

Augmented Intelligence

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ABSTRACT

Augmented intelligence (AI), also known as intelligence augmentation (IA) or cognitive augmentation, is next level artificial intelligence. Augmented intelligence refers to the synergistic technology of humans and computers. This paper compares Augmented Intelligence with Artificial Intelligence, and describes its applications including sales, business, healthcare, military, decision-making, remote assistance and logistics. The article further describes the benefits and challenges associated with AI. In the foreseeable future, AI will be augmenting our capabilities, allowing us to do more in less amount of time.

Keywords: augmented intelligence; intelligence augmentation; artificial intelligence

INTRODUCTION

Machines are performing better and better at analyzing data. Due to recent breakthroughs in technologies, organizations and businesses have started to experiment with the different ways that intelligent machines can assist humans. Leaders of organizations are increasingly under pressure to redesign their workflow processes and decide which tasks to automate, which tasks to augment, and which tasks to leave to humans. Today, artificial intelligence (AI) is shorthand for any task a machine can perform just as well as, if not better than, humans. AI is complimentary to human intelligence and will not take over human function.

There are many jobs that machines cannot do. As machines take over highly repeatable work, people will migrate to roles that call for critical thinking, creativity, judgment, and common sense. As shown in Figure 1, augmented intelligence unites the strengths of humans and machines [1]. One can augment human instinct with smart algorithms that provide fast, data-driven predictive insights. Augmented intelligence best combines human and artificial intelligence to change human behavior.

It is one of the most important emerging technologies. It covers the subfields of AI, machine learning, and neural networks and it is going to disrupt the way in which companies and people work.

AUGMENTED INTELLIGENCE

Augmented intelligence (AI), also known as intelligence augmentation (IA) or cognitive augmentation, is next level in artificial intelligence. The word "augmented" means "to improve."

AI software will simply improve products and services, not replace the humans that use them. Augmented intelligence is also AI. To avoid the confusion of using the same abbreviation for two meanings, let us call it IA: intelligence augmentation. IA refers the creation of a close-to-human autonomous intelligence using modern technology. It describes how normal human intelligence is supplemented through the use of technology. One may say that:

$$\text{Augmented Intelligence} = \text{Human} + \text{Computer}$$

One may think of IA as augmented reality, a technology which combines real-world environments with computer-generated information such as images, text, videos, animations, and sound. It has the ability to record and analyze the environment in real time. It is becoming more attractive as a mainstream technology mainly due to the proliferation of modern mobile computing devices like smartphones and tablet computers with location-based services. Like augmented reality, augmented intelligence adds layers of information on top of human intelligence, helping humans to be at their best.

The pioneers of augmentation are the sectors that generate a lot of data, such as the law, healthcare, and agriculture. The main objective of augmented intelligence is to create an entirely new process automated and designed for 20% manual exceptions.

Augmented intelligence follows a five-function cadence that allows it to learn with human influence. As shown in Figure 2, augmented intelligence repeats a cycle of understanding, interpretation, reasoning, learning, and assurance [2]:

Understanding: Systems are fed data, which it breaks down and derives meaning from.

Interpretation: New data is inputted; the system then reflects on old data to interpret new data sets.

Reasoning: The system creates “output” or “results” for new data set.

Learn: Humans give feedback on output and the system adjusts accordingly. IA is an intelligence tool with human feedback loop.

Assure: Security and compliance is ensured using blockchain or AI technology.

Having humans and machines work hand-in-hand is a win-win situation.

To effectively attain augmented intelligence, consider this checklist of five key areas [3]:

- Cultivate and look for the right talent, i.e. bilinguals with domain and technology expertise
- Have proper governance over automation and people
- Think through change management, specifically ensuring a smooth adoption in the new ways of work and upskilling talent
- Make sure your technology and processes have continuous human input
- Develop white-box algorithms that can explain why things are not working as they should

Some companies are already focusing on developing smart data analytics solutions to obtain valuable insights from big data. Augmented analytics can be used to extract insights from big data. It automates data insights and provides clearer information, which is not possible with traditional analysis tools [4].

ARTIFICIAL INTELLIGENCE AND ITS ACHIEVEMENTS

Artificial intelligence (AI) is the cognitive science that deals with intelligent machines which are able to perform tasks heretofore only performed by human beings. The word “artificial” means replacement for natural. AI is mainly concerned with applying computers to tasks that require knowledge, perception, reasoning, understanding, and cognitive abilities. AI is potentially the algorithmic study of processes in every field of study [5]. The main objective of AI is to teach the machines to think intelligently like humans do. The common assumption today is that AI will replace human labor altogether. AI is now expected to drive our cars, cook our food, and automate our work. Recently, it has received bad reputation and has become synonymous to the mass unemployment, mass slavery, and mass replacement of humans by robots.

Artificial Intelligence (AI), as its name implies, is a different form of intelligence to our own. It is human-like intelligence that works in a similar way to our brains. AI is a science with research activities in the areas of image processing, expert systems, natural language processing, computer vision, robotics, machine learning, etc. It began to become an active field of research within computer science in about 1955. Today, AI in smart machines handles the more traditional repetitive tasks. AI has many applications in today’s society.

Although AI is a branch of computer science, there is hardly any field which is unaffected by this technology. Common areas of applications include agriculture, business, law enforcement, oil and gas, banking and finance, education, transportation, healthcare, automobiles, entertainment, manufacturing, speech and text recognition, facial analysis,

and telecommunications. Some of these applications are illustrated in Figure 3 [6].

Artificial Intelligence is everywhere. From wearable products to driverless cars. Even the system that prevents a car from starting because a door is open is artificial intelligence in action. AI has been revolutionary. Artificial intelligence, in the forms of machine learning, voice recognition and predictive analysis, enable robots to provide financial advice [7]. Today industrial leaders such as Google, Microsoft, Procter & Gamble, and IBM have invested heavily on AI. For example, IBM has invested heavily in artificial intelligence with the Watson cognitive system. Some developed nations like the USA, China, Russia, UK, and France have realized the great potential of AI and are competing to win the AI race.

COMPARING ARTIFICIAL AND AUGMENTED INTELLIGENCE

AI and IA are some of the disruptive technologies that are affecting organizations, economies, and our societies. Although augmented intelligence (IA) and artificial intelligence (AI) are closely related, they are different. IA uses AI techniques but keeps the human in the loop. The goal of augmented is not to replace human activities, but instead to elevate existing human capabilities. AI is often designed to mimic human intelligence, while IA enhances human intelligence and makes it work faster and smarter. Augmented intelligence tools are created to help rather than replace humans. Augmented intelligence focuses on software that takes over small repetitive tasks.

Focusing just on AI can expose companies to unforeseeable challenges in the future. That is why we must distinguish between AI and IA. The key difference between AI and IA lies in the cognitive learning and application of any machine. Unlike AI, which tries to replicate human intelligence, IA works with and amplifies human intelligence. Instead of fearing artificial intelligence as replacement technology, we should embrace augmented intelligence and find ways we can use it to alleviate the fears.

While AI is meant to help us humans with things like computation, memory, perseverance, precision, recognition, and speed, augmented intelligence allows us to see how it can help augment more human things like abstraction, breaking rules, judgment, listening, and storytelling [8]. Augmented intelligence, not artificial intelligence, is the future. Therefore, businesses should be focusing on augmented intelligence instead of AI.

APPLICATIONS

Augmented intelligence is a tool for finding hidden meaning within data by uncovering patterns and correlations at a massive scale. Augmented intelligence can be applied in business, decision-making, healthcare, journalism, insurance underwriting, ID verification, logistics planning, remote assistance, manufacturing, finance, real estate, military, and legal profession.

• Business Sales

The merger of humans and machines is critical to advancing modern business enterprise. Departmental heads, team leads, and vice presidents often identify business opportunities to apply augmented intelligence. Although augmented intelligence systems can be placed anywhere in a business organization, it is mostly used in the business sales. Integrating intelligent capabilities into your sales department is a smart investment in your salespeople. Augmented intelligence takes the complex sales tasks off the salespersons and enables them to focus on meeting the needs of customers. AI is capable of analyzing sales data and translate data into action [9].

The range of business problems to which IA applies continues to expand at a rapid pace.

• **Healthcare**

Patients and healthcare practitioners face enormous challenges: rapidly aging population, shortage of physicians, high costs of care, etc. This is partly illustrated by the quadruple aim of healthcare shown in Figure 4 [10]. Augmented intelligence can offer a transformative set of tools to help patients, physicians, and the nation face these looming challenges [11]. Augmented intelligence is where clinical knowledge and medical data converge on a single platform. The primary role for AI is augmentation of the intelligence and skills of care givers. IA is not designed to replace healthcare practitioners but to enhance human intelligence and the physician/patient relationship. The health care industry is facing major disruption as market and regulatory forces drive an even greater need for operational efficiency while delivering better service.

• **Decision-making**

If properly applied, augmented intelligence can provide feedback and insights that enhance decision-making. Augmented intelligence involves a creative mix of data, analytics, artificial intelligence (AI), and human judgment. It is the ability of a manager to leverage artificial intelligence and collective intelligence for every decision. It guides human employees to make smarter decisions and find new discoveries. The future of decision-making requires a transition into a whole new world and way of thinking [1].

• **Logistics Planning**

A logistics planner requires a lot of knowledge and experience about what works and what does not work in the industry. Augmented intelligence comes in when artificial intelligence is used to deal with high-skilled logistics planners. To improve logistics planning, companies should use augmented intelligence, which combines inputs from human planners with artificial intelligence technology [12].

• **Remote Assistance**

Current remote systems rely on human intervention. Augmented intelligence and machine learning offer the potential to support remote assistance. This may be a situation where a field operator requires the technical support of an expert. Augmented intelligence is employed to assist human memory in the recall, recognition, and search of information in real-time [13].

• **Military**

The military seeks to develop augmented intelligence that combines the strengths of humans and machines to create a human edge in the information age. Combinations of humans and machines are necessary to cope with the complexity and maximize the military ability to create, exploit, and adapt. Augmented intelligence will harness the best of our soldiers and technology to meet future challenges [14].

BENEFITS AND CHALLENGES

Augmented intelligence, the synergy between humans and artificial intelligence, exploits the positive aspects of human and AI-generated reasoning. It is designed to play an assistive role to enhance human intelligence and to improve the quality and efficiency of the workers. It is becoming an effective weapon to address the current blemishes of medicine which include poor predictive power, therapeutic errors, and inefficient hospital workflows [15]. IA tools are used in a number of fields to help drive productivity, improve efficiency, make smarter decisions, and waste less time on repetitive tasks. IA is

better for organizations than AI as it has a quicker ROI and better utilizes the assets already in place. There are opportunities that will arise from "augmented" workplaces and life in general. It transforms social services organizations from case management to care management. Any field that requires both humans and technology will definitely be changed by augmented intelligence.

While there are benefits to using AI, there are several legal and ethical issues. There are serious issues concerning customer privacy and security. The idea that intelligence can be automated, replacing millions of humans in highly repeatable tasks, has received a great attention. For the doomsayers, AI-augmented workplace implies an impending mass unemployment. They fear that many white-collar professionals' risk being automated, from accountants' taxi drivers to telemarketers and receptionists. The fears are essentially groundless. It appears that jobs will disappear rather than being automated. If machines can replace humans, we should free to do what humans do best: create.

CONCLUSION

Intelligent machines (or computers) are efficient in numerical computation, information retrieval, statistical reasoning, and have almost unlimited storage. They can see, hear, and speak multiple languages. They have become the intimate companions of humans; they are profoundly changing our lives and shaping the future.

The human brain is an extremely complex advanced processing unit that can solve problems that computers cannot solve. No matter how intelligent machines may be, they are not completely replace humans. So, there is nothing to fear. We only need to prepare. In the foreseeable future, AI will be augmenting our capabilities, allowing us to do more in less amount of time. Rather than focusing on AI, we should consider the possibilities of how businesses can take advantage of augmented intelligence. For more information on augmented intelligence, one should consult the book in [16].

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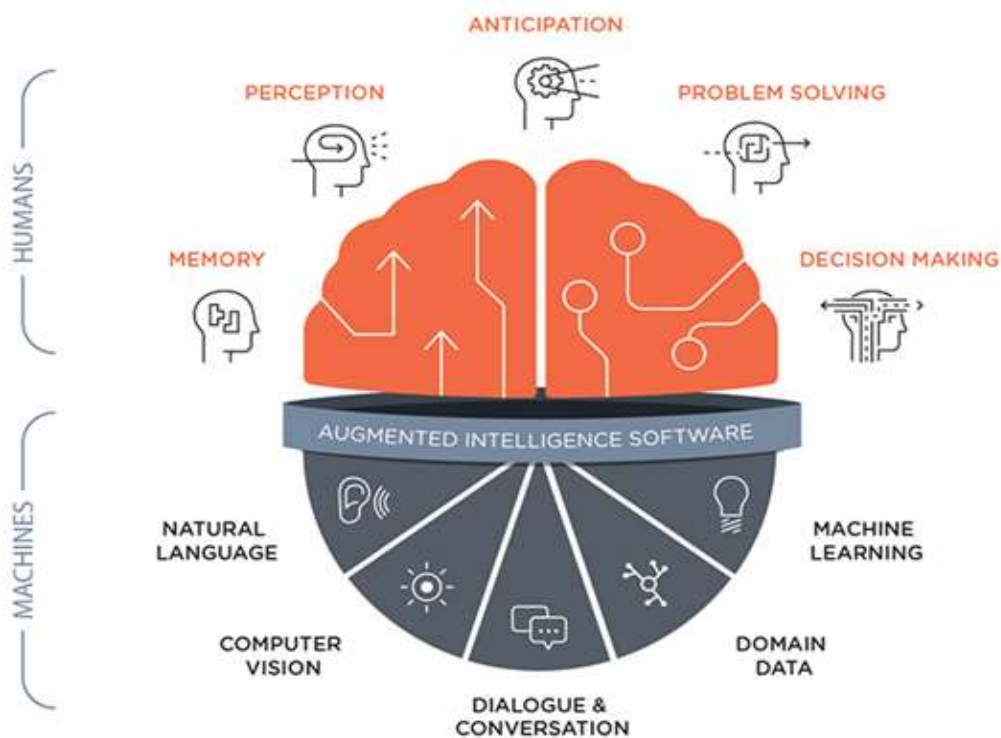


FIGURE 1: Augmented intelligence combines human and machine intelligences [1].



FIGURE 2: How augmented intelligence works [2].

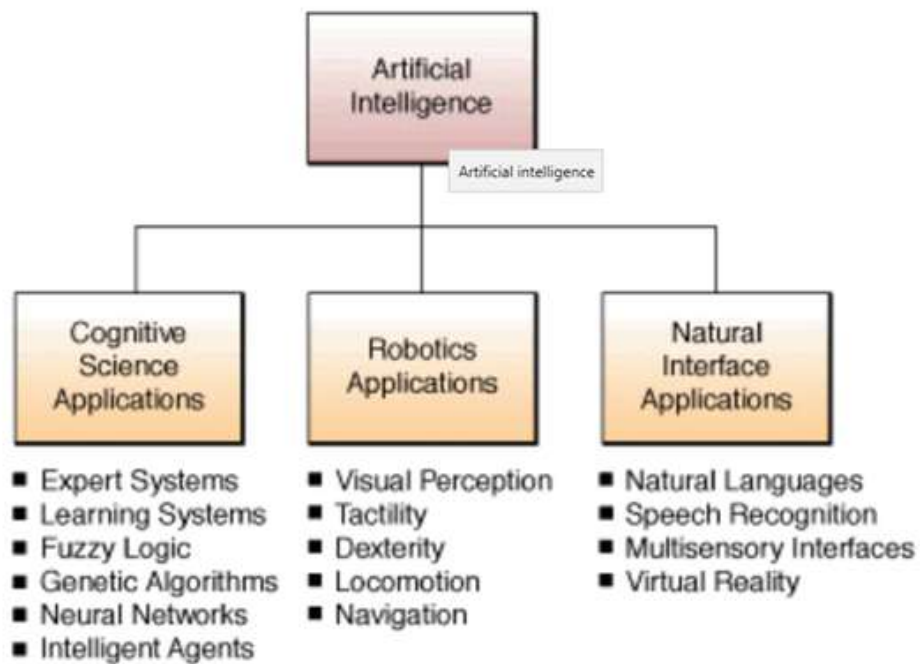


FIGURE 3: Some applications of AI [6].



FIGURE 4: The quadruple aim of healthcare [10].