

**From Manual to Autonomous: The Rise of Artificial Intelligent Robotics and Its Implications  
for the Workforce and Society**

In partial fulfillment of the requirements in  
Applications Development and Emerging Technologies

Submitted by:

**Cautibar, Mark James J.**

**De Jose, Charrie Lou P.**

**Peralta, Jennifer E.**

**Riesgo, Karen Mari**

BSIT-2A

May 11, 2023

Technological University of the Philippines Manila

## **I. INTRODUCTION AND BACKGROUND OF THE TECHNOLOGY TOPIC**

Innovation is an action that involves critical thinking and collective efforts of individuals to create preeminent inventions. One of the greatest examples of innovation is artificial intelligence. Artificial intelligence is a machine or computer that has the ability to learn and adapt to the changing world. This technological innovation can perform tasks like humans. According to Coppin (2004), artificial intelligence can deal with emerging situations, solve problems, answer questions, device plans, and perform various other functions that require some level of intelligence typically evident in human beings. Artificial intelligence encompasses different approaches in different fields including machine learning, deep learning, natural language processing, computer vision, and robotics which foster effectiveness in various industries such as in health, business, space exploration, and other. Through systematic algorithms, artificial intelligence is capable of analyzing data quickly with accurate results. This enhances the process of examination to expedite tasks and alleviate the issue of sluggish ideation with exceptional precision. As the world continually faces problems, Artificial intelligence will help generate solutions beyond extremeness bringing many impossible into reality and helping humanity.

Robotics is an interdisciplinary branch of both computer science and engineering. This involves designing, constructing, operating, and the usage of robots. This aims to build robots that can assist humans most effectively and efficiently. The role of Robotics is becoming more significant due to the utilization of Artificial Intelligence (AI). AI is facilitating robots to accomplish tasks that necessitate intelligence akin to humans, such as judgment, perception, learning, and adjustment. Usually, robots are considered replicators of humans. Besides, AI is enhancing the capabilities and adaptability of robots, and improving their safety, efficiency, and performance. The field of robotics is used to develop robots that can substitute and replicate humans, especially in most dangerous activities including radioactive experimentations, space exploration, hazardous works, and others. Across the ages, many academics, innovators, mechanics, and experts have commonly presumed that robots will eventually imitate human actions and handle duties like humans. In some ways, sometimes robots can perform tasks better than humans. The presence of humans is required in some robots to operate but in others, they can function autonomously. Nowadays, the arena of robotics is

expanding swiftly, with the progression of technology. The exploration, conceptualization, and construction of novel robots cater to diverse pragmatic objectives, encompassing household, business, and military applications.

Artificial Intelligence starts dated back to 1942 and it was called "The Bombe" machine designed by Alan Turing during World War II, this becomes clearly the turning factor in cracking German communications encoded through the Enigma machine. It helped in dashing up the interpreting of messages. Hence, this allowed the allies to react and strategize within some hours in place of awaiting days/weeks. His complete system of breaking the code become the statement that every German message contained a recognized piece of German plaintext at a recognized factor withinside the message. During the 1950s, a group of scientists, mathematicians, and philosophers conceptualized the idea of artificial intelligence. This began to challenge the world with the idea of "why machines cannot do what we do?". Alan Turing first released a test to test for machine intelligence. During this time, computers lacked functionalities including intelligence, this means that they could not store any commands, and the only thing computers could do was only to execute them. Also, running a computer is extremely expensive. In 1955, John McCarthy coined the term artificial intelligence and believed that artificial intelligence is achievable, and he led the groundwork for the development of the field. In 1958, McCarthy created the Lisp computer language, which became the standard AI programming language. In the 1960s, Eliza, the first ever chatbot was invented by Joseph Weizenbaum at the Artificial Intelligence Laboratory at MIT. This psychotherapeutic chatbot gives comfort to someone about how they feel. DeepBlue was introduced in 1997. This has become a game-changer in the world of artificial intelligence. DeepBlue was developed by IBM. This chess-playing computer program defeated Gary Kasparov, who was the reigning world chess champion at that time. In the same year the robot named Kismet developed by Cynthia Breazeal that could recognize and showcase different kinds of emotions. Later 2000s, the advancement of voice recognition features became a significant breakthrough in voice assistants like Siri (Apple, 2008) Alexa (Amazon, 2014), and Google (Google, 2016). Although these features are insufficient, developers further give this a major makeover as a result, voice recognition becomes a feature of artificial intelligence. In 2016, Hansen Robotics introduced to the world the humanoid robot named Sophia shocked the world. With the ability to think like a human, she can talk and share her opinion using

artificial intelligence. And lastly, in the year 2020, GPT-3 was released by OpenAi, and later, they released a much more updated version which is the ChatGPT in 2022. This has become a revolutionary tool that automates conversation. This required a well-structured algorithm to have an accurate result. Allowing its user to just type need then it will generate an answer automatically.

As the future will come, will these technologies become the standard practice of humans in terms of surviving in daily lives, or maybe it will become the world's major challenge in how to deal with many problems that might occur during the time of Artificial intelligence. Undoubtedly, there are a lot of possibilities that might occur in the future, but knowing that technology is changing over time, many impossible things will become possible. Moreover, the only future of the world with AI will have an impeccable impact in changing the world in a much more advanced way that could change how humans will perceive life.

Nevertheless, artificial intelligence has vast branches. We researchers chose robotics since it is more interesting to conduct this research. Apart from this, most people are familiar with robotics since it is one of the most researched branches of artificial intelligence. This will help people to fully understand robotics and artificial intelligence.

## **II. OBJECTIVES OF THE TOPIC**

The domain of artificial intelligence has demonstrated noteworthy advancement over the last half-decade. Artificial intelligence bots have become a hot topic, this study wants to know how robotics impacts the workforce and society. The researchers want to:

- To explain what artificial intelligence is.
- To describe the applications of artificial intelligence in robotics.
- To know the impacts of how AI revolutionized robotics and its application across various sectors: health, agriculture, business, and education.
- To identify the merits and demerits of robotics.
- To establish a well-constructed position regarding robotics.

### **III. SCOPE OF THE TOPIC**

The researchers want to explore artificial intelligence in robotics. This will only focus on one field of artificial intelligence which is robotics. Also, this study will further understand how artificial intelligence in robotics transformed society in advancement. The researchers want to know how various sectors utilize these technologies and how they manage to maximize their efficiency. In addition, the researchers want to address what are the positive and negative effects of these technologies on the world. Importantly, the actual construction of robots is excluded from this study.

### **IV. PRESENTATION OF THE CHOSEN TECHNOLOGY**

#### **A. Uses and Functions**

The field of robotics has made remarkable progress in recent years through the emergence of Artificial Intelligence (AI), which revolutionized the capabilities of robots. By incorporating AI algorithms into their programming, robots can perform a wide range of task with great precision, accuracy, and autonomy. These tasks include working in collaboration with humans, performing challenging and high-level jobs, recognizing, and sorting objects, processing vast volumes of data in real-time, and learning and adapting to new tasks and environments. Nowadays, robots become powerful tools because of their ability to think autonomously, achieved with the coexistence of AI and robotics. Artificial Intelligence (AI) is also employed in robotics through machine learning and edge computing. And there are multiple tasks incorporated to robots with the help of AI and machine learning involving computer vision, grasping the objects, navigation, motion control, real-world observation, and natural language processing.

Robots utilize Artificial Intelligence (AI) through machine learning, which enables them to learn and conduct specific jobs by observing and imitating human behavior. With AI, robots are equipped with computer vision to navigate, detect, and respond appropriately, allowing them to be more than just machines that perform repetitive tasks. They can now collaborate as cognitive partners with humans.

AI-based control systems and machine learning are also used in robotics to enable automation to grasp and manipulate objects, which has traditionally proven difficult for robots. Robots can grip and manipulate objects by analyzing visual input from camera and sensors using advanced algorithms, which allows them to comprehend the direction, orientation, characteristics, and forms of the items in their surroundings. With this knowledge, robots can plan and execute precise motions to control and grip the objects without human intervention.

Moreover, robots are more autonomous because of improved machine learning capabilities, eliminating the need for humans to organize and control process flows and navigation pathways. AI and machine learning assist robots in evaluating their environment, maintaining their balance, and directing their movements, allowing them to avoid obstacles. For instance, a robot with motion control could move through a congested warehouse, shifting its path when it comes across barrier or other moving objects.

For robots to operate with autonomy, they need to learn about their immediate environment. This comprehension is the result of natural process language and real-world observation. Machine learning has demonstrated an important potential for assisting computers in comprehending data and seeing patterns so they can take appropriate action. In addition, natural language processing allows robots to understand and interpret human language, including speech recognition. This skill is essential in applications where people must speak orally with the robot, like personal assistant robots. Hence, robots can understand spoken commands and reply accordingly by employing natural language processing algorithms, which improves their usefulness and usability.

Another way is employing AI in robotics through edge computing, where the information collected by robot-based sensors is examined in real-time near the machine, giving robots real-time awareness and the ability to respond quickly. The employment of many different sensors, including time-of-flight optical sensors, temperature and humidity sensors, ultrasonic sensors, vibration sensors, and millimeter-wave sensors, helps AI in assisting robots to learn and adapt. These sensors help robots become smarter and better able to behave and respond in various situations.

Therefore, AI has multiple uses in robotics, including accomplishing an array of tasks with high precision, accuracy, and autonomy with the aid of other disciplines, like machine learning and edge computing. Other activities incorporated into robots are computer vision, grasping objects, navigation, motion control, real-world observation, and natural language processing. Robots are getting more intelligent, accurate, and effective. And once humans realize the full potential of AI and robotic systems, they will advance further in the coming decades.

## **B. Importance and Benefits**

The earliest robots were remarkable, but they only had limited functionality. Back then, robots had little to no environmental awareness and could only execute specific tasks. However, with the breakthroughs in Artificial Intelligence (AI), humans can now create robots that can analyze and respond to their environment, allowing them to act independently and make decisions on their own. While some see the convergence of AI and robotic systems as the end of humanity, fearing the possibility of machines taking over, others argue that AI and robotics are tools with limitless power and enormous benefits. Moreover, Artificial Intelligence's capacity to transform basic robots into intelligent machines offers numerous benefits, including reduced errors, heightened productivity and efficiency, enhanced safety, and improved quality and accuracy for workers across multiple occupations.

Humans tend to commit errors, which may have severe repercussions, especially in critical tasks like performing surgery, piloting aircraft, running trains, handling finances, controlling nuclear power plants, and operating heavy machinery. Since AI-powered robots do not get tired, make emotional judgments, or deviate from their algorithms, they can take over these jobs and assist in lowering the risk of error while maintaining high accuracy and speed. In addition, robots may learn from their performance, further reducing the chance of making mistakes. However, machines can still make errors and cannot completely mimic human decision-making in complicated situations.

Another benefit of AI-integrated robots is that they aid in heightened productivity and efficiency. Businesses may function more effectively using autonomous robotics for routine and repetitive operations. With the help of

intelligent machines, most tasks can be executed swiftly and accurately round-the-clock, without the need for rest or breaks. Incorporating AI-powered robots can also reduce labor expenses since human operators and supervisors are not needed.

Moreover, AI-enabled robots can enhance safety measures in hazardous environments without compromising human life. These robots may investigate dangerous locations like collapsed buildings, mines, oil rigs, or nuclear power plants. By utilizing AI and machine learning algorithms, robots can identify potential threats faster than humans and take necessary actions to mitigate risks. Robots can function as virtual security guards by surveilling buildings and alerting authorities in case of any suspicious activities. Oil and gas companies already use robots to undertake data collecting or safety inspection activities in hazardous settings to lower risk to people. Over time, these robots can learn to imitate human behavior and actions, making them valuable assistants in the workplace.

Furthermore, robots equipped with AI can achieve the laser precision that is challenging for humans. They may be educated and programmed to complete intricate tasks with outstanding accuracy, resulting in greater productivity and client satisfaction. AI robots also accomplish quality-control inspections on assembly lines, saving the firm money and time. For instance, Audi worked with Intel and Nebbiolo Technologies to optimize quality-control procedures and weld inspections using Intel-enabled robotic arms, machine learning, and predictive analytics.

Finally, integrating Artificial Intelligence (AI) into robotics led to intelligent machines that can understand and respond to their environment, execute tasks precisely, eliminate mistakes, increase productivity, and take better safety measures. While concerns about machines taking over jobs and threatening civilizations persist, the benefits of AI-powered robots are vast and undeniable. Nevertheless, this collaboration between people and machines will make processes safer and more efficient, creating new job positions that require diverse skill sets. Based on McKinsey's report, full automation is only possible for 5% of occupations, and robots cannot function without human programmers, maintainers, and decision-makers. Therefore, people should not fear that machines will dominate us since we will work alongside technologies to make



work more creative rather than technical. Keep in mind that robotics and Artificial Intelligence (AI) are creations, not creators.

## **C. Literature Reviews and Supporting Information Supporting the Group Position**

### **1. Technology Observations**

Our society is currently undergoing significant technological advancements that will have a profound impact on our way of life in the coming decades. One of the primary drivers of this transformation is the rapid growth of the artificial intelligence and robotics industry. There are a variety of viewpoints on the potential consequences of this development, with some individuals anticipating significant benefits and endless possibilities for intelligent technology, while others are apprehensive about a potential scenario in which machines take control and jeopardize human existence. These perspectives are shared by scientists, industry experts, and the general public alike. In this research, we will examine the positive and negative effects of robots and artificial intelligence on our lives from a variety of perspectives.

#### **(a) Health**

Modern technologies such as AI and robots play a significant role in digital health development, improving medical care. Surgical robots are valuable assistants to surgeons, increasing accuracy and reducing recovery time for patients through minimal invasiveness e.g., The da Vinci Surgery robot is a category of robotic-assisted surgical systems. The surgeon operates the robot through a console using joystick-like controls to maneuver the robot's arms, which are fitted with surgical tools. Additionally, the da Vinci robot has a high-definition camera that offers an enlarged, three-dimensional image of the surgical site. These advancements in healthcare have the potential to make medical services more accurate and accessible.

However, there are also negative effects to consider, such as job displacement for healthcare professionals and patients feeling isolated due to the lack of emotional support and empathy from robots. Ethical

concerns around data privacy, algorithm bias, and accountability for AI-powered robots' decisions are also raised by the use of AI in healthcare.

#### (b) Agriculture

Agricultural robots have proven to be more efficient than human workers in handling various tasks such as harvesting and spraying crops, using computer vision, machine learning models e.g., weed-whacking robot it can do everything from hoeing to harvesting or AI algorithms to monitor crop and soil conditions and predict outcomes based on weather and environmental factors.

However, the initial cost of acquiring or building the robots and the need for regular maintenance can be expensive. There is also a risk of job displacement for farmers, and the robots may alter the traditional culture and emotional appeal of agriculture. Energy consumption and associated costs are also a concern. On the other hand, robots may be more acceptable to non-farm communities, and agricultural jobs require intelligence and quick thinking that the robots may not have, leaving room for human operators.

#### (c) Business

One of the incorporations of artificial intelligence into business has significant effects, both positive and negative, on the implementation of a workforce integrated with robotics. The main objective of emerging technologies is to increase safety and efficiency in all processes, rather than replacing humans in their jobs. The adoption of AI is frequently linked to productivity and efficiency improvements, as it can perform tasks at a scale and speed beyond human capacity e.g., Order Picking Robots - Here, robots have a multitude of warehouse-based applications including automated storage and retrieval, integrated material handling, as well as effortless sortation. Paper is eliminated, accuracy is increased, and walk time reduced Its capacity to analyze vast amounts of data in real-time enables organizations to deploy immediate monitoring capabilities that can identify problems and suggest solutions.

However, there are also certain barriers and disadvantages to keep in mind. For instance, the adoption of AI is hampered by a shortage of skilled technical staff and high costs, especially for businesses that lack in-house expertise. Additionally, there is the potential for automation technology to

lead to job losses, and security concerns around AI systems, such as autonomous weapons, that could cause damage.

#### (d) Education

The integration of AI robots in education has both positive and negative effects. One benefit is personalized learning, where robots can analyze student learning patterns and adapt teaching methods accordingly. For instance, robots can serve as classroom assistants in elementary schools and transmit videos from distant locations to aid learning. Children enjoy having robots in the classroom, and they can benefit from the experience.

However, there are also some drawbacks. The use of AI robots in education may result in job losses for teachers and other educational professionals. Over-dependence on technology may lead to a decline in critical thinking and problem-solving skills without the assistance of AI robots. Additionally, there are concerns regarding the security and privacy of student data collected by AI robots, which could be at risk of misuse or cyber-attacks.

## **2. Technology Literature Reviews**

The impact of robotics in our daily lives and professions is significant, with both positive and negative effects on various sectors of our society, economy, and industry. Robotics has the potential to transform our world by increasing efficiency, safety, and service quality, as well as creating new employment opportunities. According to Fran (2016), robotic systems are interconnected, interactive, cognitive, and physical tools that perceive the environment using sensors, reason about events, plan with algorithms, and act using actuators. Although human-robot interaction will evolve, the introduction of such technologies may require re-skilling and training, posing challenges to the workforce. Therefore, governments must implement policies and programs to mitigate any adverse effects of robotics. AI robotics is an exciting field that has progressed significantly in recent years, with machine learning, computer vision, and hardware advancements enabling robots to perform impossible tasks such as navigating complex environments and delicate surgical procedures.

Machine learning algorithms are among the key developments in AI robotics, allowing robots to learn from data and enhance their performance.

MarketsandMarkets (2019) conducted a study analysis that predicts a considerable rise in the robot market in the near future due to the integration of machine learning. The study aims to investigate the history, uses, and both positive and negative effects of AI robots in various industries. After evaluating the benefits and drawbacks, the study intends to form a well-established opinion on robots. The Fourth Industrial Revolution has witnessed remarkable advancements in robotics, resulting in a three-fold increase in their use over the last two decades. It is anticipated that by 2030, there will be 20 million robots in operation globally, with 14 million of them being in China. Although often conflated, robotics and artificial intelligence are distinct concepts. Robotics refers to pre-programmed machines that perform routine tasks, while AI involves creating computer models that can simulate human intelligence. Intelligent robots that are controlled by AI algorithms, a rapidly growing technology, are the current trend in robotics. In recent decades, industrial robots have proven to be efficient and productive in factories, transforming the manufacturing sector. Robotics, along with other transformative technologies such as the Internet of Things (IoT), cybersecurity, big data, open automation architecture, virtual solutions, and collaborative robots, is projected to continue to revolutionize various domains.

In conclusion, robot devices and systems are becoming increasingly popular as the world becomes more technology-oriented. Engineers in many companies are working tirelessly to make robots faster and more efficient, due to the high demand and high cost of these devices. As a result, the economy is growing at a rapid pace. To ensure that we can continue to leverage robots and other devices to make the world more technologically advanced, we must continually seek out and learn about these technologies. It is important to remember that robots cannot completely replace humans in all aspects, so we should focus on increasing our skill power to remain valuable in the workforce. There are many resources available on robotics that we should take advantage of to gain knowledge and stay informed about technological advancements. The

future generation will likely be fully automated, so it is important to prepare ourselves and future generations accordingly. Through education and training, we can develop innovative tools and skills that will drive our growth and contribute to our overall success. By measuring and improving our innovation and skill development, we can improve our student training and support, career literacy, self-awareness, and empower ourselves to succeed in a world that is becoming increasingly technology-driven.

### 3. Surveys and Technology Evaluation

The findings of a survey on AI robots in several sectors emphasized both the potential advantages and obstacles of applying these technologies. While the findings vary by industry, several polls indicate that AI robotics can boost productivity, improve safety, and accomplish jobs that humans find difficult or impossible. However, there are worries regarding employment displacement, security and privacy, as well as ethical issues that must be addressed.

Real Research, an online survey tool, published a poll on public opinion on the future of robots to get further insights into the future of robotics. Gender, age range (21-99), resident nation, marital status, and language were all weighted. This poll ran from December 19 to December 25, 2022, with a total of 20,000 participants.

Respondents were questioned about their acquaintance with the subject of study connected to robotics in figure 1, the initial survey. According to the study, 49.18% of respondents were very familiar, 20.61% were moderately familiar, and 14.58% were somewhat familiar. Meanwhile, 8.59% of respondents were slightly familiar with the field, while 7.03% were entirely unfamiliar.

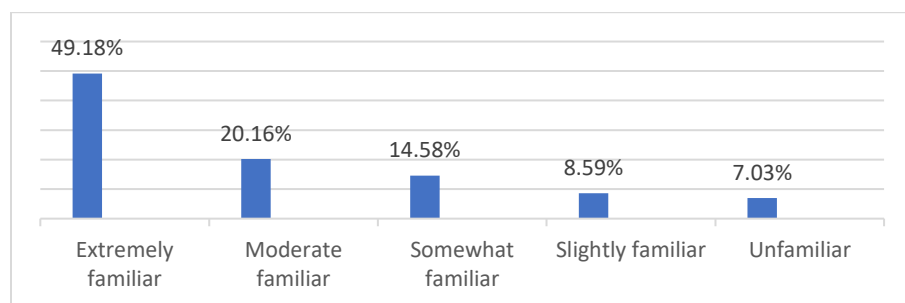
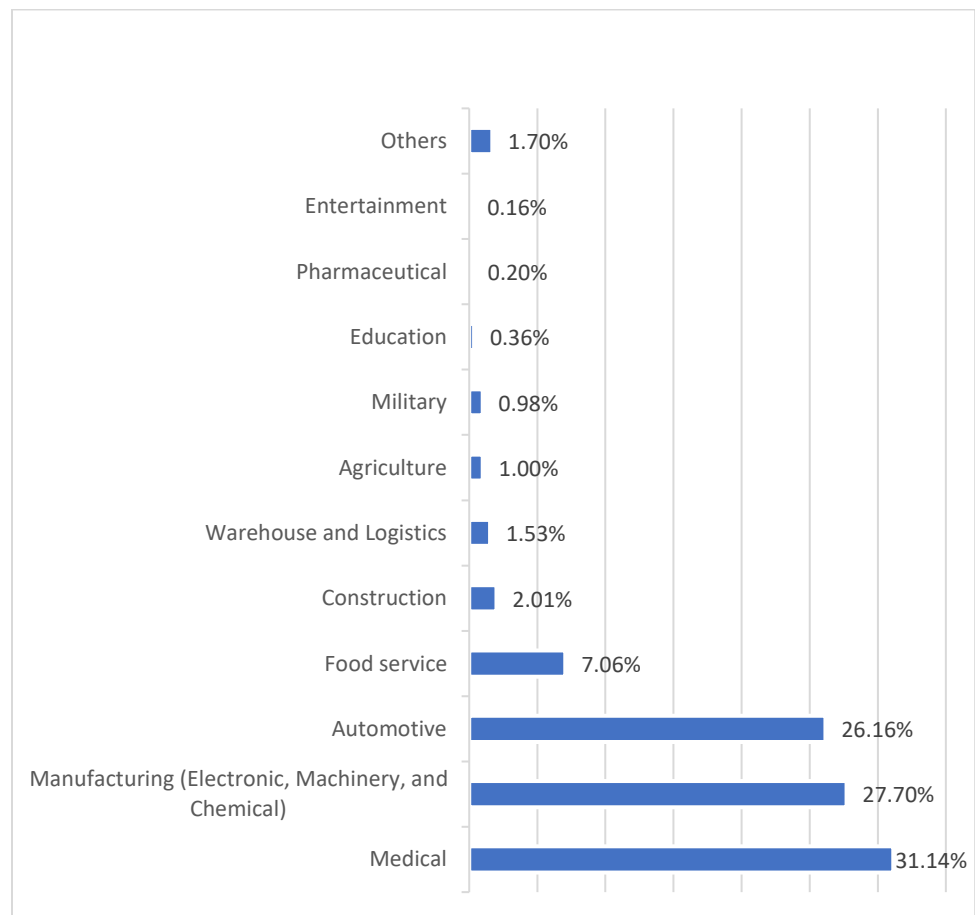


Figure 1: Respondents if they were aware of the robotic field of study.

The usage of robots is becoming more common as companies continue to embrace modern technologies. In figure 2, respondents were asked to name which industry they thought would profit the most from the deployment of robots in a following survey question. According to the findings, 31.14% of respondents thought the medical business would profit the most, 26.16% thought the automobile industry would benefit the most, and 27.7% thought the manufacturing industry would benefit the most. Other respondents react to the questions based on what they believe will gain the most from this study, such as food service, construction, warehouse and logistics, agriculture, military, education, pharmaceutical, entertainment, and others.



*Figure 2: Respondents on which industry would benefit the most.*

The next survey question asked respondents to identify the key benefits of utilizing robotics, and the findings showed that 26.03% feel greater safety is the primary benefit, while 23.41% believe higher

productivity is the primary benefit. Furthermore, enhanced efficiency was regarded as the key advantage by 22.45% of respondents, while consistency was seen as the primary benefit by 12.41%.

On the other side, 28.77% of respondents say that one of the key drawbacks of utilizing robotics is limited intelligence, while 17.03% believe that limited intelligence is a big disadvantage. Furthermore, 19.13% of respondents cited a lack of originality as a key drawback, while 10.44% cited a lack of flexibility as a primary disadvantage.

In addition to the last survey, 73.58% agree that the benefits of robots exceed the drawbacks, while 5.74% believe differently.

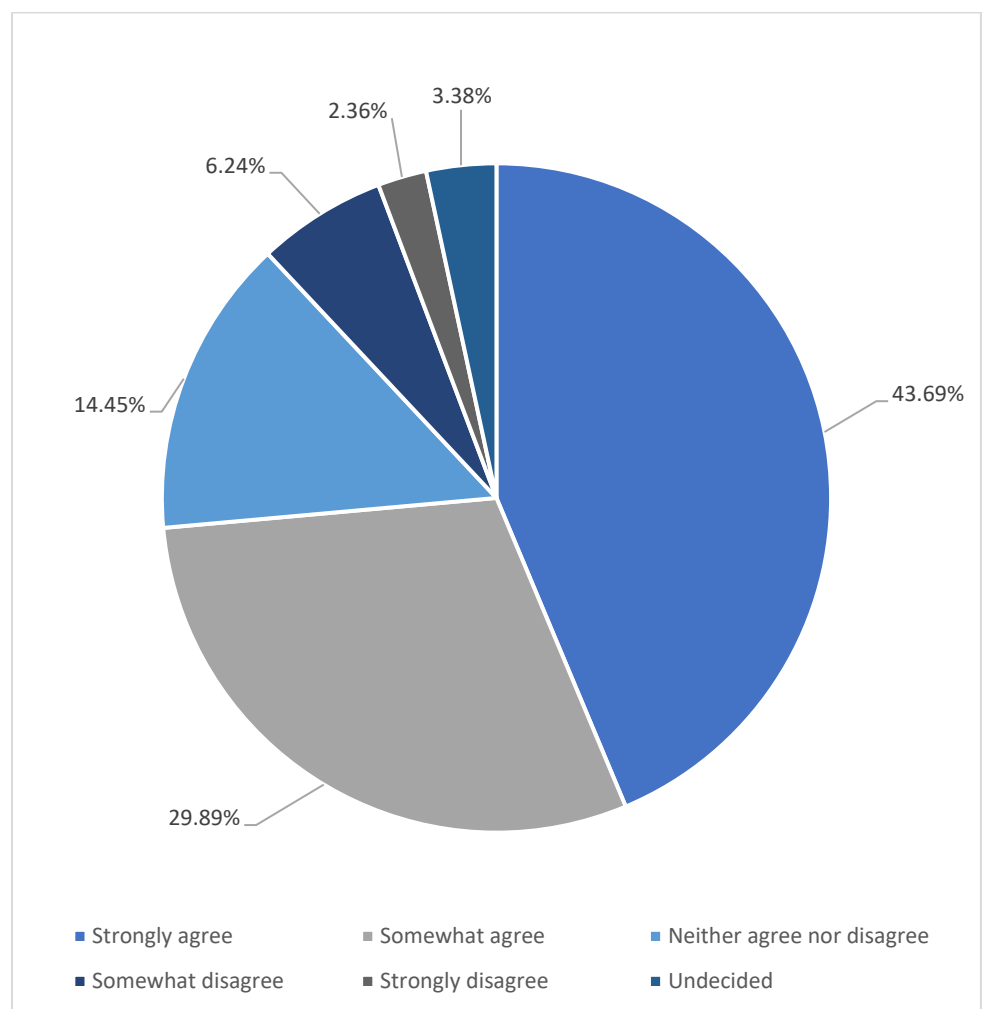


Figure 3: Most respondents say the advantages outweigh the disadvantages.

Because robot technology evolves on a daily basis, so does the standard of robots. This poll asked respondents about their thoughts on robot safety and effectiveness.

According to poll findings in figure 4, 39.56% believe they are highly safe, 31.96% believe they are somewhat safe, and 20.28% believe they are slightly safe. On the other hand, 5.49% believe they are barely safe, and 2.71% believe they are very unsafe.

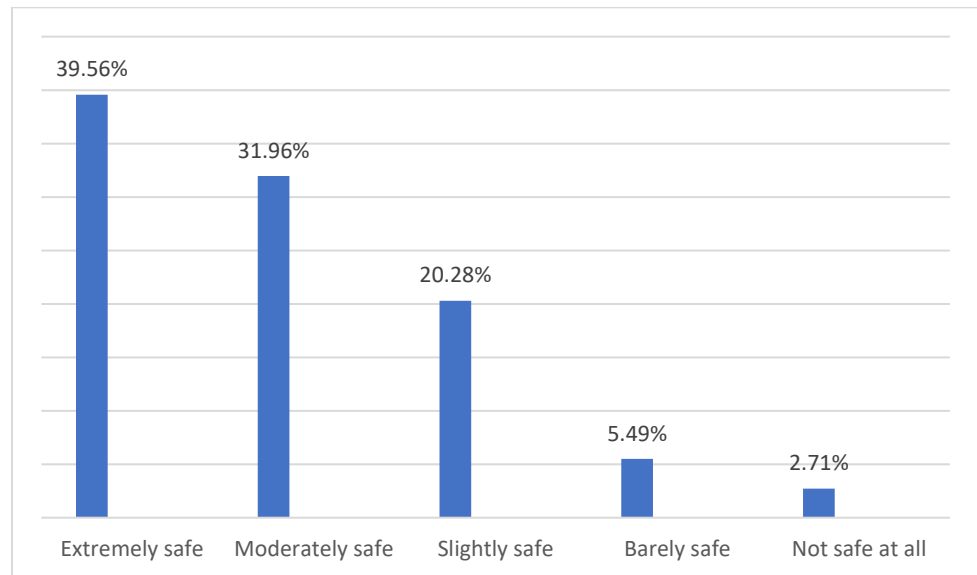


Figure 4: Most respondents say robots are safe to use.

Yes, according to 63% of respondents, the future of robotics is likely to be considerably better. Compared to 28.99% who disagree. 7.89% of those polled were still unsure.

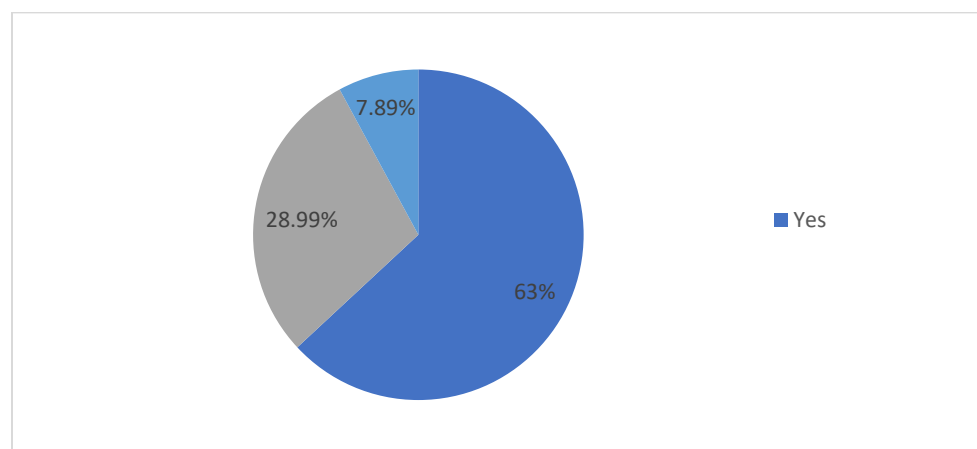


Figure 5: Respondents agreed Robots will make a better future for humanity.



In figure 6, respondents were asked, "Do you believe robots will take over the workforce in the future?" The findings found that 43.94% said 'certainly,' 36.04% said 'probably,' 11.22% said 'probably not,' 3.21% said 'absolutely not,' and 5.6% said they didn't know.

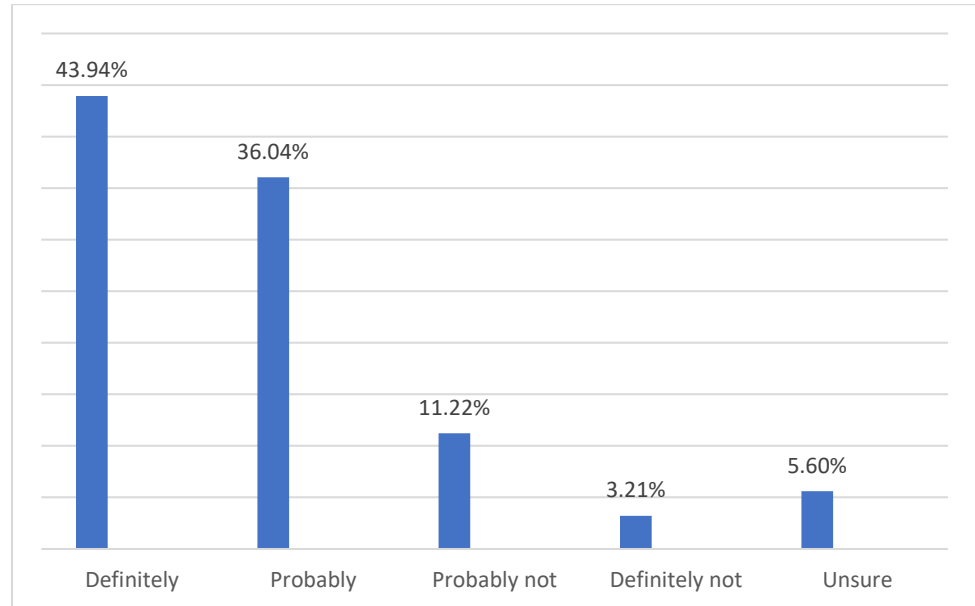


Figure 6: Most say that robots will take over many industries in the future.

Overall, the survey results emphasize the need for a balanced approach to implementing AI robotics, considering both the potential benefits and risks. It is also crucial to address technical and organizational challenges, such as integration with existing systems and developing the necessary technical expertise. By addressing these challenges and working towards responsible and ethical implementation, AI robotics has the potential to transform various industries and improve the quality of life for many people.

## V. SUMMARY

The rapidly expanding field of robotics powered by artificial intelligence (AI) aims to develop machines capable of performing human-like functions like judgment, perception, learning, and adaptation. Skills and adaptability are enhanced as a result, which improves performance, efficiency, and safety. One of the most significant developments in AI robotics are machine learning algorithms,

which enable robots to learn from data and enhance their performance. Robots will be able to comprehend and interpret human speech by incorporating natural language processing algorithms. Additionally, robots will be able to collect and analyze information in real time through the use of edge computing and a variety of sensors, allowing them to react quickly and become smarter in a variety of situations. There are numerous advantages to incorporating AI into robotics, including decreased errors, increased productivity and efficiency, increased safety, enhanced quality and accuracy, and collaboration between humans and machines. Simulated intelligence-controlled robots can test dangerous conditions and recognize potential dangers sooner than people, making them significant working environment partners and upgrading safety efforts.

The fields of medicine, agriculture, business, and education are just a few of the many areas of society that could be transformed by AI technology. Although there are ethical issues associated with outsourcing work and a lack of emotional support for patients, AI has the potential to enhance the accuracy and accessibility of medical services in the healthcare sector. Despite the fact that there are concerns regarding costs, job displacement, and the possibility of altering the culture of traditional farming, AI in agriculture have the potential to increase efficiency in a variety of tasks. While the integration of AI in education could possibly result to job losses for educators and an excessive reliance on technology may result in a decline in students' capacity for critical thinking and problem-solving, it has the potential to personalize learning and support student learning. Despite the worries, most accept that the advantages of AI powered robots could surpass the disadvantages.

There is a debate about the possibility that AI powered robotics will eventually replace human workers. But robots cannot function without human involvement, and full automation is possible for only 5% of professions. As a result, AI robotics implementation should require a balanced approach wherein human and machines would work alongside one another to produce better outcomes, as well as, considers both potential benefits and risks, along with technical, organizational, and ethical concerns.

## **VI. CONCLUSION**

In conclusion, the integration of AI into robotics is transforming industries in various ways, from improving productivity, safety, and service quality to creating new employment opportunities. AI algorithms utilization in robots has enabled the execution of tasks with precision, accuracy, and autonomy, making them valuable assistants in the workplace. Survey findings indicate that the majority of respondents believe that the medical industry would benefit the most from this technology, followed by the manufacturing and automotive industries.

While there are concerns presented, such as job displacement and algorithm bias, most respondents believe that the benefits of robots outweigh the drawbacks, and the future of robotics is likely to be considerably better. As technology continuously advances, staying informed and developing the necessary skills to remain valuable in the workforce is crucial. Through education and training we must prepare ourselves and future generations accordingly. Ultimately the integration of AI into robotics has helped in expanding their capabilities and applications in numerous industries, paving the way for a more advanced future.

## **VII. RECOMMENDATIONS**

Given the various potential benefits and risks associated with the development and integration of Artificial Intelligence in various fields, it is important for people to carefully consider the impact of Artificial Intelligence and take steps to reduce potential risks while maximizing the benefits. Some possible approaches to address these concerns include:

1. Consider ethical guidelines – All aspects of AI usage and development must follow ethical guidelines to ensure that it is used accordingly for the benefit of society.
2. Establishment of new and/or improvement of existing laws and regulations – The introduction of laws and regulations can help establish the responsible and within ethical reason development and implementation of this technology, with due consideration of the possible risks and consequences.

3. Constant monitoring and evaluation – The use of AI should be constantly monitored and evaluated to ensure that it is safe to use and free from the possibility of error.
4. Be prepared and anticipate potential issues and risks – It can help minimize the impact, if one is prepared and anticipated the potential risks accompanying this type of technological advancement. This includes identifying and addressing existing and/or potential security risks and investing in research to stay ahead of new threats.

From robotics and health to business and education, Artificial Intelligence is evolving rapidly in a short period of time and its applications are limitless. It has the potential to create new opportunities to improve our lives, and to profoundly change and transform and change the society we are accustomed to.

## REFERENCES

- Administrator. (2023). Introduction to AI Applications in Robotics. *University of San Diego Online Degrees*. <https://onlinedegrees.sandiego.edu/application-of-ai-in-robotics/>
- Artificial Intelligence in Education: A Review*. (2020). IEEE Journals & Magazine | IEEE Xplore. <https://ieeexplore.ieee.org/document/9069875>
- Author, R. (2022). 44% Think Robots Will Take Over the Workforce in the Future. *Survey Results & Insights - Real Research Media*. <https://realresearcher.com/media/44-percent-think-robots-will-take-over-the-workforce-in-the-future/>
- Author, R. (2023). Survey: Public Opinion on the Future of Robotics. *Survey Results & Insights - Real Research Media*. <https://realresearcher.com/media/survey-public-opinion-on-the-future-of-robotics/>
- Ayyagari, N. (2022). The Timeline of Artificial Intelligence – From the 1940s. *Verloop.io*. <https://verloop.io/blog/the-timeline-of-artificial-intelligence-from-the-1940s/#john-mcarthy---the-father-of->
- Conclusions*. (n.d.). One Hundred Year Study on Artificial Intelligence (AI100). <https://ai100.stanford.edu/2021-report/conclusions>
- Duggal, N. (2023). Advantages and Disadvantages of Artificial Intelligence. *Simplilearn.com*. <https://www.simplilearn.com/advantages-and-disadvantages-of-artificial-intelligence-article>
- Fran. (2021, December 6). *The future of robotics: How will robots change the world?* - *FutureLearn*. FutureLearn. <https://www.futurelearn.com/info/blog/general/introduction-robotics-future-robots>
- Handley, E. (2022). What are the pros and cons of implementing AI in healthcare? *Open Access Government*. <https://www.openaccessgovernment.org/what-are-the-pros-and-cons-of-implementing-ai-in-healthcare/140058/#:~:text=Possible%20Security%20Risks,taken%20by%20the%20wrong%20hands.>
- Heaven, W. D. (2023, March 6). The inside story of how ChatGPT was built from the people who made it. *MIT Technology Review*. <https://www.technologyreview.com/2023/03/03/1069311/inside-story-oral-history-how-chatgpt-built-openai/>

- Jaiswal, S. (2023). Role of Artificial Intelligence and Machine Learning in Robotics. *Emeritus - Online Certificate Courses | Diploma Programs*.  
<https://emeritus.org/in/learn/role-of-artificial-intelligence-and-machine-learning-in-robotics/#:~:text=Precise%20machine%20learning%20processes%20are,on%20uns,een%20data%20and%20situations.>
- Learn How Artificial Intelligence (AI) Is Changing Robotics. (n.d.). Intel.  
<https://www.intel.com/content/www/us/en/robotics/artificial-intelligence-robotics.html>
- LiveTiles. (2022). 15 Pros and 6 Cons of Artificial Intelligence in the Classroom. *LiveTiles*.  
<https://livetilesglobal.com/pros-cons-artificial-intelligence-classroom/>
- Job, W. R. T. M. (2023). 14 (Awesome, Or Scary?) Examples Of Robots In The Workplace. *willrobotstakemyjob.com*. <https://willrobotstakemyjob.com/robots/robots-in-the-workplace>
- Magsumbol, J., De, Concepcion, R., II, & Dadios, E. P. (2021). The Adoption and Inhibition of Robotics Technology in the Philippines. *ResearchGate*.  
[https://www.researchgate.net/publication/358736596\\_The\\_Adoption\\_and\\_Inhibition\\_of\\_Robotics\\_Technology\\_in\\_the\\_Philippines](https://www.researchgate.net/publication/358736596_The_Adoption_and_Inhibition_of_Robotics_Technology_in_the_Philippines)
- Mahendra, S. (2023). Robotics and AI: The Role of Artificial Intelligence in Robots. *Artificial Intelligence +*. <https://www.aiplusinfo.com/blog/robotics-and-ai-the-role-of-artificial-intelligence-in-robots/>
- NI Business Info. (n.d.). *Risks and limitations of artificial intelligence in business* | *nibusinessinfo.co.uk*. <https://www.nibusinessinfo.co.uk/content/risks-and-limitations-artificial-intelligence-business>
- Pratt, M. K. (2023). 7 key benefits of AI for business. *Enterprise AI*.  
<https://www.techtarget.com/searchenterpriseai/feature/6-key-benefits-of-AI-for-business>
- Rosales, M. A., Magsumbol, J. V., Palconit, M. G. B., Culaba, A. B., & Dadios, E. P. (2020). *Artificial Intelligence: The Technology Adoption and Impact in the Philippines*.  
<https://doi.org/10.1109/hnicem51456.2020.9400025>
- Sakovich, N., & Sakovich, N. (2023). How Artificial Intelligence and Robotics Are Changing Our Lives. *SaM Solutions*. <https://www.sam-solutions.com/blog/ai-and-robotics-impact-on-our-lives/>
- Sam. (2023, March 14). 6 Fields of AI - TechEmergent. *TechEmergent*.  
[https://techemergent.com/fields-of-ai/#1\\_Robotics](https://techemergent.com/fields-of-ai/#1_Robotics)

- Schroer, A. (2022). 26 AI Robotics Companies Driving Innovation. *Built In*.  
<https://builtin.com/artificial-intelligence/robotics-ai-companies>
- SITNFlash. (2020, April 23). *The History of Artificial Intelligence - Science in the News*.  
 Science in the News. <https://sitn.hms.harvard.edu/flash/2017/history-artificial-intelligence/>
- Soffar, H. (2022, October 1). Agricultural robots advantages, disadvantages & uses |  
 Science online. *Science online*. <https://www.online-sciences.com/robotics/agricultural-robots-advantages-and-disadvantages/>
- Soffar, H. (2022b, November 12). Robot teachers uses, types, advantages and  
 disadvantages | Science online. *Science online*. <https://www.online-sciences.com/robotics/robot-teachers-uses-advantages-and-disadvantages/>
- Stone, P., Brooks, R., Brynjolfsson, E., Calo, R., Etzioni, O., Hager, G., Hirschberg, J.,  
 Kalyanakrishnan, S., Kamar, E., Kraus, S., Leyton-Brown, K., Parkes, D., Press, W.,  
 Saxenian, A., Shah, J., Tambe, M., & Teller, A. (2022). Artificial Intelligence and Life  
 in 2030: The One Hundred Year Study on Artificial Intelligence. *arXiv (Cornell University)*. <https://doi.org/10.48550/arxiv.2211.06318>
- These 5 robots could soon become part of our everyday lives.* (2022, December 27).  
 World Economic Forum. <https://www.weforum.org/agenda/2022/02/robots-future-tech/>
- Walch, K. (2020). Application of AI in robotics boosts enterprise potential. *Enterprise AI*.  
<https://www.techtarget.com/searchenterpriseai/feature/Application-of-AI-in-robotics-boosts-enterprise-potential>
- West, D. M., & Allen, J. R. (2022, March 9). How artificial intelligence is transforming the  
 world. *Brookings*. <https://www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/>
- What Is AI?* (n.d.). Caltech Science Exchange.  
<https://scienceexchange.caltech.edu/topics/artificial-intelligence-research/artificial-intelligence-definition>