ARTIFICIAL INTELLIGENCE

ABSTRACT

Artificial intelligence is a human endeavor to create a non-organic machine-based entity, that has all the above abilities of natural organic intelligence. Researchers are creating systems which can mimic human thought, understand speech, beat the best human chessplayer, and countless other feats never before possible. This paper describes about the various approaches and applications of Artificial Intelligence.

Keywords

Neural Network; Expert System; Aviation; Swarm Intelligence; Weather Forecast; Neurona.

1. INTRODUCTION

Artificial intelligence is the intelligence of machines and the branch of computer science that aims to create it. Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent. The ability to create intelligent machines has intrigued humans since ancient times, and today with the advent of the computer and 50 years of research into AI programming techniques, the dream of smart machines is becoming a reality. Researchers are creating systems which can mimic human thought, understand speech, beat the best human chessplayer, and countless other feats never before possible. Intelligence is the ability to think, to imagine, to create, memorize, understand, recognize patterns, make choices, adapt to change and learn from experience. Artificial intelligence is a human endeavor to create a non-organic machine-based entity, that has all the above abilities of natural organic intelligence. It is the ultimate challenge for an intelligence, to create an equal, another intelligent being. It is the ultimate form of art, where the artist’s creation, not only inherits the impressions of his thoughts, but also his ability to think!

2. HISTORY OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence, or AI for short, is a combination of computer science, physiology, and philosophy. AI is a broad topic, consisting of different fields, from machine vision to expert systems. The element that the fields of AI have in common is the creation of machines that can “think”.

Artificial Intelligence, or AI for short, is a combination of computer science, physiology, and philosophy. AI is a broad topic, consisting of different fields, from machine vision to expert systems. The element that the fields of AI have in common is the creation of machines that can “think”. In order to classify machines as “thinking”, it is necessary to define intelligence. To what degree does intelligence consist of, for example, solving complex problems, or making generalizations and relationships? And what about perception and comprehension? Research into the areas of learning, of language, and of sensory perception have aided scientists in building intelligent machines. One of the most challenging approaches facing experts is building systems that mimic the behavior of the human brain, made up of billions of neurons, and arguably the most complex matter in the universe. Perhaps the best way to gauge the intelligence of a machine is British computer scientists Alan Turing. He stated that a computer would deserves to be called intelligent if it could deceive a human into believing that it was human.

Artificial Intelligence has come a long way from its early roots, driven by dedicated researchers. The beginnings of AI reach back before electronics, of philosophers and mathematicians such as Boole and others theorizing on principles that were used as the foundation of AI Logic.

AI really began to intrigue researchers with the invention of the computer in 1943. The technology was finally available, or so it seemed, to simulate intelligent behavior. Over the next four decades, despite many stumbling blocks, AI has grown from a dozen researchers, to thousands of engineers and specialists; and from programs capable of playing checkers, to systems designed to diagnose disease. AI has always been on the pioneering end of computer science. Advanced-level computer languages, as well as computer interfaces and word-processors owe their existence to the research into artificial intelligence. The theory and insights brought about by AI research will set the trend in the future of computing. The products available today are only bits and pieces of what are soon to follow, but they are a movement towards the future of artificial intelligence. The advancements in the quest for artificial intelligence have, and will continue to affect our jobs, our education, and our lives.

Fig 1: Timeline of major AI events

3. APPROACHES

Approaches are the methods used to create Artificial Intelligence. In the quest to create intelligent machines, the field of Artificial Intelligence has split into several different approaches based on the opinions about the most promising
methods and theories. These rivaling theories have lead researchers in one of two basic approaches; bottom-up and top-down. Bottom-up theorists believe the best way to achieve artificial intelligence is to build electronic replicas of the human brain's complex network of neurons, while the top-down approach attempts to mimic the brain's behavior with computer programs. These approaches have been applied to a variety of programs. As we progress in the development of Artificial Intelligence, other theories will be available, in addition to building on today’s methods. Initially, researchers thought that creating an AI would be simply writing programs for each and every function an intelligence performs! As they went on with this task, they realized that this approach was too shallow. Even simple functions like face recognition, spacial sense, pattern recognition and language comprehension were beyond their programming skills!

They understood that to create an AI, they must delve deeper into natural intelligence first. They tried to understand how cognition, comprehension, decision-making happen in the human mind. They had to understand what understanding really means! Some went into the study of the brain and tried to understand how the network of neurons creates mind. Thus, researchers branched into different approaches, but they had the same goal of creating intelligent machines. Let us introduce ourselves to some of the main approaches to artificial intelligence. They are divided into two main lines of thought, the bottom up and the top down approach:

3.1. Neural Networks and Parallel Computation

The human brain is made up of a web of billions of cells called neurons, and understanding its complexities is seen as one of the last frontiers in scientific research. It is the aim of Al researchers who prefer this bottom-up approach to construct electronic circuits that act as neurons do in the human brain. Although much of the working of the brain remains unknown, the complex network of neurons is what gives humans intelligent characteristics. By itself, a neuron is not intelligent, but when grouped together, neurons are able to pass electrical signals through networks.

![Figure 2: The neuron "firing", passing a signal to the next in the chain.](image)

3.2 Neural Networks: This is the bottom up approach. It basically aims at mimicking the structure and functioning of the human brain, to create intelligent behavior. Researchers are attempting to build a silicon-based electronic network that is modeled on the working and form of the human brain! Our brain is a network of billions of neurons, each connected with the other. At an individual level, a neuron has very little intelligence, in the sense that it operates by a simple set of rules, conducting electric signals through its network. However, the combined network of all these neurons creates intelligent behavior that is unrivaled and unsurpassed. So these researchers created network of electronic analogues of a neuron, based on Boolean logic. Memory was recognized to be an electronic signal pattern in a closed neural network.

3.3 Expert Systems: This is the top down approach. Instead of starting at the base level of neurons, by taking advantage of the phenomenal computational power of the modern computers, followers of the expert systems approach are designing intelligent machines that solve problems by deductive logic. It is like the dialectic approach in philosophy. This is an intensive approach as opposed to the extensive approach in neural networks. As the name expert systems suggest, these are machines devoted to solving problems in very specific niche areas. They have total expertise in a specific domain of human thought. Their tools are like those of a detective or sleuth. They are programmed to use statistical analysis and data mining to solve problems. They arrive at a decision through a logical flow developed by answering yes-no questions. Because of the large storage capacity of computers, expert systems had the potential to interpret statistics, in order to formulate rules. An expert system works much like a detective solves a mystery. Using the information, and logic or rules, an expert system can solve the problem. Chess computers like Fritz and its successors that beat chess grandmaster Kasparov are examples of expert systems. Chess is known as the drosophila or experimental specimen of artificial intelligence.

3.3.1 Uses of Expert Systems

1. Expert systems are used for problems where there is incomplete data about a subject, and insufficient theory available for the creation of an algorithmic solution. Some problems, such as medical diagnosis, are not easily solved with an algorithm, but instead require reasoning and induction.

2. Numerical algorithms are more efficient then expert systems, and are typically more exact. However, many problems are not suited to being easily modeled mathematically, and in these cases numerical algorithms are not possible. Other AI techniques, such as artificial neural networks are suited for problems where there is very little theory but a wealth of experimental data.

3. Expert systems tend to be slow, and often require extensive human interaction. However, well-designed expert systems can be very rigorous, and some expert systems have been shown to outperform the human experts that helped to develop them.

3.4 Experimental Games

Scientists in the 1960s developed machines that could play chess in an attempt to create machines that could think by themselves. They made tremendous strides in developing sophisticated decision trees that could map out possible moves, but those programs included so many potential alternatives that even contemporary supercomputers cannot assess them within a reasonable amount of time. They reduced the number of alternatives, which allowed the machines to play at the chess master level. To simulate the thinking process, the computers processed large amounts of data on alternative moves. Some of these experiments continue through the present. A highly publicized success in this area came in 1997 when an IBM supercomputer named Deep Blue beat world chess champion Garry Kasparov in a match.

4. APPLICATIONS OF AI

Artificial Intelligence in the form of expert systems and neural networks have applications in every field of human endeavor. They combine precision and computational power with pure logic, to solve problems and reduce error in operation. Already, robot expert systems are taking over many jobs in industries that are dangerous for or beyond human ability. Some of the
applications divided by domains are as follows: We have been studying this issue of AI application for quite some time now and know all the terms and facts. But what we all really need to know is what can we do to get our hands on some AI today. How can we as individuals use our own technology? We hope to discuss this in depth (but as briefly as possible) so that you the consumer can use AI as it is intended.

First, we should be prepared for a change. Our conservative ways stand in the way of progress. AI is a new step that is very helpful to the society. Machines can do jobs that require detailed instructions followed and mental alertness. AI with its learning capabilities can accomplish those tasks but only if the worlds conservatives are ready to change and allow this to be a possibility. It makes us think about how early man finally accepted the wheel as a good invention, not something taking away from its heritage or tradition.

Secondly, we must be prepared to learn about the capabilities of AI. The more use we get out of the machines the less work is required by us. In turn less injuries and stress to human beings. Human beings are a species that learn by trying, and we must be prepared to give AI a chance seeing AI as a blessing, not an inhibition.

Finally, we need to be prepared for the worst of AI. Something as revolutionary as AI is sure to have many kinks to work out. There is always that fear that if AI is learning based, will machines learn that being rich and successful is a good thing, then wage war against economic powers and famous people? There are so many things that can go wrong with a new system so we must be as prepared as we can be for this new technology.

1. **Heavy Industries and Space:** Robotics and cybernetics have taken a leap combined with artificially intelligent expert systems. An entire manufacturing process is now totally automated, controlled and maintained by a computer system in car manufacture, machine tool production, computer chip production and almost every high-tech process. They carry out dangerous tasks like handling hazardous radioactive materials. Robotic pilots carry out complex maneuvering techniques of unmanned spacecrafts sent in space. Japan is the leading country in the world in terms of robotics research and use.

2. **Finance:** Banks use intelligent software applications to screen and analyze financial data. Software programs that can predict trends in the stock market have been created which have been known to beat humans in predictive power.

3. **Computer Science:** Researchers in quest of artificial intelligence have created spin offs like dynamic programming, object oriented programming, symbolic programming, intelligent storage management systems and many more such tools. The primary goal of creating AI still remains a distant dream but people are getting an idea of the ultimate path which could lead to it.

4. **Aviation:** Air lines use expert systems in planes to monitor atmospheric conditions and system status. The plane can be put on auto pilot once a course is set for the destination.

5. **Weather Forecast:** Neural networks are used for predicting weather conditions. Previous data is fed to a neural network which learns the pattern and uses that knowledge to predict weather patterns.

However, even though the fear of the machines are there, their capabilities are infinite. Whatever we teach AI, they will suggest in the future if a positive outcome arrives from it. AI are like children that need to be taught to be kind, well mannered, and intelligent. If they are to make important decisions, they should be wise. We as citizens need to make sure AI programmers are keeping things on the level. We should be sure they are doing the job correctly, so that no future accidents occur.

6. **ADVANTAGES OF AI**
   1. Machines can be used to take on complex and stressful work that would be otherwise performed by humans.
   2. Machines can complete the task faster than a human assigned to the same task.
   3. Use of robotics to discover unexplored landscape, outer space and also be useful in our home activities.
   4. Less danger, injury and stress to humans as the work is done by a artificially intelligent machine.
   5. Aiding of mental, visually and hearing impaired individuals.
   6. Used for games to create a atmosphere where you don't feel like you are playing against just a machine.
   7. Understanding complex software can be made in to easy-to-understand types with the aid of artificial intelligence.
   8. Less errors and defects.
   9. Time and resources are not wasted but effectively used to achieve the end goal.
   10. Their function is infinite.

6. **DISADVANTAGES OF AI**
   1. It lacks the human touch. Human qualities are sometimes ignored.
   2. The ability to replace a human job. This gives rise to humans feeling insecure and may have the fear of losing their job.
   3. Human capabilities can be replaced using a machine and therefore can foster feelings of inferiority among workers and staff.
   4. Artificial Intelligence can malfunction and do the opposite of what they are programmed to do.
   5. It may corrupt the younger generation.
   6. There is no filtering of information.
   7. This type of technology can be misuse to cause mass scale destruction.

7. **FUTURE WORK**

In spite of its great advances and strong promise, AI, in name, has suffered from low esteem in both academic and corporate settings. To some, the name is inexorably — and unfavorably — associated with impractical chess-playing computers and recluse professors trying to build a "thinking machine." As a result, many developers of AI theories and applications consciously shun the moniker, preferring instead to use the newer jargon of fuzzy applications, flexible software, and data-mining tools. In avoiding the label AI, they have found more receptive audiences among corporate decision-makers and private investors for their AI-inspired technologies.

Thus, while the practices and ideas known as AI are hardly dead, the name itself is shifting toward obscurity. This is true not only because of the perceived stigma, but also as a consequence of the diversity and heterogeneity of ways in which AI concepts have been implemented. Furthermore, these concepts are verging on ubiquity in software applications programming. Such disparate objectives as building a customer order system, implementing a self-diagnostic manufacturing system, designing a sophisticated search engine, and adding voice-recognition capabilities to applications all employ AI theories and methods. Indeed, Ford Motor Company was slated to implement an engine-diaagnostic neural network in its car computers beginning in the 2001 model year. With AI so entrenched in modern software development, it has lost many of its distinctions from software generally.
8. CONCLUSION

Artificial intelligence changes these days come faster, and from more directions, than ever before. All this change will have even broader impact than what we have experienced in the past: rapid advances in technology have brought an array of sensors, vehicles and weapons that can be operated by remote control or are totally autonomous. Within a decade, those machines will be able to perform many of the most dangerous, strenuous or boring tasks now assigned to people. In the process, we are also inventing new ways of destroying ourselves.

9. REFERENCES


