STM JOURNALS

Journal of
Advancements in Robotics

ISSN: 2455-1872
Volume 11, Issue 3, 2024
September–December
DOI (Journal): 10.37591/JoARB

https://journals.stmjournals.com/joarb

Review JoARB

A Survey on the Evolution of AI (Artificial Intelligence) and Robotics

Vaibhav Sharma[1,*], Arvind Tiwari[2]

Abstract

This is the age of new technology and gadgets to improve the livelihood of human beings in aspects of every manner while arranging the host of facilities for every task related to our daily lifestyle. To improve the machine and their working manner smartly only programming is not enough it takes a lot more than just programming and here the implementation of AI tools takes place to improve the quality, efficiency, accuracy, and reliability with ease of utility characteristics. Robotics engineering is the greatest example of the utility of artificial intelligence and nowadays this works everywhere and in every field which is related to the real-world scenario. The era of AI and Robotics has now been a decade, and both have an overnight success journey, the integration of these two changes the multitude of the industry. AI and Robotics take adaptive and more intelligent techniques for each and every field to develop more accurate and fast processing applications for various fields. The first AI program was presented by Dartmouth Summer Research Project on Artificial Intelligence (DSRPAI) in the 1960s; till from there AI has come with a lot more expectations, inventions, and developments, and now it lives with the age of big data, which can collect huge information for any person or organization to process and AI in this regard has already been quite more powerful tools to influence many sectors like banking, marketing, investments, medical science and not the last entertainment. While working with AI in these sectors, Robotics gets involved to deal with the complex issues and problems for the betterment of these industries, and it is just not enough fields the integration of AI and Robotics is a breakthrough in the fields of computer science, mathematics, or neuroscience. AI and Robotics are not the next big things of the future it is involved so deeply in the present scenarios of our life. Here in this article the overall evolution of AI and Robotics till now and its future has been defined with a step-by-step evolutionary period of both powerful tools along with the use of their integration and implementation in various fields in today's world.

Keywords: Artificial intelligence, robotics, AI tools, business and AI, history of AI

INTRODUCTION

Artificial intelligence is the ability of machines to perform the diffusion of tasks with assistance from people. Machines might be capable of research, resolving problems, making plans, supposing, and so on. Synthetic intelligence refers to the replication of human intelligence using machines. Artificial intelligence is an area of technology that is rapidly developing every day. It is predicted that in the not-too-distant future, synthetic intelligence will dramatically regulate human life and, most likely, put a cease to all global difficulties by resolving important issues [1]. Artificial intelligence is described because the discipline of PC technology and engineering is concerned with the development of clever machines that perform like human beings. Artificial intelligence enables machines to sense, recognize, act, and study approaches similar to human beings. Artificial Intelligence is classified

***Author for Correspondence**
Vaibhav Sharma
E-mail: sharma.vaibhav11@gmail.com

[1,2]Associate Professor, Department of Computer Science, Dr. CV Raman University Chhattisgarh, Kota, Chhattisgarh, India

Received Date: September 23, 2024
Accepted Date: October 14, 2024
Published Date: November 04, 2024

Citation: Vaibhav Sharma, Arvind Tiwari. A Survey on the Evolution of AI (Artificial Intelligence) and Robotics. Journal of Advancements in Robotics. 2024; 11(3): 10–17p.

into four types: reactive machines, constrained memory, concept of thoughts, and self-awareness. Artificial Intelligence (AI) is not a future concept that is currently happening in the world. Artificial intelligence has a great impact on our lives and is involved in our daily lifestyle from one way to another, and it is now impossible to leave it for no reason. Advanced technology is advancing with the use of AI tools, and the capability of learning these technologies is increasing enormously. This is a great achievement in the machine learning process, which also involves the development of robotics mechanisms through the use of machine learning. AI is now a part of our daily lifestyle and has evolved to provide many specific benefits in every industry and in every technology that is in the development process, whether it is from the automobile, medical science, education system, etc. [2].

LEARNERS OBJECTIVES

The following are the key learning objectives of this article:

- Learners will know what AI is.
- Learners will understand the evolution process of AI and Robotics.
- Learners will be able to understand the development process of AI.
- Learners will be able to differentiate between AI and Robotics.
- This article provides learners with knowledge about the different fields of AI and Robotics.
- The learner will understand the working manner of AI.
- This article will introduce the fields of AI and Robotics to the learner.
- This section defines the social impact of the use of AI and Robotics [3].

ARTIFICIAL INTELLIGENCE

The term "synthetic intelligence," which refers to intellect created with the aid of human beings, is made of the phrases "synthetic" and "intelligence." Artificial intelligence, then, is what takes place while machines are given artificial intelligence to perform sensible responsibilities, just like the ones finished through people. Ultimately, it comes all the way down to creating sensible gadgets that may mimic the human brain and characteristics and behave like people. Artificial intelligence has become better known today because of expanded information volumes, high-level calculations, and enhancements in processing power and capacity. The replication of human intelligence functions by machines, particularly computer systems, is known as artificial intelligence. Expert systems, natural language processing, speech recognition, and machine vision are examples of AI applications. AI systems typically ingest a vast volume of labeled training data, which then examine the data for correlations and patterns before employing these patterns to forecast future states. By studying millions of instances, an image recognition tool can learn to recognize and describe objects in photographs, just as a chatbot that is given examples of text can learn to produce lifelike dialogues with people [4].

Types of AI

There are numerous ongoing AI research and development projects, most of which are categorized into distinct categories. These divisions offer more of a narrative than a taxonomy, which can explain the development of AI, where it is headed, and what the future may contain. What we can anticipate from the technology and the four types of AI are listed below.

1. *Reactive AI*: Reactive AI algorithms can only work with current data. Because this type of AI lacks a specific functional memory, it cannot draw on past experiences to guide current and future decisions.
2. *Limited memory*: AI with limited memory can temporarily store information from experience. Deep learning has significantly increased AI's capacity for picture identification, and additional classes of AI algorithms have quickly emerged, including deep reinforcement learning [5].
3. *Mind empower AI*: The ability of an AI system to assign mental states to different entities is referred to as the theory of mind capabilities. By examining speech, images, and other types of data, emotion AI seeks to understand, replicate, monitor, and react correctly to human emotion. Despite its potential use in industries such as healthcare, customer service, advertising, and many others, this skill is still far from being an AI theory of mind.

4. *Self-aware AI*: This refers to AI that can replicate human emotions, desires, and requirements. This is a far-fetched aim, for which we lack both hardware and algorithms. In the future, it will be possible to determine whether artificial general intelligence (AGI) and self-aware AI are related [6].

The following section describes the various applications of AI, which will help us better understand AI.

Application of AI

- To solve universal and complex problems to understand the universe.
- AI is used in healthcare industries to make accurate, reliable, and faster diagnoses.
- Massive volumes of data can be managed and organized by AI. AI can analyze a large amount of data to find the newest hashtags, trends, and user requirements.
- Every business must prioritize data protection, and in the digital age, cyberattacks are increasing significantly [7].
- AI and finance industries are the best matches for each other.
- Some sectors in the automotive sector utilize AI to provide users with virtual assistants for better performance.
- Artificial intelligence plays a significant role in robotics. Most of the time, general-purpose robots are programmed to carry out monotonous duties, but with the aid of AI, we can develop intelligent robots that can carry out activities based on their own experiences rather than being pre-programmed. Robots that resemble humans, such as Erica and Sophia, are the best examples of artificial intelligence. These robots can speak and act in a human-like manner [8].

Some of the key areas in which the role of AI cannot be denied, and it is everywhere in our daily routine in almost every field using AI tools for betterment.

History of AI

Regardless of having earmarks of being somewhat innovative, computerized reasoning has a long history, as should be visible to doing a little examination. It is imagined that ideas from computerized reasoning were utilized in Greek folklore. The following are a few achievements throughout the entire existence of computer-based intelligence that characterize the excursion from the man-made intelligence age to work-date improvement.

1. *Early foundations of AI (1950s to 1960s):* This covers the birth of artificial intelligence as an academic discipline and the initial progress in AI, such as logic theorists and general problem solvers.
2. *AI (1970s to 1980s):* The early promises of AI were not fully realized, leading to skepticism about its potential.
3. *Knowledge-based systems (1980s to 1990s):* The focus shifted to rule-based expert systems that utilize human knowledge to make decisions. Although they are limited in many respects, they have found applications in various industries.
4. *Machine learning and neural networks resurgence (1990s to early 2000s):* This period saw the re-emergence of interest in AI owing to the advancement of machine learning techniques and the use of neural networks for various tasks, such as image and speech recognition.
5. *Big data and deep learning (mid-2000s to early 2010s):* With the rise of big data and the availability of powerful graphics processing unit (GPU), deep learning techniques have demonstrated breakthroughs in various domains, including natural language processing, computer vision, and gaming.
6. *AI in industry and everyday life (2010s to early 2020s):* This period marked the integration of AI technologies into various industries and everyday life with the development of AI-powered virtual assistants, autonomous vehicles, and AI-driven recommendation systems.

7. *Ethical and societal implications (ongoing):* As AI systems become more prevalent, discussions on ethical considerations, bias, transparency, and safety have gained prominence. This article describes ongoing efforts to ensure responsible AI development and deployment of responsible AI.
8. *Advancements in reinforcement learning and AI ethics (ongoing):* In recent years, reinforcement learning, in which AI systems learn from interaction and feedback, has shown impressive results in various domains. AI ethics and governance frameworks have also been developed to address ethical challenges.
9. *AI and robotics integration (ongoing):* The integration of AI with robotics is an evolving article with the development of AI-powered robots for applications in manufacturing, healthcare, and other sectors.
10. *AGI and beyond (future):* The quest for AGI remains an ongoing aspiration of the AI community.

The evolution of AI is continuous, and new developments have occurred at any moment; thus, according to its high-speed development process, the evolution of artificial intelligence can be categorized as defined in the following section according to the different phases described above [9].

Categorization of AI

1. *Foundation and early research*
   - Birth of AI as an academic discipline.
   - Development of early AI systems and programs.
2. *AI winter*
   - Setbacks and reduced interest in AI research.
   - Skepticisms about the potential of AI.
3. *Knowledge-based systems era*
   - Focus on rule-based expert systems.
   - Utilization of human knowledge for decision-making.
4. *Machine learning and neural networks resurgence*
   - Renewed interest in AI with the advancement of machine learning techniques.
   - Utilization of neural networks for various tasks.
5. *Big data and deep learning*
   - Impact of big data and GPU technology on AI development.
   - Breakthroughs in deep learning for applications in natural language processing (NLP), computer vision, etc.
6. *AI in industry and everyday life*
   - Integration of AI technologies into industries and everyday life.
   - Examples of AI-powered virtual assistants, autonomous vehicles, etc.
   - Efforts to ensure responsible AI development and deployment.
7. *Advancements in reinforcement learning and AI ethics*
   - Progress in reinforcement learning for interactive AI systems.
8. *AI and robotics integration*
   - Integration of AI with robotics in various sectors.
9. *AGI and beyond (future)*
   - Aspirations for AGI.
   - Ongoing efforts to achieve AGI-like capabilities.

It is essential to note that AI development is continuous and dynamic; therefore, these categories may evolve and change with time as breakthroughs and challenges emerge [10].

AI and Robotics

Artificial intelligence and robotics are frequently confused; however, they are two separate concepts with some overlaps. Robotics and artificial intelligence are closely connected fields that frequently

overlap and support one another. Robotics and artificial intelligence both entail the creation of systems that mimic or simulate human behavior and intelligence. These are as follows:

- *AI in robotics control*: AI approaches have been applied to create intelligent control systems for robots. These systems provide robots with the ability to see their surroundings, make judgments, and perform actions in accordance with the data gathered. Robots are frequently programmed to perform tasks independently using machine learning methods such as deep learning and reinforcement learning.
- *Perception and sensing*: To recognize objects, barriers, and other pertinent information, AI algorithms assist in processing sensor inputs from the senses of vision, touch, and sound. Robots can "see" and understand visual input thanks in large part to computer vision, a branch of artificial intelligence [11].
- *Robot route planning and navigation* AI systems are used to guide robots in challenging settings. These algorithms consider collision prevention, route-planning efficiency, and obstacle avoidance. Robots can adapt to changing circumstances and make quick decisions while moving by integrating AI technology.
- *Human-robot interaction*: Robots that can comprehend and respond to human speech using NLP techniques are more user-friendly. Robots can interpret human emotions and activities through AI-powered facial and gesture recognition.
- *Learning and adaptation*: AI-enhanced robots can learn from mistakes and modify their behavior. Robots can improve performance and efficacy through ongoing learning.
- *Autonomous systems*: The fusion of robotics and AI has facilitated the creation of autonomous systems. Thanks to sophisticated AI algorithms, autonomous vehicles, drones, and even industrial robots are improving their ability to complete tasks without direct human interaction.
- *Deep reinforcement learning*: Deep reinforcement learning has recently become a promising strategy for teaching robots. Robots must be trained through trial-and-error methods, where they are taught both successful and unsuccessful behaviors. Impressive outcomes have been obtained using this strategy in various domains, including complicated locomotion problems and robot manipulation.

In conclusion, robotics and AI are related topics in which robots' abilities are improved by AI technologies by allowing them to observe, reason, learn, and interact with their environment. Automation, autonomy, and human-robot collaboration continue to improve thanks to this cross-disciplinary cooperation.

SOCIAL IMPACT OF AI AND ROBOTICS

The potential for man-made intelligence to modify how we live, work, and play makes this huge. The mechanization of human positions, including client support, lead creation, misrepresentation identification, and quality control, has been effectively applied in business. Computer-based intelligence is suitable for a few errands more extensively than people. Computer-based intelligence advances regularly, finishes work quickly, and with few mix-ups, particularly with regard to rehashed, meticulous exercises, such as breaking down a colossal number of lawful papers to confirm key fields are filled in accurately. Simulated intelligence can give organizations functional experiences that they might not have known about because of the tremendous informational collections it can process. Simulated intelligence and advanced mechanics can have critical social effects, both positive and negative. There are a few central issues to consider in both ways.

Positive Effects of AI and Robotics

- *Efficiency and automation*: AI and robotics can automate monotonous jobs and procedures, thereby boosting productivity across a range of industries.
- *Healthcare innovations*: AI-driven diagnostics, personalized medicine, and robotic-assisted procedures can improve healthcare results, reduce errors, and provide people in remote locations with access to medical treatment.

- *Education and learning:* AI-powered educational systems may adjust to specific learning requirements, giving pupils individualized learning experiences.
- *Environment conservation*: Robotics and artificial intelligence can be utilized for resource management, disaster response, and environmental monitoring. Monitoring efforts to protect species, stop deforestation, and clean up pollution can be performed with drones and sensors.
- *Agricultural innovation*: AI-powered precision agriculture methods can increase food security by increasing crop yields, decreasing pesticide use, and improving water resource management.
- Robotic assistants can assist with daily activities and movement, as well as communication.
- *Exploration and research*: Robots and AI can be used in dangerous environments where human presence is scarce, such as deep-sea exploration and space exploration. We can now collect information and insights that were previously unattainable thanks to them.

Negative Impact of AI and Robotics

- *Displacement of jobs*: Automation supported by AI and robots has the potential to create job displacement, particularly in industries that involve repetitive and regular work. This could result in unemployment and economic inequality if not addressed properly.
- *Privacy*: AI systems can collect and manage vast amounts of personal data, which raises concerns about privacy, spying, and potential misuse of sensitive data.
- *Fairness and bias*: Artificial intelligence systems may perpetuate and exacerbate societal biases if they are taught biased data.
- *Ethical dilemmas:* As AI and robots advance, concerns regarding responsibility and accountability for mistakes made, as well as the possibility for autonomous systems to make life-or-death decisions, are raised.
- *Social isolation*: Technology's rising pervasiveness raises the possibility of social isolation as well as a decline in face-to-face encounters. Social cohesiveness and mental health may have been affected by this.
- *Security dangers*: Significant security dangers are posed by AI-driven cyberattacks, autonomous weapon systems, and the potential for AI to be exploited in disinformation operations.
- *Economic disruption*: If particular regions or sectors are not fully equipped to adapt to these technological advances, the rapid advancement of AI and robots can cause economic disruption [12].

In conclusion, AI and robotics can significantly alter many facets of civilization. It takes careful analysis, ethical principles, regulation, and a cooperative effort from researchers, legislators, industry stakeholders, and the general public to maximize the positive consequences while reducing the negative ones.

Future of AI and Robotics

Future developments in artificial intelligence and robotics have the power to drastically alter many facets of society, the economy, and daily life. This section outlines general trends and possibilities that might shape the future of AI and robotics.

- *Human and AI*: Collaboration between humans and AI systems is most likely to happen in the future. AI will support human decision-making, problem-solving, and creative processes, resulting in more effective and productive outputs across a variety of sectors.
- *Ethics and regulation:* As artificial intelligence and robotics become more pervasive in society, ethical issues become more important. Regulations will probably be created to ensure the appropriate and secure use of AI, especially in fields such as autonomous vehicles, healthcare, and surveillance.
- *Education and skill development*: AI-powered learning aids may tailor instruction to each student's needs and preferences. AI may also help in retraining and upskilling the workforce, as job functions change as a result of automation.

- *AI in healthcare*: AI has the potential to revolutionize healthcare by facilitating personalized treatment plans, quicker medication discovery, more precise diagnostics, and remote patient monitoring.
- *AI in entertainment:* there may be an increase in the use of AI-generated materials in music, art, literature, and media. Virtual reality simulations and immersive games may benefit from artificial intelligence.
- *Applications in the environment*: These technologies can help create a cleaner future by automating sustainability-related jobs and monitoring and managing natural resources.
- *Security and privacy:* As AI is being used more frequently, security and privacy concerns will spread. Therefore, it is crucial to create AI systems that can withstand attacks and ensure data privacy.
- *Economic impact:* Robotics and AI have the power to upgrade all sectors and change the nature of employment. While certain professions might be automated, new positions in system upkeep, AI development, and other areas could appear.
- *Global collaboration and research:* To address these issues and maximize the advantages of AI and robotics while reducing potential threats, global collaboration among researchers, engineers, and politicians is essential.
- *Development of ethical AI*: The emphasis on ethical AI will increase, covering topics such as bias reduction, accountability, transparency, and justice in AI algorithms.

Keep in mind that A variety of elements, such as technical developments, societal judgments, economic concerns, and ethical choices, influence the future. The way these elements interact and develop over time determines the course of robotics and AI.

CONCLUSION

The research paper "Evolution of AI and Robotics" concludes by providing a thorough review of the development of AI and robotics from their genesis to the present. It examines how machine learning, neural networks, and robots are interconnected while understanding the moral and social ramifications of their development. In the end, the article presents a future in which robotics and AI are still reshaping several businesses and society. The "Evolution of AI and Robotics" examines the dynamic development of artificial intelligence and robotics from their conception to the present. It dives deeply into the background, tracing the origins of AI and robotics to early theoretical ideas in the 20th century. The research paper includes important occasions, such as the creation of the first neural networks and expert systems. This survey report describes how ethical and societal concerns regarding AI and robotics have recently emerged, addressing issues such as job displacement, algorithmic bias, and the appropriate application of these technologies. It emphasizes how crucial moral standards and laws determine the direction of AI and robotics. Ultimately, the "Evolution of AI and Robotics" portrays an ever-evolving landscape where AI and robotics continue to advance in unprecedented ways. This evolution is marked by a combination of theoretical foundations, technical breakthroughs, and increasing integration of intelligent systems into our daily lives, fostering a future that holds both exciting potential and important ethical questions.

REFERENCES

1. Amigoni F, Schiaffonati V. Ethics for robots as experimental technologies: Pairing anticipation with exploration to evaluate the social impact of robotics. IEEE Robotics and Automation Magazine. 2018;25:30–6. DOI: 10.1109/MRA.2017.2781543.
2. Agrahari A, Rao DT. A review paper on big data: Technologies, tools, and trends. Int Res J Eng Technol. 2017;4:640–9.
3. Reba RC. Introduction to robotics in medicine. In: Brady M, Gerhardt LA, Davidson HF, editors. Robotics and artificial intelligence. NATO ASI series. Vol. 11. Berlin, Heidelberg: Springer; 1984. p. 591–2. DOI: 10.1007/978-3-642-82153-0_30.

4. Chen Y, De Luca GD. Technologies supporting artificial intelligence and robotics application development. J Artif Intell Technol. 2021;1:1–8. DOI: 10.37965/jait.2020.0065.
5. Desarkar A, Das A. Big-data analytics, machine learning algorithms, and scalable/parallel/distributed algorithms. In: Bhatt C, Dey N, Ashour AS, editors. Internet of Things and Big Data Technologies for Next Generation Healthcare. Springer International Publishing; 2017. p. 159–97. DOI: 10.1007/978-3-319-49736-5_8.
6. Denecke K, Baudoin CR. A review of artificial intelligence and robotics in transformed health ecosystems. Front Med. 2022;9:795957. DOI: 10.3389/fmed.2022.795957. PubMed: 35872767.
7. Dwivedi YK, Sharma A, Rana NP, Giannakis M, Goel P, Dutot V. Evolution of artificial intelligence research in technological forecasting and social change: Research topics, trends, and future directions. Technol Forecast Soc Change. 2023;192:122579. DOI: 10.1016/j.techfore.2023.122579.
8. Garcia E, Jimenez MA, De Santos PG, Armada M. The evolution of robotics research. IEEE Robot Autom Mag. 2007;14:90–103. DOI: 10.1109/MRA.2007.339608.
9. Mowforth P, Bratko I. AI and robotics; flexibility and integration. Robotica. 1987;5:93–8. DOI: 10.1017/S0263574700015058.
10. Rosenschein SJ. Formal theories of knowledge in AI and robotics. New Gen Comput. 1985;3:345–57. DOI: 10.1007/BF03037076.
11. Van Roy V, Vertesy D, Damioli G. AI and robotics innovation. In: Zimmermann K, editor. Handbook of Labor, Human Resources and Population Economics. Cham: Springer; 2020. p. 1–35. DOI: 10.1007/978-3-319-57365-6_12-1.
12. White J. The role of robotics and AI in technologically mediated human evolution: A constructive proposal. AI Soc. 2020;35:177–85. DOI: 10.1007/s00146-019-00877-z.

