient scientific developments and especially to the myth of Pandora's box is provided.

## 2. A historical overview of some ancient "Intelligent technologies"

Until Historians tend to trace the idea of the "automaton" or "intelligent technologies" back to the medieval craftsmen who developed self-moving machines. However, this is partly truth. Indeed, the history of Artificial Intelligence (AI) began in antiquity, with myths, stories and rumors of artificial beings endowed with intelligence or consciousness by master craftsmen. AI began with "an ancient wish to forge the gods"[4]. Aristotle (384–322 B.C.) was the first to formulate a precise set of laws governing the rational part of the human mind. He developed an informal system of syllogisms for proper reasoning, which in principle allowed one to generate conclusions mechanically, given initial premises. "Logic is new and necessary reasoning", Aristotle [2], [4], and [5].

In the Hellenistic period (323-31 BC), many brilliant Greek scientists produced a variety of machines, driven either hydraulically or pneumatically. The Ancient Greeks recognized that automata, and other artefacts with natural forms –imaginary or real – could be both harmless and dangerous. The automata in the Hellenistic world were intended as tools, toys, religious spectacles, or prototypes for demonstrating basic scientific principles. Numerous water-powered automata were built by Ktesibios, a Greek inventor and the first head of the Great Library of Alexandria; for example, he "used water to sound a whistle and make a model owl move. He had invented the world's first 'cuckoo clock'".] This tradition continued in Alexandria with inventors such as the Greek mathematician Hero of Alexandria (sometimes known as Heron), whose writings on hydraulics, pneumatics, and mechanics described siphons, a fire engine, a water organ, the aeolipile, and a programmable cart.

The god Hephaestus had created female robots to carry out his orders. According to Homer, these servants of the divine were – in every way – "as real young women, with sensations and reason, strength, and even voice. Moreover, they were endowed with all the inherent knowledge of the

Immortal Gods". He had also built a fleet of tripod stools, "without driver", that responded to commands to deliver food and wine. The wonders created by Hephaestus were imagined by an ancient society, generally considered to be little advanced from the technological point of view. The various questions are as old as the myth itself: Whose desires do the AI robots mirror? With whom will they learn? Over twenty-five hundred years later, the developers of Artificial Intelligence still aspire to achieve what the Ancient Greeks attributed to Hephaestus, their God of technological invention.

Prometheus and Epimetheus were brothers. The former thought before he acted: he used prospective foresight and only then deliberated. The second reacted before thinking, with all the inherent consequences of impulsiveness. In his dialogue titled Protagoras, Plato contrasts Prometheus with his dull-witted brother Epimetheus, "Afterthinker". In Plato's dialogue Protagoras, Protagoras asserts that the gods created humans and all the other animals, but it was left to Prometheus and his brother Epimetheus to give defining attributes to each. However, Epimetheus gave everything was given by Zeus to the animals. Thus, no physical traits were left when the brothers came to humans, Prometheus decided to give them the stolen fire and other civilizing arts.

The legend of Talos, the ancient Greek robot, can be given an impressive distinction: it birthed the first humanoid robot in history [13]. The myth of the bronze giant and protector of Minoan Crete is relevant even to this day. The bronze hero symbolizes the technological development in metallurgy in the prehistoric Minoan years. They had reached such a high level that they created with their imagination a bronze superhero to protect them. In a modern world obsessed with technology, it might be surprising to know the first humanoid robot was to be found in ancient Greece. He was not born but was made—either by Zeus himself, or Hephaestus, the god of fire and iron, on the order of Zeus. In a coin found in the Minoan palace of Phaistos, Talos is portrayed as a young, naked man with wings. Talos' job was to protect Crete from outside attack. He would not allow ships to approach the island, throwing giant rocks at potential invaders. If an enemy managed to land on the island, Talos' body would automatically heat up into a glow and he would kill the invader with a fatal embrace. Talos was not only protecting Crete from outside enemies, but he was also the protector of citizens from all kinds of injustice. He would tour Cretan villages four times every year, carrying on his back bronze plates inscribed with divinely inspired laws. Their purpose was to ensure these laws were observed in the province. Another very important property of Talos was that he was a servant of justice, much like today's superheroes like Iron Man — revealing the importance ancient Cretans attached to justice.

Intelligent technologies were not created only by Greeks but by others. According to Jewish legend, King Solomon used his wisdom to design a throne with mechanical animals which hailed him as king when he ascended it; upon sitting down an eagle would place a crown upon his head, and a dove would bring him a Torah scroll. It is also said that when King Solomon stepped upon the throne, a mechanism was set in motion. As soon as he stepped upon the first step, a golden ox and a golden lion each stretched out one foot to support him and help him rise to the next step. On each side, the animals helped the King up until he was comfortably seated upon the throne [14].

In ancient China, a curious account of automata is found in the Lie Zitext, believed to have originated around 400 BCE and compiled around the fourth century CE. In addition, Chinese mythology also present on history of AI [8-9]. Zhuge Liang , the famous chancellor in Chinese

history married a young Chinese girl (Miss. Huang) after been impressed by her cleverness. She was making excellent "intelligent machines". When the chancellor went to Huang's house for the first time, he was greeted by two big dogs. The dogs rushed towards him aggressively and were stopped by force by servants of the house. He was soon surprised when he found out that the dogs were actually "intelligent machines" made of wood. He was impressed by Huang's wisdom and decided to marry Her. The two "intelligent machine" dogs present another form of AI in ancient mythical stories.

## 3. Today's Artificial Intelligence: Theories and applications

Just what do people mean by Artificial Intelligence (AI)? The term has never had clear boundaries. The concept of what defines AI has changed over time, but at the core there has always been the idea of building machines which are capable of thinking like humans. In other words, A.I. is the study of how to make computers do things at which, now, people are better. Our Attempt to Build Models of Ourselves. Or, stating differently, can we build artificial people? When, it was introduced at a seminal 1956 workshop at Dartmouth College, it was taken broadly to mean making a machine behave in ways that would be called intelligent if seen in a human. If we want to build machines at least to help us do this more efficiently, then it makes sense to use ourselves as a blueprint. Artificial Intelligence's progress has been staggering. Efforts to advance AI concepts over the past 40-45 years have resulted in some truly amazing innovations. Medical diagnosis, electronic trading, e-learning, speech data mining, energy efficiency of buildings, environmental problems, renewable energy systems, autonomous vehicles, smart cities, and space exploration, are just some of the incredible applications emerging from AI development.

To understand some of the deeper concepts, such as data mining, natural language processing, and driving software, you need to know the three basic AI concepts: 1) Machine Learning (ML) 2) Neural Networks (NN) and 3) Deep Learning (DL).There are also a very large number of research results for ML, NN and DL and have been published. However, all of them are revised old methods of AI and ANN. It is beyond the scope of this paper to analyze further all theories and methods. The interested reader can find a plethora of books and research papers on Journals and Proceedings of International Conferences and Workshops for theories and applications of Artificial Intelligence. Furthermore, lately a new very interesting scientific sub-field of AI has emerged: the Edge Intelligence (E.I.).

Edge Intelligence (E.I.) refers to a set of connected systems and devices for data collection, caching, processing, and analysis proximity to where data is captured based on artificial intelligence. Edge intelligence aims at enhancing data processing and protect the privacy and security of the data and users. Although recently emerged, spanning the period from 2010 to now, this field of research has shown explosive growth over the past five years. A challenging question is due here: what we are after? Edge Intelligence, Edge Artificial Intelligence or simply Intelligence at the Edge. A first look at this question could make us wonder and raise more relevant questions. What do the three terms mean? The same issues, different issues, or identical ones? How are all these questions and issues related in seeking true scientific knowledge to solve problems of the society?

## 4. The threats of AI and the myth of Pandora's box

The Human beings have been aware of the risks associated with knowledge or its associated technologies since the dawn of time. Not just in Greek mythology, but in the founding myths of Judeo-Christian religions, there are signs and warnings against these dangers. Yet, such warnings and forebodings have never made as much sense as they do today. This stems from the emergence of machines capable of cognitive functions performed exclusively by humans until recently. Besides those technical problems associated with its design and conceptualization, the cognitive revolution, brought about by the development of AI also gives rise to social and economic problems that directly impact humanity. Therefore, it is vital and urgent to examine AI from a moral point of view. The moral problems are two-fold: on the one hand, those associated with the type of society we wish to promote through automation, complexification, digitization and power of data processing available today; on the other, how to program decision-making machines according to moral principles acceptable to those humans who will share knowledge and action with them.

Besides the interesting ancient Greek "mythical" technologies, it of great interest to mention and analyze the AI and the myth related to the Pandora's box. In Greek Mythology, the cornerstone of Hephaestus's divine laboratory was a "female android" commissioned by Zeus and given the name Pandora. Each God then endowed this artificial damsel with a human trait: beauty, charm, knowledge of the arts, and deception. Pandora was given as wife to Epimetheus, an individual known for his compulsive optimism. Prometheus, the brother of Epimetheus, warned humankind that Pandora's pot – latter called box -should never be opened. As an intelligent artefact, a vengeful agent of Zeus, the supreme God, Pandora enticed Epimetheus, who was overcome by curiosity and carried out her mission of having a jug of catastrophes opened to torment humankind forever.

However, prediction is crucial as human ingenuity, curiosity and audacity continue to push the boundaries of biological life and death, to promote the fusion of the human and the machine. Our world is undoubtedly unprecedented in terms of the escalation of technological possibilities. But the disturbing oscillation between technological nightmares and the big futuristic dreams is timeless. The ancient Greeks understood that the quintessential attribute of humanity was to have always tried to reach the "beyond human," neglecting the prediction of consequences. We mirror the act of Epimetheus, who accepted the gift of Pandora and only later realized his error. Maybe someday entities with AI will be capable of absorbing the deepest desires and terrors of mortals, expressed in mythical reflections on artificial life.

The present state of development of AI, both in its ability to elucidate emerging cognitive processes in evolution, and in its technological aptitude for the design and production of intelligent software and artefacts, is in fact the greatest intellectual challenge of our time. However, the academic and scientific communities have long debated the threats posed by AI. The AI threats are many and different. It would take a whole new article or even a book, [6], to present and analyze all of them. However, it is worth mentioning a few.

Automation of jobs, the spread of fake news and a dangerous arms race of AI-powered weaponry have been proposed as a few of the biggest threats posed by AI. The threats of new cognition-enhancing drugs, genetics, and "androids" techniques that have the capacity to alter human beings themselves, aren't of purely scientific concerns but these involve ethics, economics, and social policies as well. The results that AI produces, depend on how it is designed and what data

it uses. Both design and data can be intentionally or unintentionally biased. For example, some important aspects of an issue might not be programmed into the algorithm or might be programmed to reflect and replicate structural biases. The AI Now Report [7] provides an insight into social challenges arising from the accelerated integration of AI methods and technologies into core social institutions. The report highlights the way the manipulation of big data by the Tech elites and law enforcement agencies undermines questions of ethical and meaningful accountability and even democracy itself. There are debates on robotics, deep learning, and super-artificial intelligence, self-driving cars, machine learning and biological networks that alert us to the existential threat posed by the future AI. These risks include: the creation of new weapons of mass destruction, or catastrophe through accidental misuse. In addition, AI "underlies human capabilities in strategic decision, social manipulation, voting on elections, hacking, technology research, political campaign, protecting the environment, economic productivity, and whether they are interacting with AI or a person".

The inherent dangers of such powerful technologies have inspired several leaders in the scientific community to voice concerns about AI. Physicist Stephen Hawking said in a 2014 interview with BBC, "humans, limited by slow biological evolution, couldn't compete and would be superseded by AI, while in 2017 in a conference has said "the emergence of artificial intelligence could be the worst event in the history of our civilization. AI will 'transform or destroy' society". Elon Musk called the prospect of artificial intelligence "our greatest existential threat" in a 2014 interview with MIT students at the AeroAstro Centennial Symposium. Microsoft co-founder Bill Gates has also expressed concerns about Artificial Intelligence. During a Q&A session on Reddit in January 2015, Mr. Gates said, "I am in the camp that is concerned about super intelligence. First the machines will do a lot of jobs for us and not be super intelligent. That should be positive if we manage it well. A few decades after that though the intelligence is strong enough to be a concern. I agree with Elon Musk and some others on this and don't understand why some people are not concerned."

In January 2015, Stephen Hawking, Elon Musk, and dozens of artificial intelligence experts, signed an open letter on AI calling for research on the societal impacts of AI. The letter affirmed that society can reap great potential benefits from artificial intelligence, but called for concrete research on how to prevent certain potential "pitfalls": artificial intelligence has the potential to eradicate disease and poverty, but researchers must not create something which cannot be controlled. The four-paragraph letter, titled "Research Priorities for Robust and Beneficial Artificial Intelligence: An Open Letter", lays out detailed research priorities in an accompanying twelve-page document [15-18].Rather than fear mongering, the letter is careful to highlight both the positive and negative effects of AI.

Will Stephen Hawking, Elon Musk, Bill Gates, and the other AI experts signing the open letter, be the Titans Prometheus of our era? They warned the scientists to stop, or at least to diminish the reckless search for AI, because they predicted that, once set in motion, humans would not be able to control it.

Future agents with AI - possibly freed from their creators - "will feel" the need to display the knowledge that is hidden from them; in the path of this desideratum, will they make decisions according to their own logic? Will these deliberations be ethical in the human sense? Or will the ethics of AI be something "beyond the human?" Launched from the Pandora's pot / box - just like computer viruses dropped by some sinister hacker who seeks to make the world more chaotic - misery and evil have flown to pester humans since the world exists. In the simplistic fairy tale

versions of the myth, the last thing to come out of Pandora's box was hope. In more negative versions, the last thing in the jar was the "anticipation of misfortune." Zeus had programmed Pandora to close the lid, holding prescience there. Deprived of the ability to anticipate the future, humanity is only left with what we call "hope."

## 5. Conclusions and Future research directions

With This paper provides a short scientific overview of the evolution of Artificial Intelligent (AI) since the ancient times. The field of AI is broad and still not well defined. It has various subfields and applications across all scientific fields as well as to many issues of the society. The ancient Greek intelligent technologies are remarkable and many of todays' scientific breakthroughs are based on some of them. The first humanized robot that walked on earth, named TALOS, was a bronze giant built in the ancient island of Crete according to the historical myth. Similarly, the myth of Pandora's box when compared with the AI potential threats and dangers, is a remarkable and in a way also humoristic comparison. Paradigms from the Jewish and Chinese ancient cultures indicate that indeed AI has its roots in ancient times. The whole scientific field of AI and its several methods and practices are dancing all around us. Thousands of research studies are performed every year producing many scientific results, thus creating a challenging Big Data Driven World (BDDW).Creativity in science and the arts is open to creative and imaginative innovations, the stakes are now much higher than ever before.

No one denies or even can stop AI technologies which penetrate in our everyday life activities and the accelerated integration of powerful artificial intelligence systems into our world, open countless opportunities for harnessing their potential for creative innovations and breakthroughs. This incredible transition provides a challenge and at the same time an opportunity to design creative intelligent tools and services for the good benefit of the society. However, once Pandora's box of the incredible AI technologies is open, it would require "creative and innovative intelligence", and "wise judgment" to harness its potential as well as "blessed power" to shape it.

Future research topics are numerous and quite challenging. The whole education system needs to be reformed, given more emphasis on anthropocentric values and ethics. Research is needed to investigate how is Edge Intelligence related to Edge Computing and Edge Analytics. Specific comparison between them will unfold challenging issues of AI. From a broader societal horizon beyond the conceptual and methodological preoccupation of academic, research, government, social, religious, business and entrepreneur communities, there is a need for an ongoing dialogue.(Some call this a conversation between technology and society). However, I insist to name it A DIALOGUE. A conversation is between a small number of people and usually it is between two persons. Instead, the Dialogue I propose, between these communities, must reach some concrete and specific decisions which will have a positive impact on the Society. Thus, THISDialogue, is an ongoing one between all stake holders but been sincere, serious, logical, and constructive according to the INDUSTRY 6.0the Wise Anthropocentric Revolution [10]. This then also poses a challenge to the design of intelligent, interactive, innovative, and collaborative "tools and systems" that facilitate and implement the "outcomes" of THISDialogue. The AI machine raises the question of values we hold and judgements we make about shaping the nature and path of wise and prosperous societies.

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