

A Comprehensive Review of Artificial Intelligence

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Abstract— Artificial intelligence is a multidisciplinary field aimed at automating tasks that currently require human intelligence. Computer Author's medical diagnosticians and systems that automatically tailor-behavior ware to specific user requirements are examples of recent AI achievements. Perception, Manipulation, Reasoning, Communication, and Learning are the key problem areas addressed in Artificial Intelligence Perception is concerned with constructing physical world representations from sensory data (visual, audio, etc.). Manipulation refers to the use of articulating appendages (such as mechanical arms or locomotion devices) to achieve a desired state in the physical world. Higher-level cognitive tasks like planning, drawing inferential conclusions from a world model, diagnosing, designing, and so on are all covered by reasoning. The difficulty of interpreting and communicating information through the use of language is addressed by the communication. Finally, Learning addresses the system's performance automatically improved over time based on the system's experience. Many key technical principles have emerged from A.I. that integrate these disparate problem areas and serve as the scientific discipline's foundation.

Index Terms— Introduction of Artificial Intelligence, history of Artificial Intelligence, Evolution of Artificial Intelligence, Advantage and Disadvantage of Artificial Intelligence.

I. INTRODUCTION

Artificial Intelligence refers to the intelligence displayed by machines. In today's world, Artificial Intelligence has become most popular. It is the simulation of human intelligence in computers that have been programmed to learn and mimic human actions. These machines can learn from their mistakes and do human-like tasks. Artificial intelligence (AI) will have a significant impact on our quality of life as it develops. It's only natural that everyone today wish to connect with AI technology in some way, whether as a consumer or as a professional in the field. Check out Great Learning's PG Program in Artificial Intelligence and Machine Learning to learn more about this field.

This Artificial Intelligence course will train you with a comprehensive curriculum from a top-ranked global school while also preparing you for a job in the field. With renowned professors and devoted mentor support, the program provides a hands-on learning experience. You will get a certificate from The University of Texas at Austin once you have completed the course. Great Learning Academy also provides Free Online Courses to help you master the fundamentals of the subject and get a head start on your AI journey. A

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layperson with only a rudimentary understanding of technology would associate it with robots. Artificial Intelligence, they trust, is a Terminator-like figure that can act and think for itself. If you ask an AI researcher what artificial intelligence is, he or she will tell you that it is a set of algorithms that can produce outcomes without being explicitly directed to do so. And they'd all be correct.

II. HISTORY

For a long time, people have imagined inanimate objects coming to life as intelligent entities. Robots were mythologized by the ancient Greeks, and Chinese and Egyptian engineers developed automatons. The initial attempts to represent human thought as a symbolic system may be traced back to classical philosophers.

However, the discipline of AI was not formally created until 1956, when the phrase "artificial intelligence" was adopted at a meeting at Dartmouth College in Hanover, New Hampshire. Marvin Minsky, an MIT cognitive scientist, and others who attended the conference were quite positive about AI's future. In the book "AI: The Tumultuous Search for Artificial Intelligence," Minsky is quoted as saying, "Within a generation [...] the challenge of rising artificial intelligence programs will be significantly addressed" (Basic Books, 1994).

However, creating an artificially intelligent being was not easy. Following multiple publications condemning AI advancement, government funding and interest in the subject dwindled, known as the "AI winter" from 1974 to 1980. In the 1980s, the field was revitalized when the British government refunded it in part to compete with Japanese efforts. From 1987 to 1993, the field went through another big winter, this time accompanied by the collapse of the market for some of the first general-purpose computers and declining government financing. Revitalized utilized have after then, research resumed, and in 1997, IBM's Deep Blue upset Russian grandmaster Garry Kasparov to become the first machine to defeat a chess champion. In 2011, IBM's Watson question-answering system beat out defending champions Brad Rutter and Ken Jennings to win the game show "Jeopardy!"

This year, the talking computer "chatbot" Eugene Goostman made headlines after deceiving judges into believing he was a real flesh-and-blood human during a Turing test, a competition created by British mathematician and computer scientist Alan Turing in 1950 to determine whether a machine is intelligent. However, artificial intelligence researchers allege that just a third of the judges were duped and that the bot was able to avoid some queries by pretending to be an adolescent who spoke English as a second language.

The Turing test, according to many scientists, is no longer a good measure of artificial intelligence. "For the most part, the huge majority of folks in AI who've thought about it think it's a pretty poor test because it only looks at outward behavior," Perlis told Live Science. Indeed, some researchers are working on a new version of the test. However, AI has expanded far ahead of the search for real, human-like intelligence.

III. EVOLUTION

Artificial intelligence (AI) is advancing at a breakneck pace. Researchers have developed software that uses Darwinian evolution notions, such as "survival of the fittest," to produce AI programs that improve generation after generation without the required for human intervention. The program's keywords intelligence programs were able to duplicate decades of AI research in just a few days, and its creators trust that one day it will be able to develop new AI approaches. "They took a massive leap into the unknown whereas other people were taking tiny steps," says Risto Miikkulainen, a computer scientist at the University of Texas at Austin who was not involved in the research. "This is one of those publications that have the potential to spark a lot of future research," says the author.

It takes time to develop an AI algorithm. Consider neural networks, a typical type of machine learning used for things like language translation and autonomous driving. These networks are based on artificial neurons and learn from training data by adjusting the strength of connections between them. Smaller sub circuits of neurons do specific tasks—for example, spotting road signs—and it can take months for researchers to figure out how to connect them so they operate mutually seamlessly. In a few years, scientists have automated some procedures to boost up the process. However, these programs still rely on humans to put together pre-built circuits. That means the outcome is still constrained by the engineers' imaginations and biases. So Quoc Le, a Google computer scientist, and colleagues created AutoML-Zero, a program that could create AI algorithms with virtually no human input, utilizing only basic mathematical principles that a high school student would understand. "Our ultimate goal is to generate unique machine learning concepts that even researchers have yet to discover," he explains. Using a loose approximation of evolution, the program discovers algorithms. It begins by randomly combining mathematical operations to generate a population of 100 candidate algorithms. It then puts them through an easy job, such as deciding whether a picture depicts a cat or a truck in an image recognition scenario.

The program evaluates the performance of the algorithms to that of hand-designed methods in each cycle. To develop little variants of the best algorithms, copies of the top performers are "mutated" by randomly changing, altering, or deleting a few of their code. These "children" are included in the population, while older programs are phased out. The cycle continues.

The system generates thousands of these populations at once, allowing it to run tens of thousands of algorithms every second until a good solution is found. To speed up the search, the computer employs techniques such as exchanging algorithms between populations regularly to avoid evolutionary dead ends and automatically weeding out duplicate algorithms. The researchers show in a preprint paper published on arXiv last month that the strategy can make mistakes with a variety of standard machine learning approaches, including neural networks. Although the solutions are simplistic in comparison to today's most powerful algorithms, Le concedes that the work is a proof of concept and that he believes it can be scaled up to produce considerably more complicated AIs.

Still, Joaquin Vanschoren, a computer scientist at the Eindhoven University of Technology, trusts it will be some time before the method can compete with the best. He believes that rather than asking the computer to start from scratch, it could be seeded with some of the tactics and approaches that people have developed. "We can prime the pump using machine learning."

That is something Le intends to address. He argues that focusing on small problems rather than complete algorithms has potential. On April 6, his group released a paper on arXiv that used the same method to rebuild a commonly used ready-made component in neural networks.

However, Le believes that increasing the library's amount of mathematical operations and allocating additional computer resources to the program could allow it to uncover new AI capabilities. He explains, "That's a path we're particularly excited about." "To find something extremely fundamental that will take humans a long time to figure out."

IV. ADVANTAGES

Artificial intelligence applications offer big benefits and have the potential to disrupt any industry. Let's take a look at a few of them.

- 1) **Human Error Reduction:** The term "human error" was used to describe the fact that humans make mistakes from time to time. Computers, on the other hand, do not make these errors if they are correctly programmed. Artificial intelligence makes choices based on previously obtained data and a set of algorithms. As a result, errors are decreased, and the prospect of achieving better precision and accuracy is increased. For example, AI has removed most of human mistakes in weather forecasting.
- 2) **Take risks instead of humans:** This is one of artificial intelligence's most significant advantages. By constructing an AI Robot that can do risky tasks for us, we can transcend many of humanity's risky limits. It can be utilized effectively in every type of natural or man-made disaster, whether it is going to Mars, defusing a bomb, exploring the deepest regions of the oceans, mining for coal and oil. Have you heard about the explosion at the Chernobyl nuclear power facility in Ukraine? There were no AI-powered robots present at the time to assist us in

minimizing the effects of radiation by controlling the fire early on, as any human who came close to the core died in minutes. They eventually used helicopters to drop sand and boron from a safe distance. AI Robots can be utilized in situations when human intervention is risky.

- 3) **Available 24 hours a day**, 7 days a week: An average human will labor for 4–6 hours per day, excluding breaks. Humans are created in such a way that they can take time off to replenish themselves and prepare for a new day at work, and they even have weekly off days to keep their professional and home lives separate. But, unlike humans, we can use AI to make machines work 24 hours a day, seven days a week with no breaks, and they don't get bored. For instance, educational institutions and helpline centers receive a large number of requests and difficulties that AI can successfully handle.
- 4) **Assisting with Repetitive Tasks**: We will be doing a lot of repetitive tasks in our day-to-day work, such as writing thank-you emails, double-checking documents for flaws, and so on. We can use artificial intelligence to efficiently automate these monotonous chores and even remove “boring” duties from humans' schedules, allowing them to be more creative. For example, at banks, we frequently see numerous document verifications to obtain a loan, which is a time-consuming task for the bank's owner. The owner can use AI Cognitive Automation to speed up the process of document verification, which will benefit both the customers and the owner.
- 5) **Digital Assistance**: Some of the most advanced companies use digital assistants to connect with their customers, reducing the requirement for human workers. Many websites also use digital assistants to supply things that users seek. We can discuss what we're searching for with them. Some chatbots are constructed in such a way that it's difficult to tell if we're conversing with one. For example, we all know that businesses have a customer service team that is responsible for answering customer's questions and concerns. Organizations can use AI to create a voice bot or a chatbot that can assist customers with all of their questions. Many firms have already begun to implement them on their websites and mobile applications.

V. DISADVANTAGES

Every bright side has a negative counterpart. Artificial Intelligence, on the other hand, has some drawbacks. Let's take a look at a few of them.

- 1) **High Creation Costs**: Because AI is evolving regularly, hardware and software must be upgraded regularly to keep up with the latest requirements. Machines necessitate repair and maintenance, both of which incur significant expenditures. Because they are extremely complicated machinery, their construction necessitates exorbitant prices.

- 2) **Making Humans Lazy**: Artificial intelligence (AI) is making humans lazy by automating the majority of their tasks. Humans are prone to get addicted to these advancements, posing a threat to future generations.
- 3) **Unemployment**: As AI replaces machines for the majority of repetitive tasks and other duties, human interference decreases, causing a big challenge in employment standards. Every company is attempting to swap minimum-qualified employees with AI robots that can perform similar tasks more efficiently.
- 4) **No Emotions**: Machines are unquestionably superior when it comes to efficiency, but they cannot replace the human connection that binds a team together. Machines are unable to form bonds with humans, which is an essential characteristic in team management.
- 5) **A lack of outside-the-box thinking**: Machines can only accomplish the tasks for which they were intended or programmed; anything beyond causes them to crash or produce irrelevant outputs, which could be a huge hindrance.

VI. WHY IS ARTIFICIAL INTELLIGENCE IMPORTANT

Data-driven AI automates repetitive learning and discovery. However, AI is not the same as robotic automation that is controlled by hardware. Instead of automating manual processes, AI reliably and without weariness conducts regular, high-volume computerized tasks. Human inquiry is still required to set up the system and ask the proper questions for this form of automation.

Artificial intelligence (AI) enhances the intelligence of existing products. In most circumstances, AI will not be sold as a standalone product. Rather, AI features will be added to existing goods, similar to how Siri was brought to a new generation of Apple products. Automation, conversational platforms, bots, and smart devices may be used to develop a variety of technologies at home and at business, from security intelligence to financial research.

AI adapts by allowing data to program itself using progressive learning algorithms. AI discovers patterns and structure in data, allowing the system to develop a skill: The algorithm is now a predictor or a classifier. As a result, just as the algorithm can teach itself to play chess, it can also educate itself on what product to promote next on the internet. When fresh data is introduced, the models adapt. When the first answer is incorrect, back propagation is an AI strategy that allows the model to adjust through training and further data. Using neural networks with numerous hidden layers, AI analyses more and more data. It was nearly difficult a few years ago to make a fraud detection system with five hidden levels. With the advent of supercomputers and big data, all of that has changed. Deep learning models require a large amount of data to expert because they learn directly from the

data. The more data you provide them, the more precise they will be.

Deep neural networks enable AI to achieve previously unthinkable levels of accuracy. Your interactions with Alexa, Google Search, and Google Photos, for example, are all based on deep learning, and they're becoming better as we use them. Deep learning, image classification, and object identification AI algorithms may now be utilized in the medical profession to spot cancer on MRIs with the same accuracy as highly expert radiologists.

AI makes the most of information. When algorithms know on their own, the data becomes intellectual property. The answers are in the data; all you have to do now is use AI to extract them. Data currently plays a more essential role than ever before, and it can help you get a competitive advantage. Even though everyone uses similar approaches, if you have the greatest data in a competitive business, you will win.

VII. THE FUTURE OF ARTIFICIAL INTELLIGENCE

Modern AI — specifically, "narrow AI," which performs objective activities using data-trained models and frequently falls into the categories of deep learning or machine learning has before now impacted practically every major business. This has been especially true in a few years, as data collection and analysis have accelerated significantly thanks to improved IoT connectivity. The improvement of connected devices, as well as ever-faster computer processing.

Some industries are only getting started using AI, while others are seasoned veterans. Both have a lot of work ahead of them. Regardless, the impact of artificial intelligence on our daily lives is difficult to neglect:

- ✓ **Transportation:** Autonomous automobiles will one day transport us from place to place, even though perfecting them could take a decade or more.
- ✓ **Manufacturing:** AI-powered robots assist humans with a restricted range of tasks such as assembling and stacking, while predictive analysis sensors ensure that equipment runs smoothly.
- ✓ **Diseases are diagnosed more quickly and precisely,** medication discovery is sped up and streamlined, virtual nursing assistants monitor patients, and big data analysis aids to provide a more personalized patient experience in the comparably AI-nascent field of healthcare.
- ✓ **Education:** With the help of AI, textbooks are digitized, early-stage virtual tutors assist human teachers, and facial analysis assesses students' emotions to improve discern who is struggling or bored, and better adapt the experience to their unique requirements.
- ✓ **Journalism, too, is utilizing AI and will continue to boost from it.** Bloomberg employs Cyborg technology to assist in the interpretation of complex financial reports. The Associated Press uses Automated Insights' natural language capabilities to

publish 3,700 earnings report stories per year, approximately four times more than in the past.

- ✓ Last but not least, Google is working on an AI assistant that can make human-like phone calls to arrange appointments at places like your local hair salon. The technology comprehends context and nuance in addition to words.

VIII. CONCLUSION

AI is at the heart of a new venture to develop computational intelligence models. The primary premise is that intelligence (human or otherwise) can be represented using symbol structures and symbolic processes that can be programmed into a digital computer. There's a lot of discussion over whether such a properly programmed computer would be a mind or just a simulation of one, but AI researchers don't have to wait for the dispute to be resolved, or for a hypothetical machine that can model all of human intelligence. Aspects of intelligent behavior, such as problem-solving, inference, learning, and language comprehension, have already been implemented as computer programs, and AI is already being used in very limited domains, such as recognizing soybean plant illnesses. The current AI problem is to create ways to express commonsense knowledge and experience that allow individuals to carry out ordinary tasks like holding a wide-ranging conversation or navigating a busy street. We may need to design new machines to handle the complexity of the human mind, or we may be able to execute such programs on conventional digital computers.

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