

# A review of Applications and Opportunities of Artificial Intelligence

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**Abstract**— In the new era of big data and Industry 4.0, artificial intelligence (AI) is one of the main forces driving industrial progress and a key factor in fostering the integration of cutting-edge technologies like blockchain, cloud computing, and the Internet of Things.

This study analyzes the field of artificial intelligence with a focus on embodied AI. Additionally, it takes into account agent-based artificial intelligence, models of artificial consciousness, and philosophical analysis of AI. It concludes that the field has made only modest advancements and that there is hardly any formalism or unanimity. Although there are many problems with AI, there is no denying that it has evolved into inventive and ground-breaking assistance in a variety of applications and industries.

**Keywords**— machine learning, artificial intelligence, algorithms

## I. INTRODUCTION

Artificial intelligence (AI) can be defined as any theory, method, or technique that enables machines (particularly computers) to examine, replicate, exploit, and investigate human thought processes and behavior [1]. It is the computation and intelligent calculation of data. AI is the study of characteristics of human activities, the creation of a specific intelligent system, the application of computer hardware and software to simulate the underlying theories, approaches, and techniques of human behavior, and the ability to make computers perform tasks that only humans were able to do in the past.

Each person must understand what artificial intelligence and machine learning will entail for the human species now that humans have established their presence on the planet. There have been various literature reviews conducted during the fifty years since artificial intelligence (AI) was first defined. In the domain of computers, artificial intelligence is also known as machine intelligence. In contrast to the natural intelligence exhibited by people, it is intelligence that machines have revealed. Everyone needs to be aware of what the development of artificial intelligence will mean for the human race now that humans have established their position on the planet.

## II. BACKGROUND STUDY

A field of computer science called artificial intelligence, or AI, makes an effort to mimic aspects of human intelligence or senses. These involve gaining knowledge, using logic, and adapting. In artificial intelligence, several topologies and

methodologies are employed. The top-down and bottom-up methodologies are the two basic approaches. While top-down theorists believe that computer programming can accurately mimic the behavior of the human brain, bottom-up method theorists believe that the best way to create artificial intelligence is by creating electronic replicas that are indistinguishable from the complex network of neurons found in the human brain. The research into artificial intelligence is quite specialized and sophisticated. Two primary areas serve as the foundation for artificial intelligence research [2].

One area of discussion centers on organic thinking, where artificial intelligence is built to mimic human thought processes. In the second line, phenomenal is described as based on formalizing universal truths and certainties about the world. It is believed that the majority of the challenges are what robots are expected to solve, which would necessitate extensive knowledge of the outside world. However, sometimes both types of research intersect and may ultimately succeed with the help of artificial intelligence. To obtain the knowledge necessary for an AI to operate properly, a great deal of knowledge in various areas must be collected [5].

The past provides numerous examples of how technologies can automate the most time-consuming parts of jobs without eliminating them, such as the flying shuttle loom, which relieved weavers' physical strain from manually operating looms, and ATMs, which cut the time required for tellers to perform the routine tasks of counting money and updating balances. The value of employees is focused on the outcome they generate rather than being easily broken down into component jobs. Because of productivity advances, new technologies in many cases have raised the demand for human labor and even given rise to entirely new job categories.

Workers are increasingly more productive in tasks that cannot be automated as labor becomes more mechanized, and even with AI, these difficult-to-automate tasks are common. Human traits like intuition, moral judgement, and social skills—which are essential to most jobs—cannot be replicated by machines. In particular industrialization and commercialization projects, AI is applied increasingly frequently, demonstrating new development tendencies.

A more comprehensive understanding of artificial intelligence suggests that it can combine learning, sensing, problem-solving, and adapting new solutions to the system [6].

Additionally, linguistic thinking and logic are involved. There are two forms of artificial intelligence: 1. Weak AI. 2. Powerful AI.

1. Weak AI. The idea behind weak artificial intelligence is that machines act intelligently. Weak AI demonstrates that machines can perform virtual functions like thinking, talking, and moving if they are designed to do so. For instance, a computer can play and move players automatically in a game of chess. Although a computer cannot think, it is programmed to always do the proper action.
2. Strong AI: The idea behind strong AI is that machines would perform computations, think for themselves, and anticipate future outcomes.

For example, IBM created the artificial intelligence supercomputer "WATSON." Thus, there will undoubtedly be machines or perhaps even humanoids in the future that can perform their tasks and have greater mental capacities than humans.



### III. ARTIFICIAL INTELLIGENCE IMPACT ON BUSINESS

By moving the right AI technology, your business may achieve the ability to:

- By automating routine chores and working it;
- Boosts productivity and operational efficiencies;
- Saves time and money;
- Quickly make business decisions based on cognitive technology outputs;
- Avoid blunders and "human error," proving that smart systems are appropriately configured;
- Identifying and utilizing sales opportunities will help you generate revenue.
- Develop knowledge by facilitating analysis and providing wise counsel and assistance Recent research indicates that the primary motivation for employing AI in business was to get an advantage over competitors. Then, the source of the incentive was:
  - A decision made by an executive;
  - A specific corporate, operational, or technical issue;
  - A test conducted internally;
  - Client demand;
  - An unexpected solution to a problem;
  - An outgrowth of another project.



Recent advances in AI have been helped by three factors

1. Having access to massive data produced by enterprises, governments, science, wearable technology, and social media
2. ML algorithms have improved as a result of the availability of massive volumes of data.
3. The development of cloud-based services and increased processing power, support the operation of complex machine-learning algorithms.

### IV. APPLICATIONS OF AI

AI is significant because it may assist in resolving incredibly time-consuming problems in a variety of areas, including entertainment, education, health, business, transportation, and utilities. Five categories can be used to group AI applications [7]:

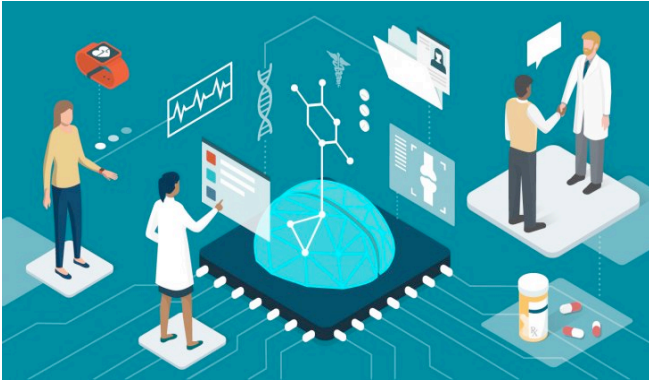
- Reasoning: the capacity to arrive at solutions to issues logically. Use insight to identify consumer preferences and provide them with a better experience, for instance in financial asset management. produce excellent leads by mining a large amount of data; save money by optimizing your operations, personnel, or products; legal assessment, financial application processing, autonomous weapons systems, games
- Knowledge: The ability to show knowledge about the world. e.g., financial market trading, purchase prediction, fraud prevention, drug creation, medical diagnosis, the media recommendation
- Planning: The capability to set and achieve goals. e.g. inventory management, demand forecasting, predictive maintenance, physical and digital network optimization, navigation, scheduling, logistics
- Communication: The ability to get spoken and written language. e.g. real-time translation of spoken and written languages, real-time transcription, intelligent assistants, voice control
- Perception: The ability to infer things about the world via sounds, images, and other sensory inputs. Example: medical diagnosis, autonomous vehicles, and surveillance.

### V. AI TRENDS IN ALL SECTORS

#### A. Healthcare

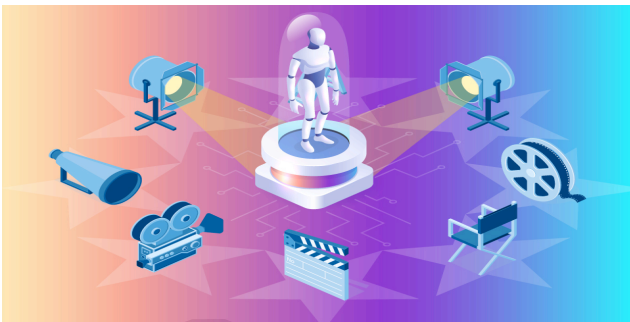
There are still many issues with the medical industry's progress. Medical science and intelligence are provided by

AI, which recognizes the successful marriage of medicine and technology [3]. Regional medical information platforms for health records are created using modern networking technologies, particularly the widely used Internet of Things (IoT) technology. In addition to gradually achieving informationization, it can realise the relationship and interaction between patients and physicians, hospitals, and medical devices. Technology and medicine can work together to make the medical procedure digital, electronic, quick, and accurate. The healthcare sector has benefited from AI and ML technology because it produces vast amounts of data for training and allows algorithms to recognize patterns more quickly than human analysts [8][9].



### B. Entertainment

With services like Netflix or Amazon Prime, where ML algorithms monitor the user's behavior and compare it to that of other users to decide which shows to recommend, AI is becoming more and more prevalent in modern life. The algorithms are gradually becoming more clever over time, to the point where they can recognize that a user might wish to purchase something as a present rather than for themselves, or that different family members have varied viewing habits.



### C. Finance

Digital financial services have been made possible through the deployment of AI in the financial sector. The entire banking sector has gained additional development vigour as a result. Many people are aware of the potential uses of AI in the financial sector. AI adaptation takes place over time. The evolution of the financial industry is significantly impacted by the use of AI. AI is a service for the financial sector as well as an analysis of financial data [4].

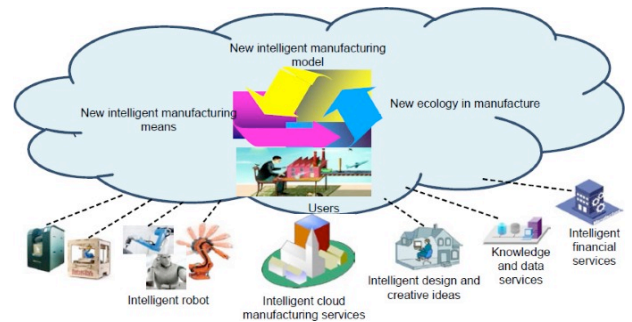
### D. Data Security

With the transition to a digital world, cyberattacks are becoming more common. Concerns have also been raised concerning AI programmes turning against systems. A bot

called Automatic Exploit Generation (AEG) can determine whether a software flaw that could compromise security can be exploited. If a weakness is discovered, the bot immediately fixes it. AEG systems aid in the creation of automated algorithms for creating signatures that can forecast the risk of cyberattacks.

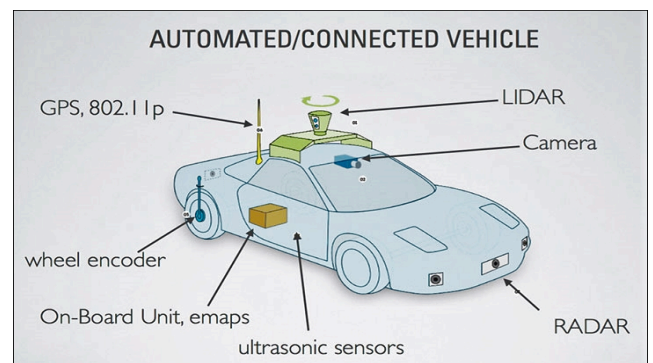
### E. Manufacturing

The application of AI and manufacturing integration has raised economic and manufacturing productivity, made up for labor shortages, increased production flexibility, and reduced costs. Mass customization, better supply and demand matching, more precise market forecasting, the promotion of manufacturing service transformation, and enhanced manufacturing quality control. Complex system engineering is encouraging the deep integration of AI and manufacturing further. The development and use of compound skills, Internet technology, information security, and the standardization of AI are only a few of the issues and difficulties that all nations in the globe face.



### F. AI in autonomous driving

Robotic systems are used in autonomous driving. Deep learning is the current, successful method for optimizing driving behavior in autonomous cars. Large volumes of data are produced as a result of the various traffic conditions and unforeseen circumstances that moving cars encounter. To give training examples, this data is transmitted back to the cloud platform. After extensive training and learning, you will get both your own driving experience as well as the outcomes of other cars' training and learning. The drive technology will be modified by the continued expansion of sample training, considerably enhancing autonomous driving technology. Meanwhile, there are other obstacles to autonomous driving, including technical problems, expense s, rules, and legislation.



### G. AI in education

The integration of AI and education at this time resulted in significant changes to the nature of education, from AI education to educational AI. The idea of collaborative, people-oriented education is the main focus of the curriculum. Objects used in education can be both people and machines. For both machines and people, educational AI research objects become educational activities and guidelines.



### H. AI in the retailing industry

In the not-too-distant future, machines will assist customers rather than employees when they visit convenience stores to check out products online. The virtual assistant will offer logical suggestions based on the customer's purchasing preferences and past purchases when customers don't know how to filter online products. A checkout counter is not necessary for the new store Amazon Go. The operation of conventional convenience stores and even supermarkets is in some ways threatened by Amazon's newest intelligent convenience store, which employs some of the most cutting-edge purchasing innovations available. The model incorporates computer vision, sensor fusion, and deep learning techniques. The benefit of AI for the retail sector is the realization of a genuine consumer experience with products.

With AI, the retail sector can undergo additional adjustments, including those that should be made before consumer consumption as well as during and after the actual consumer buying process.

## VI. CONCLUSION

To create AI models for information pre-processing, processing, refining, and value-added services, advanced ML, pattern recognition, and data mining approaches are adopted in this significant area of computer applications. AI is widely used in many different industries and serves as the application platform for Industry 4.0, the Internet of Things, and big data. AI effectively supports people's work and daily lives while also advancing the informationization and automation of the smart society. Both the techniques and the applications of

artificial intelligence have grown rapidly. AI will likely become more widespread and all-encompassing with the advancement of platforms, algorithms, and interaction techniques. We are starting to see intelligent financial systems, intelligent teachers, intelligent teachers, and intelligent teachers in our daily lives. The invention of conventional procedures, such as human-machine collaboration, is a consequence of the rise of intelligent systems. This paper provides a comprehensive overview of the state of AI development, explains its core technologies and applications, and forecasts its future development trajectories, providing researchers and practitioners with motivation.

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