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The Role of Artificial Intelligence (AI) in the Near Future

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Abstract: ***Every aspect of human endeavour has been reformed by the research of man-made intelligence in the field of computer science and as a matter of fact, the quality and speed of productivity in almost every sphere have been greatly improved by PCs with the utilization of intelligently designed computer programs. As a result of this, computers have turned out to be extremely valuable machines which executes smart ideas very quickly. Artificial or man-made Intelligence thus, looks to promote computing by creating machines which don't simply executes shrewd thoughts, but brainstorm keen thoughts. In this paper, we clarified the advanced AI rudiments and the different delegate utilizations of AI. In the setting of present-day digitalized world, Artificial Intelligence is a technology that enables machines to execute the intellectual and creative functions of humans by being able to make decisions independently and finding ways to solve real life problems on their own. The ability to learn is built into most man-made intelligent systems like the robots, which makes it easier for humans to improve their performance. Therefore, this paper is further aimed at investigating the future forecasts for AI and the problems that it will help to solve in one or two decades from now.***

Keywords: Intelligence, Artificial Intelligence, Machine Learning, Computer Science, Forecast

I. INTRODUCTION

These days, the Artificial Intelligence technology has progressed to the extent that we presently have machines that think and behave like humans even if not 100 percent yet. Artificial Intelligence as an aspect in Computer Science has come a long way and it is an area that is still developing and so much researches are carried out almost on a daily basis in this area. AI as a field was at first established to address the question which goes as thus: “is it conceivable to manufacture a machine that can exhibit similar intelligence like that of humans?”. A fundamental advance in the quest for making machine intelligence according to [1] “was made by first understanding the very idea of knowledge representation, reason, learning, perception, and problem solving. Through an understanding of these areas AI researchers discovered much narrower tasks that a machine can perform and it is from there that the field of artificial intelligence was expanded.”

There are two broad categories of artificial intelligence research, given to us in Peter Norvig’s book “Artificial Intelligence: A modern Approach”. They include: general artificial intelligence which has to do with the founding question of artificial intelligence – “is it possible to create a machine that can perform the same intellectual tasks that a human being can?” The second classification of AI research is known as narrow artificial intelligence also called weak AI. The narrow artificial intelligence is not concerned with creating a machine with human intelligence, instead researchers in narrow AI strive to solve specific narrow tasks using this artificial intelligence. Most of the artificial intelligence applications and research being done today falls into the narrow AI classification. Machine learning is one popular subfield of narrow AI that is concerned with finding ways to have computers learn how to carry out a task without being programmed to do so. A popular type of machine learning seen today is known as supervised learning, we equally have the unsupervised learning as a type of machine learning too.

Artificial Intelligence (AI) has a very long and interesting history. Bruce [2] opines that “the beginnings of artificial intelligence are traced to philosophy, fiction, and imagination.” Most researchers and historians also trace the origin of the concept to ancient times where thinking machines and artificial creatures were used in myth and storytelling. McCorduck [3] in her book “Machines Who Think” references the Greek myth of Talos, a man created out of bronze. She stated in her book that “this man was created by the god Hephaestus to patrol and protect the beaches of Crete, along with the more famous story of Pandora and her box, also a creature created by Hephaestus, as two of the earliest examples of mythical thinking machines.”

Some examples of the earliest known non-mythical machines that were built to exhibit some form of ‘tricked’ intelligence is described by Heron of Alexandria (10AD – 70AD) in one of his famous works the Pneumatica [1]. The Pneumatica describes

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several ideas for mechanical machines such as singing birds, and mechanical puppets [4]. These machines do not have the ability to think, they were just mechanical machines built to perform specific tasks normally requiring intelligence.

Quoting from the work of [1], "by the early 17th century the concept of complex machines and the topic of intelligence re-emerged with Descartes's writings on animals. Descartes explored the concept of the mind, body and soul. Descartes suggested that body works like a machine with material properties and that the mind or intelligence is non material, he used animals as an example of complex machines that have no reason or intelligence."

Mathematical logic and formal reasoning were created as a forerunner to modern artificial intelligence. By1642, Blaise Pascal had invented what is credited as the first mechanical calculator, a 12-inch-long mechanical brass box that could perform addition [5]. Thirty years later (in 1672), Gottfried Leibniz had improved on the previous models to create a mechanical calculator that could perform multiplication and division, now known as the Leibniz Calculator.

The present AI systems functions based on their programming or what they are being fed with. However, AI scientists are still faced with the responsibility of building systems that will function independently to a reasonable extent outside their programming box. These systems, should be able to acquire knowledge and figure out how to use the knowledge they've acquired to provide solutions to the problems which humans currently have not been able to solve. It is only when this is accomplished that AI researchers can say that they have achieved their goal.

II. RELATED WORKS

Amanuel [6] carried out a research on Self-Learning Computer Troubleshooting Expert System. This system was designed to help I.T personnels and computer users to solve problems occurring in the computer system effectively and efficiently. The knowledge of domain experts acquired through interview question and document analysis and observation was made when the personnel were troubleshooting problems in offices and laboratories. The acquired knowledge was modelled by using decision tree and represented by rule-based mechanisms. The knowledge which was represented was then implemented using SWI Prolog and its performance was analysed by experts in the ICT office of Addis Ababa University. The outcome of the analysis showed that the expert system is has what it takes to assist the ICT personnel and system users. This is another progress that has been made towards advancing AI is every aspect of our lives and we shall see for certain more of these advancements in the future. Amanuel [6] recommends that the expert system should also be further strengthened to include the knowledge acquired from physical inspection of the computer condition for better decision. He also recommends in his words that "the scope of the expert system should be extended to incorporate other symptoms occurring in the computer system such as physical appearance of the device, sound emitting, LED light, BIOS message, POST (power on self-test) and network problems occurring in the user's personal computer."

Nwulu [7] carried a research on Artificial Intelligence – Now and the Future. Based on his research and findings, computers at present have not formulated new concepts nor provided new solutions, they are still working within the confines of solving problems which humans have found solutions to or have defined algorithms to obtain their solutions. According to this researcher, computers are simply working within the confines of what they are fed with. So researchers in AI still have the task to design computers which would no longer be spoon fed with programs, but they will learn to "cook" so to speak their own programs, after gaining the necessary experience can formulate "recipes" to solve problems, which man at present has no solution to (introduce new concepts), to the amazement of its designers. Until this is achieved, computers would still remain as quoted, "pre-programmed to do exactly what humans want them to do. They accept input and outputs the correct output. They may do it at blazingly fast speeds, but their underlying mechanisms depend on humans having already worked out how to write the programs that control their behaviour".

So future Artificial Intelligence seeks to give birth to "genius" computers which can reformulate the laws on their own like Einstein did in physics, "discover" and "methodize" classical mechanics as did Sir Isaac Newton. Computers which can come up with breakthrough discoveries. AI also has a dream of producing "inventive" computers which can rival human inventors like Thomas Edison (inventor of the electric bulb), the Wright brothers (inventors of the aircraft), Ferdinand Verbiest (inventor of the automobile). These computers, [7] suggested should also rival their designers by conceiving concepts such as "designing" as well, thinking entities like themselves (that is, the intelligent computers). In his view, he argued that it is only when computers become self-decisive, self-intended, conceptually creative, and innovative that they can be said to be truly intelligent, thinking outside their programmed box.

Rupesh and Choudaiah [8] in their research titled Artificial Intelligence and its Role in Near Future, they stated that the idea of creating AI is aimed at making human life easier and that artificial intelligence can achieve great and even greater discoveries and advances for humanity due to its multiple possibilities. In their view, most artificial intelligence systems nowadays now have the ability to learn, which allows people to improve their performance over time. The adoption of AI outside the technology sector is at

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an early or experimental stage though but the evidence suggests that it can provide real value to human lives. They also suggested that the current AI bases its operation on accessing huge amounts of information, processing it, analysing it and, according to its operation algorithms, executing tasks to solve certain problems.

Guy-Warwick [1] carried out a research which he titled Artificial Intelligence – where we came from, where we are now, and where we are going. He stated that "the field of artificial intelligence was born out of a single question: can we create a true machine intelligence?" While humanity's initial dream for artificial intelligence was to build that machine intelligence, Guy-Warwick insisted that the field of artificial intelligence has grown into a much larger and much more applied field with many areas of pursuits and many applications. In his words, "Artificial Intelligence is a fact of the future. Its effects will be seen in potential every industry and those effects might be profound. The use of intelligent machines could be enormously beneficial to humanity, from improving our healthcare system to preventing vehicle deaths." However, he also opined that intelligent machines could also pose significant threats and risks, from autonomous machines making kill decisions, to massive unemployment, to the potential of a general AI existential threat.

A. The 19th and 20th Century Artificial Intelligence

As stated in the work of [1], "towards the end of the 19th century, significant milestones in computational machines and logic were reached with notable mentions being George Boole who invented Boolean algebra (an important component of modern computers) along with Charles Babbage and Ada Lovelace who created what is credited as the first mechanical computer."

The ideas of Samuel Butler ideas on conscious and evolving machines wasn't revisited again until the mid-20th during the information technology revolution.

The beginning of the 20th century was an exciting time for mathematics and computer science and can be marked as a turning point for artificial intelligence progress. In 1936 a landmark achievement was reached and the idea of the modern computer was born with Alan Turing publishing his paper On Computable Numbers [9]. Turing proposed a machine, called today a Turing Machine that is capable of computing anything that is mathematically computable. Turing machines use a tape and as such are capable of executing stored instructions (programs). Turing machines became the basis of what we know as the modern computer. Alan Turing contributed enormously to computer science in his short life and is now considered by some to be the father of computer science. Twenty-six years after Alan Turing revolutionized computer science with his machines he wrote another paper titled "Computing Machinery and Intelligence" where he proposed a test of a machine's ability to show intelligence which is now referred to as the Turing Test [10]. In this paper, published in 1950 in the journal "Mind", Allan Turing investigated on what it takes to test if a machine can think. This work is now popularly known as "the Turing Test" [7]. Turing Test was all about a simple conversation game between a human expert and a computer running an AI program in it. If the human expert is fooled by the computer after 5 minutes of conversation, then it meant that computer is intelligent.

Earlier in 1945, Isaac Asimov, a Columbian University alumnus, had coined the term robotics. Isaac was an author of both science fiction and popular science books. He is best known for his "Foundation" series of novels as well as the three laws that governs robotics which he formulated in his "I, Robot" collection of stories. These laws states that as thus: "a robot may not injure a human being or, through inaction, allow a human being to come to harm. Secondly, a robot must obey orders given it by human beings except where such orders would conflict with the First Law. And lastly, a robot must protect its own existence as long as such protection does not conflict with the First or Second Law."

In the year 1952, Arthur Lee Samuel, an American Scientist and a pioneer in the field of AI (Machine Learning), developed the first checkers program on IBM's first commercial computer called IBM 701 which happens to be the first ever self-learning program. He did the best work in making the computer learn from its experience and his work was one of the earliest and the most influential examples of machine learning.

B. Modern Artificial Intelligence & Some of its Contributors

The modern-day Artificial Intelligence started in 1956 when John McCarthy coined the term "Artificial Intelligence" in a conference at Dartmouth College. He first defined Artificial Intelligence as "the science and engineering of creating intelligent machines." Still in the same 1956, Allen Newell, an American researcher in the field of Computer Science and Cognitive Psychology developed the first true AI program called "Logic Theorist" alongside Herbert Simon and J.C Shaw. Logic Theorist was the first AI program designed to mimic the problem-solving skills of human beings.

Later in 1964, Daniel Bobrow, an American research fellow in the Intelligent Systems Laboratory of Palo Atto Research Centre created an AI program called STUDENT, with which he earned his Ph. D. STUDENT was also one of the early AI programs that

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solved algebra word problems. It is often seen as an early accomplishment of AI in Natural Language Processing. This was immediately followed by creation of ELIZA by a man called Joseph Weizenbaum at MIT in 1965. ELIZA was an interactive AI program that carries on a dialogue in English.

In 1973, International Business Machines (IBM) researchers built their first robot. IBM which is a multi-national company founded in 1911 has been one of the leaders in AI research since the 1950s when Arthur Samuel developed the Checker program that learned from experience.

In 1997, IBM again designed the Deep Blue chess playing computer. A major milestone was reached when the Deep Blue computer program defeated the world chess champion, Gary Kasparov, to a 6-round game of chess (McCorduck 2004).

In 2003, John McCarthy founded the "MIT Computer Science and Artificial Intelligence Laboratory" alongside Marvin Lee Minsky who has written several texts on Artificial Intelligence. His text "Perceptrons" later became the fundamental work in the analysis of Artificial Neural Network (ANN). Marvin Lee Minsky also created the Stochastic Neural Analog Reinforcement Calculator.

C. Future with Artificial Intelligence

Many businesses and individuals are optimistic that this AI-driven shift in the workplace will result in more jobs being created than lost. Vishal [11] in his paper stated that "as we develop innovative technologies, AI will have a positive impact on our economy by creating jobs that require the skill set to implement new systems. It is likely that artificial intelligence will soon replace jobs involving repetitive or basic problem-solving tasks, and even go beyond current human capability. Darrell [12] base on scientific prediction, categorized the future work in AI into three which includes: the near-term future (2020-2025), the medium-term future (2025-2030), and the long-term future (2030-2040).

III. APPLICATIONS OF AI IN FUTURE TECHNOLOGIES

In a few years' time, Artificial Intelligence will touch nearly all the industries on this planet and there are plenty of ways AI is and can transform certain industries [13]. Andrew [14] gave a speech titled "Artificial Intelligence is the New Electricity." Here, he argued that artificial intelligence is poised to transform many different industries. He equally argued that the IT industry has already been transformed by AI as seen by the huge successes of tech companies such as Google, Amazon, and Microsoft. In his talk, he mentioned the transportation, logistics, and healthcare industries all as examples of industries that are currently being transformed or poised to be transformed in the coming immediate future.

A number of recent studies have been conducted that support Andrew's hypothesis that artificial intelligence is poised to transform the world. Most notably, the Pardee Report prepared for the National Intelligence Council in 2016 by Andrew Scott and Barry Hughes is a lengthy review of what the future of artificial intelligence might look like in the United States and globally. The report makes the clear point that artificial intelligence is poised for rapid advancement and that AI has the potential to transform many areas of human activity. Additionally, the Pardee report predicts that labour will be impacted by the automation of jobs, particularly in the manufacturing and service sectors [1].

A. Transportation

When it comes to artificial intelligence transforming industries, the first industry that comes to most people's mind is the transportation industry. There has been lots of recent enthusiasm among tech blogs and the media around the success of self-driving technology. On the 14th of April 2016, a convoy of six semi-automated trucks demonstrated that success by driving from multiple factories in different countries to Rotterdam, Netherlands using self-driving technology. The trucks had human drivers behind the wheel for emergencies but were otherwise completely self-driving. Later on, that year Uber's self-driving truck, built by the start-up company Otto, successfully made a 120-mile drive from Fort Collins to Colorado Springs with a delivery of 50,000 cans of beer.

Despite the concerns about the impact these self-driving technologies might have on transportation labour, it is clear that the technology is not slowing down with companies such as Google and Uber investing large amounts of money. Self-driving technology is not the only area of transportation that artificial intelligence is likely to impact. Other areas include road maintenance, road safety and planning, traffic prediction, control systems, and construction. Artificial intelligence will shape transportation in the immediate future [1].

B. Medicine & Health Care

Another industry frequently mentioned as being on the cusp of large changes due to artificial intelligence is healthcare and medicine. AI system can help medical physicians deliver faster and accurate treatment by analysing a large amount of clinical data like demographics, medical notes, recordings from medical devices and laboratory images. For instance, AI can help in detecting

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epithelial ovarian cancer in stage 1A when it has a 94% cure rate. Whereas, by a normal process, it is usually undetected or is detected in stage 3 or 4, when the symptoms start appearing and chances of cure start plummeting. Moreover, Elon Musk's Neural Lace could be the next AI advancement in the field of healthcare. It is an ultra-thin mesh that can be embedded in the skull creating an interface between the machine and the brain. Gradually, it would become a part of the brain and help in treating brain disorders. Researchers are hoping that in future AI may enhance the ability of a human to provide better healthcare services and will enhance life expectancy of human civilization [15].

C. Military

The next area as predicted by many where we will see a massive application of AI is the Military. In 2015, US Deputy Defense Secretary Robert Work said they planned on having at least $12 billion funding set aside by 2017 for artificial intelligence weapon technology. This technology will include autonomous weapons and deep learning machines that focus on human-machine collaboration in combat [16]. It is predicted that in the near future with AI, we will see autonomous weapons that will make kill decisions based on their programming. Also, systems that operate in logistics and surveillance will be another application of AI in the military in the future.

IV. CONCLUSIONS

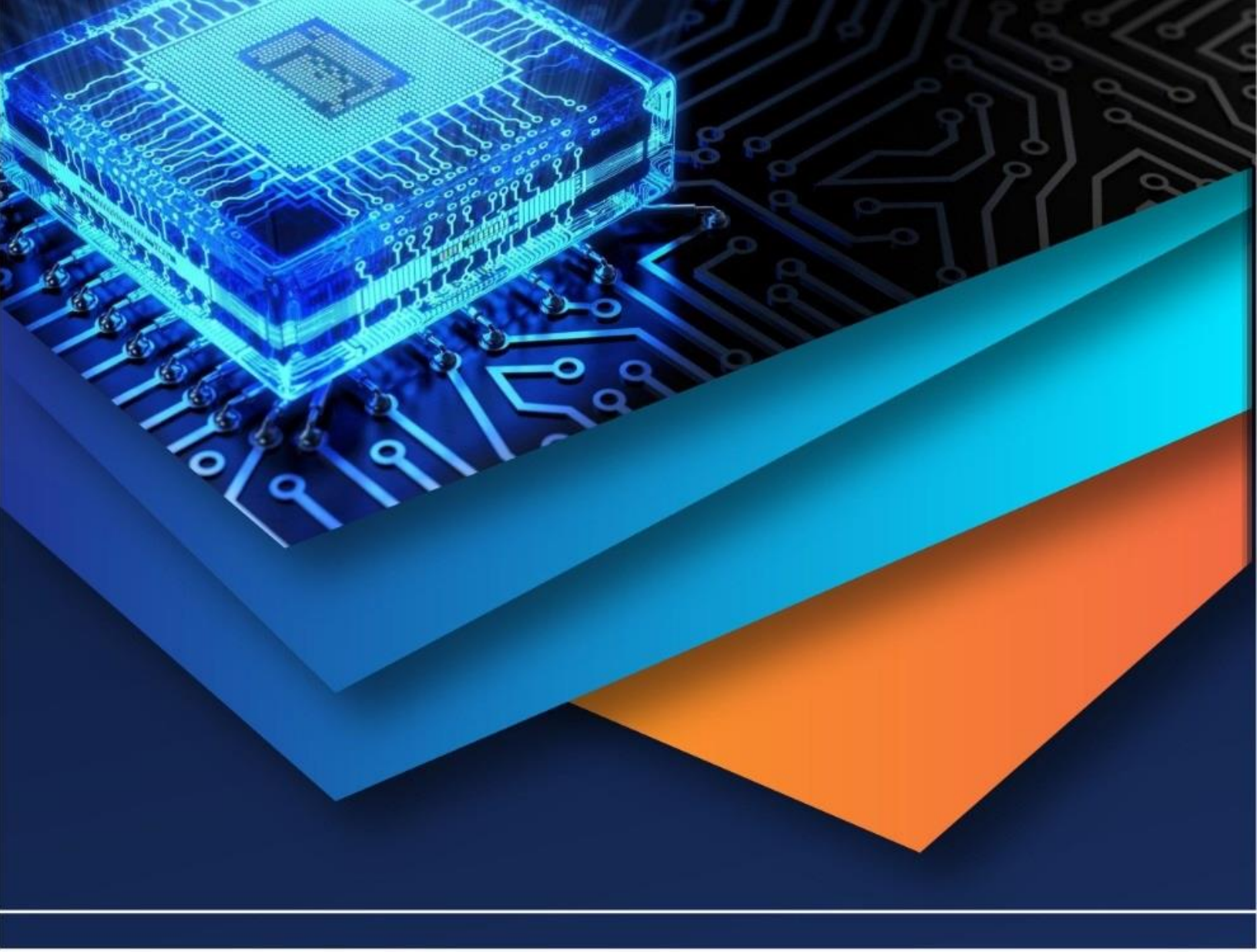
Predicting the future of Artificial Intelligence has never been easy, although most scientists have predicted its future in a positive light claiming that it will assist us in performing a lot of tasks in future, for example, those that ordinarily will be hazardous to humans while others have also predicted it in a negative light claiming that in the near future, the jobs currently performed by humans will be taken away and assigned to machines which for a truth we are already seeing all that happening presently. AI in the 90's was focused just on enhancing human circumstances. But today, research in AI have move a bit from that, it is now centred on constructing human-like machines (robots). Although the main goal of AI has been to create machines that will behave like humans in possibly every aspect, machines that will think intelligently and proffer new solutions on their own with humans programming them to do so. Machines at present have not formulated new concepts nor provided new solutions yet, they are still working within the confines of solving problems which humans have found solutions to or have defined algorithms to obtain their solutions. They are still working within the confines of what they are being fed with.

Researchers in AI has been working tooth and nail to make sure that the main goal of AI is achieved and one thing is certain, in the future, there will be improvement on what we are seeing now. For all the predictions that has been made already concerning AI, if eventually the hard work of AI researchers pays off, one day, we will find ourselves dwelling with intelligent machines and a robot walking and working with us.

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