

The Future of Artificial Intelligence with Respect to Society: A Comprehensive Review

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Abstract- Artificial Intelligence (AI) is still in its infancy but continues to bring tremendous benefits to human life and may well prove to be the most powerful technology ever invented. It has played a vital role in our society and has transformed lifestyle of humans to a massive extent. It has the potential to transform health sector, increase productivity, can play a major role in saving environment and enhance both freedom and democracy. In recent past the AI has penetrated into human's life to a greater extent. Although this penetration has impacted into positive and negative ways on society but, this current era of Digitization can't survive without adopting AI tools and technologies in solving highly complex and diverse societal problems. Presently, the dependency of humans on AI system has increase manifold and in near future the society may leads to explainable AI, where there are chances for every human activity to be controlled by machines. In this paper, we begin with a general introduction to the field of artificial intelligence, then progress to exploring the subsets of AI and examine their practical applicability with respect to different domains of society followed by Impactful Evaluation where the positive influence of AI in different fields has been explored. Lastly, the focus has been paid to Critical Evaluation in which the negative consequences and various challenges associated with AI has been paid attention. In conclusion, several recommendations for AI systems and their associated applications have been made to enhance its applicability in the society.

Keywords- Artificial Intelligence, Machine Learning, Model Building, Expert System.

I. INTRODUCTION

Artificial intelligence (AI) technologies have made rapid advances in the last decade, opening possibilities for new applications in healthcare, transport, education, science, and more. Artificial Intelligence (AI) [1] is concerned with the computational understanding of intelligent behavior and therefore the creation of intelligent machines. The term 'intelligence' refers to the capability of learning, understanding, or coping with novel or complex situations through application of knowledge and skills in order to make judgments or develop opinions based on reasoning. AI enables the machines to learn from their past experiences, adapt to new inputs, and execute the jobs that resemble exactly to humans. The scope and the ability of an AI system to emulate human intellectual skills of thinking and reasoning, is used to classify the types of AI. AI embodies a diverse set of tools, techniques, and algorithms and Figure 1 shows various subfields of Artificial intelligence, including neural networks, genetic algorithms, symbolic AI, and deep learning. These major areas are showing exponential growth and making significant impacts in diverse areas like health care, space, robotics, and military. With the increasing amount of data, ubiquitous connectivity, high-performance computing, and

various algorithms present at our disposal, AI is going to add a new level of efficiency and sophistication to future technologies.

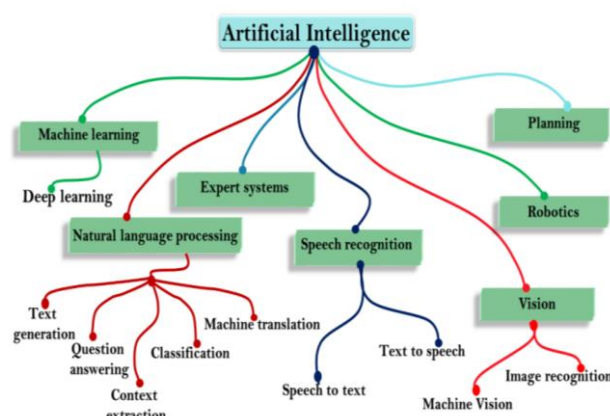


Figure 1: Various Subfields of Artificial intelligence.

The purpose of this paper is to explore the impact of artificial intelligence on society. As the researchers have shown increased interest in AI, lot of studies have been started on the impact of AI on society, restricted not only in technological but also in legal and ethical areas. This

paper highlights prospects in a variety of sectors where artificial intelligence (AI) is rapidly gaining traction, such as transportation, agriculture, finance, marketing and advertising, healthcare, and so on. The current study is organized into three components to examine the impact of AI on society: technical evaluation, impactful evaluation, and critical evaluation. The first section examines numerous AI sub-fields and their distinct societal applications. The second section assesses AI's overall positive impact on society that includes Agriculture, Banking and Financial Services, Business, Defense, Education, Healthcare, Legal Systems, and Transportation. The third part examines the negative effects of AI on society along with different challenges. Finally, recommendations for AI system and their applications to the society have been made.

II. TECHNICAL EVALUATION OF AI

This section dives into the technical aspects of artificial intelligence by looking at the numerous fields and sub-fields of AI. Language understanding; learning and adaptive systems; gaming; robotics; problem solving, and perception all these fields fall under the umbrella of AI that deals with the science of developing intelligent agents. These AI fields are further divided into multiple sub-fields. The field of language understanding encompasses speech recognition, information retrieval, question-answering and language translation. The practical applications for each sub-field are addressed separately [4]. Table 1 presents the detail of different fields and sub-fields of AI along with their practical applications in the society.

Table 1: Different AI Fields and Sub Fields with their applications in Society.

S. No.	Field	Sub Field and their Practical Applications in the Society	Impact on Society
1	Language Understanding	<p>Speech Understanding:</p> <ul style="list-style-type: none"> • Apple's Siri, Google's Alexa, Echo Dot, Google Assistant • Venmo and PayPal allow customers to make transactions using voice assistants • Swisscom, a telecommunications firm based in Switzerland, has implemented voice verification technique in its call centers to avert defense breaches <p>Information Retrieval:</p> <ul style="list-style-type: none"> • Search Engines: Google Search Engine, Google Scholar, ResearchGate • Academic Research Databases: Scopus, Web of Science, IEEE Explore, PubMed • System Information App, Document Recovery, Harddisk Data Recovery Apps <p>Language Translation:</p> <ul style="list-style-type: none"> • Google Translate, Microsoft Translator, Hi Translate App • M2M-100: introduced by Facebook to translate 100 languages <p>Question Answering:</p> <ul style="list-style-type: none"> • IBM's Watson, Microsoft LUIS • AI Chatbots: Ada, Manychat, SnatchBot, LivePerson, Intercom <p>Semantic Information Processing</p> <ul style="list-style-type: none"> • Advertisements and marketing messages, recommendation systems • Sentiment Analyzer, SentiScore App, Emotion Analyzer app, Social Media Text Analysis 	These facilities mimic humans in terms of natural language and perform different tasks by accepting voice commands. This language understanding by AI model will help to solve many societal problems related to health care, crime control by going through different social networking platform data. These technologies ease many human activities in society related to the physical impairments.
2	Learning and Adaptive System	<p>Cybernetics:</p> <ul style="list-style-type: none"> • Self-Driving vehicles, Nanorobots, Automatic washing machines 	Assist humans in routine task and decrease accidental rate caused due to human errors while driving.
3	Gaming	<p>Particular Games:</p> <ul style="list-style-type: none"> • AlphaGo: it defeated world champion of Go player Lee Sedol • DarkForest: developed by Facebook • DeepBlue: defeated world champion player - Garry Kasparov • FEAR, Half-Life, Stockfish, TD-gammon 	Help humans to enhance their reasoning skills and provides multiple solution of a single problem through virtual platforms.
4	Robotics	<ul style="list-style-type: none"> • Industrial Automation: SCARA robots, Delta robots, Coordinate robots • Household: Vacuum-Cleaner robot, Floor-Washing robot, Knightscope, Atlas • Military: MIDARS, Autonomous Rotorcraft Sniper System, Dragon Runner, PETMAN • Humanoid Robot: Sophia, Greenman, Robot Shalu, Epi, OceanOne, Rashmi Robot 	Assist humans in various tedious routine tasks. It also adds to the national security. This kind of AI machine adds heavily in industrial revolution and increase productivity to meet different challenges related to manufacturing.

5	Problem Solving	<ul style="list-style-type: none"> • Heuristic Search: Travelling salesman problem, Cost optimization, • Interactive Problem Solving: Online shopping, Online fraud prevention, E-learning • Automatic Program Writing: Atom Weaver, DeepCoder, Andrej Karpathy generated automatic code using RNN at Tesla, 	AI dramatically enhance efficiency at workplace and frees human workforce in conducting business AI equip humans in better way to handle repetitive or dangerous task. Provides multiple solution of a problem.
6	Perception	<p>Pattern Recognition:</p> <ul style="list-style-type: none"> • Medical Images: CT scans, MRI scans, X-rays for disease detection • Biometric Attendance System, Iris Scanning, Fingerprint Sensors <ul style="list-style-type: none"> • Prediction of plant diseases from Leaves, Flowers, Fruits • Seismic analysis to study natural events 	AI based system perceives better in healthcare and efficient at medical diagnosis when compared to human.

III. IMPACTFUL EVALUATION OF AI

Artificial Intelligence (AI) has evolved as a transformative technology that posed a profound impact on every aspect of human life. It helps in making our daily lives easier and automates laborious and time-consuming work in a variety of industries. AI applications are getting their roots deep in a variety of domains of the society by improving decision-making and reducing costs [5]. This section assesses the positive impact of AI in the most significant eight domains of the society i.e., Agriculture, Banking and Financial Services, Business, Defense, Education, Healthcare, Legal Systems, and Transportation sector. Table 2 depicts the practical applications of AI in the undertaken domains of the society.

3.1 AI in Agriculture

As per reported by the United Nations Food and Agriculture Organization, the worldwide population will be around 10 billion people by 2050. Till date, only 4% of the additional land has been cultivated to meet the growing demand of food consumption. The traditional farming methods employed by farmers are not sufficient to feed the entire population. As a result, agriculture sector needs to be automated in order to handle such a serious global problem of underproduction. Agriculture has changed due to integration with AI based technology which has enhanced crop productivity while improving real-time supervision, reaping, and advertising. AI has resolved a variety of issues such as climate change, population increase, labour shortages, and food security concerns. It is now possible to collect adequate data concerning to issues of agronomic and weather-related matters, which leads to reduction in the usage of pesticides and herbicides, thereby preserving the soil fertility for enhancing the crop yield and its quality. The agro-based sector has benefited greatly from the advanced AI based technologies of computerized devices by means of drones and farm robots [6].

3.2 AI in Banking and Financial Services

AI approaches have been shown to have a significant impact in banking and financial services. These technologies are utilized for a variety of functions, including digital payments, quick and accurate credit

scoring, transaction fraud detection, loan risk prediction and evaluation. AL systems eliminate many human errors. Chatbots are being successfully used by banks to advise consumers about services and options, as well as to conduct transactions without the need for human interaction. Virtual assistants powered by artificial intelligence are being utilized to aid banks in improving and lowering their regulatory compliance costs.

AI can find certain pattern in the data points and their association, which can lead to the discovery of hidden sales prospects resulting in a direct revenue impact. According to Forbes, machine learning is being used by 70% of financial firms to predict cash flow events and alter credit scores. AI is increasingly being used by large financial firms such as Zest Finance, Insurify, and others to build AI solutions for these organizations by employing deep learning models, graph theory, and other methodologies. By 2023, banks are expected to save \$447 billion in total costs through AI applications, with \$416 billion coming from the front and middle office [7].

3.3 AI in Business

Artificial intelligence has a significant impact on society and industry. It has aided the company in expanding output and lowering product costs, as well as providing solutions for difficult assignments and assisting in quick corporate expansion. An entrepreneur can receive a better response from the audience and acquire a competitive advantage over other online businesses by using AI algorithms for sales prediction. Increased worker productivity, accessibility to acquiring and selling with service to clients at any time of the year, and enhanced performance and efficiency in corporate operations are all benefits of automation in business. It has a wide range of effects on marketing and advertising. It enables personalization of online experiences by providing content that customers are most likely to be interested in, as well as making it easier for marketers to target their adverts. Chatbots have been integrated into websites to give customers with immediate support [8].

AI has also become a more prominent target for corporate development and investment. Private equity investment in

AI companies has risen substantially during 2016, more than tripling from 2016 to 2017, reaching USD 16 billion. AI start-ups garnered 12% of global private equity investments in the first half of 2018, up from 3% in 2011. Google's \$400 million investment in DeepMind technology in 2014 was the company's largest in the European Union.

3.4 AI in Defense

Artificial intelligence (AI) is now used practically in many military applications and is a vital component of modern combat. Integrating AI into routine military operations could improve logistics, cybersecurity, administration, and maintenance, as well as reduce institutional workload and allow soldiers to focus on key responsibilities. Unmanned vehicles such as drones and AI-based military robots can carry out operations and make judgments faster, saving human lives. The development of advanced kinds of AI-driven devices in the armed division has been strengthened through increased research in the defense industry. During the fiscal year 2017, the US Department of Defense (DoD) spent a total of USD 7.4 billion on AI. Russia is also involved in the development of military AI, with a particular emphasis on robots. The Chinese government issued a policy on July 20, 2017, outlining its ambition to lead AI by 2030 [9].

3.5 AI in Education

In the field of education, artificial intelligence (AI) has posed a strong influence and significant impact in transforming the learning and teaching processes in administering educational activities. Intelligent education systems assist both teachers and students by providing timely training and feedback. The utility and effectiveness of learning in these systems has been improved by diverse computing technologies, including machine learning, statistical models and cognitive learning theory. Software robots and web-based chatbots have been implemented to execute teachers' tasks independently or in collaboration with them as virtual assistants. In the past, students could simply obtain study materials through web-based online education. However, AI has changed web-based education into smart learning, allowing students to put their queries to chatbots in real time in order to clear their doubts. Additionally, the quality of teaching activities has been enhanced by automating tasks of assessment and grading of the students' progress. In terms of investment, AI has had an impact on the global education system. According to experts, artificial intelligence is expected to produce more employment than it eliminates by 2025, but these emerging professions will require more proficiency as compared to the previous careers. Educational system needs to explore the learning programmes to provide people with the skills required to keep up with the contemporary [10].

3.6 AI in Healthcare

The growth in processing power and machine learning algorithms has changed medical technology and the healthcare area. These AI-based expert systems can help medical practitioners diagnose and prognostic numerous medical illnesses using clinical data, biomedical signals and imaging data. It has been used to diagnose a variety of diseases, especially chronic diseases, at an early stage, resulting in better treatment and a lower mortality rate. Robots have been used in medicine for more than 30 years to assist human surgeons or to do procedures on their own with less damage, higher precision, and faster recovery. These AI algorithms are also utilized in medication design and discovery, assisting researchers in clinical trials by assisting them in identifying the most promising compounds or current pharmaceuticals that may have benefits for various illnesses. AI also played a key part in the global COVID-19 pandemic by assisting in contact tracing, disease cluster identification, case tracking, outbreak prediction, mortality risk, and the identification of genetic signatures [11].

3.7 AI in Legal System

Artificial intelligence (AI) possesses the ability to improve the consistency and transparency of the legal system. It can help courts make unbiased decisions in a timely and error-free manner. Besides, AI application has the potential to lower the expenses of litigation and court processes, making them more accessible to individuals from all walks of life. A number of multinational companies, including Premonition Analytics, Ravel Law, and others, have already created AI-based legal outcome prediction tools [12].

3.8 AI in Transportation

The transportation business has been transformed by artificial intelligence, which now allows automobiles, trains, ships, and planes to function in autonomous manner. Artificial intelligence (AI)-based algorithms are employed in traffic management to reduce traffic congestion, unexpected delays, carbon emissions, and total financial costs. It has the potential to make all modes of transportation safer, cleaner, smarter, and more efficient, thereby improving passenger safety and simplifying our lives. Autonomous vehicles help to reduce the number of traffic accidents caused by human error. For the time being, the majority of firms are continuing to run their pilot projects in order to perfect self-driving vehicles and ensure passenger safety. Self-driving vehicles will receive widespread acceptance as technology advances, and they will become commonplace in the consumer market. Sensors (such as GPS, cameras, and radar), as well as actuators (devices that convert an input signal into motion), control units, and software, are used in such vehicles [13].

Table 2: Positive Impact of AI on Society

Domain	Practical Applications of AI in Society
Agriculture	<ul style="list-style-type: none"> See and Spray Robot: the California-based startup developed to observe and exactly drench weeds on cotton plants

	<ul style="list-style-type: none"> • FarmBot: to aid farmers in various tasks from seed plantation to weed detection • Harvest CROO Robot: to aid strawberry farmers choose and bundle their crops • Plantix App: the Berlin-based farming tech business made to identify plant diseases, possible flaws, and nutritional deficits in soil • Prospera: the Israeli start-up has developed a cloud-based solution which correlates between data labels and makes predictions through this information
Banking and Financial Services	<ul style="list-style-type: none"> • Alipay Credit-Scoring: utilized consumer data points to compute credit scores • Credit Scoring System: AI based system to know whether a person can be granted loan • Eno: SMS text-based assistant offered by a bank in the US • Erica Chatbot: used by Bank of America to serve more than 10 million customers in 2018 • JPMorgan Chase: used for fraud detection from credit card transaction details in chase data centers
Business	<ul style="list-style-type: none"> • Salesforce: used for sales management and customer relationship management • HANA: used by companies to manage their databases • Alibaba, Amazon, Flipkart, Myntra: display product recommendations based on AI
Defence	<ul style="list-style-type: none"> • Project Maven AI based system: used by US to identify insurgent targets in Iraq and Syria • DARPA's TRACE program: uses AI to automatically locate and identify targets with the help of Synthetic-Aperture Radar (SAR) images • SKYNET: AI based tool used by US National Security Agency to identify terror suspects
Education	<ul style="list-style-type: none"> • Teacherbot Jill Watson: used as Teaching Assistant by Professor Ashok Goel for online Master degree programme in Computer Sciences at Georgia Tech in the United States • SQL Tutor: developed at the University of Canterbury to teach the students about retrieval of data from databases using the SQL SELECT statement • ZOSMAT: created to meet all of the requirements of a classroom • Robin Humanoid Robot: to instruct young children a second language • REALP: developed to assist children in improving their reading comprehension
Healthcare	<ul style="list-style-type: none"> • Molly- virtual nurse developed by Sense.ly company to provide follow-up care to patients, focusing mostly on those that have chronic diseases • RUDO- an 'ambient intelligent system' to help blind people in home environment • AlphaFold algorithm of Google Deep mind used to predict protein structure of COVID-19 virus, that helps in vaccine development • MAKO: surgical robot used to perform joint replacement surgery • Aethon: mobile robot used for Secure delivery of pharmacy medications and laboratory specimens in the hospital
Law	<ul style="list-style-type: none"> • Lex Machina: uses AI to infer the legal outcomes of a trial in advance • Legal Mation: uses AI to help lawyers in generating automatic pleadings • ROSS Intelligence: AI-powered legal research tool developed at the University of Toronto to answer all the queries about legal issues • KIRA AI based systems: used for the recognition, extraction, and examination of clauses from contracts and other lawful documents • Xiao Fa Robot: introduced in the courts of Beijing to give legal assistance to judicial officers
Transportation	<ul style="list-style-type: none"> • Autonomous taxis started operating in Tokyo • Otto accomplished the world's first automatic truck delivery in the United States, transporting 50,000 cans of Budweiser beer over a 120-minute span. • Waymo has started testing self-driving minivans and trucks on public roads in selected states. • China has already constructed a smart roadway that allows electric vehicles to charge while driving.

IV. CRITICAL EVALUATION OF AI

Artificial intelligence, like a coin with two sides, has both positive and harmful effects on society. Despite the fact that AI has improved our lives and made significant contributions in many areas of society, it has certain societal implications. The negative effects of AI on society are discussed in this section. Advances in AI technology and job automation may result in job loss, particularly among low-skilled individuals. It may also widen the wealth inequality between technocrats and traditional

business owners. According to a 2015 analysis by Bank of America, during the next 20 years, approximately 35 percent and 47 percent of all workers in the United Kingdom and the United States, respectively, are at risk of being displaced by technology. Many more jobs are at risk in developing countries, according to the World Bank, with 69 percent in India, 77 percent in China, and 85 percent in Ethiopia. It takes a lot of skill, time and energy along with latest hardware and software to build AI based machine to simulate human intelligence, thus making it high in cost.

Apart from that, AI-based systems may be biased, which can lead to unanticipated outcomes, such as when Microsoft's Twitter bot 'Tay' turned racist. The right to privacy is in jeopardy, with the risk of given the prospect of unlawful access to online activity data. As a result of automation, odious activities like phishing, delivering viruses to software, and exploitation of AI systems can lead to hacking of smartphone, laptops, databases, etc.

There may be high chances when AI models will be trained to perform any adverse activity like design and development of dangerous autonomous weapons and they may go into the wrong hands. It poses the biggest threat to security. Such programmes could cause mass casualties. Extensive automation of multiple tasks using AI models may become a problem for future generations as humans become increasingly reliant on it. Morality and ethics are crucial human characteristics that can be a biggest challenge to include into artificial intelligence. The rapid advancement of AI has sparked fears that it will one day develop uncontrollable AI based systems that finally wipe out mankind completely [14].

4.1 AI and Challenges to the Society

Artificial intelligence (AI) has transformed the society, and AI applications are being accepted all over the world, yet their use might raise concerns and questions about human values, justice, privacy, security, and liability. AI could create lack of privacy, transparency and biased, hinder societal advancement, lead to unfair outcomes, limit our willingness to make difficult choices, wrong predictions can lead to life threatening events and threatens job security. Cybercriminals can take advantage of AI system in social engineering scams. AI based becomes too complex and lacks emotional intelligence. AI causes complacency and prevent out of box thinking viewing AI as human will strongly disrupt adoption. In many cases the AI system may poses severe threats to personal safety.

The following are some of the societal challenges posed by AI:

- AI is capable of analyzing a wide range of data sources. As a result the data protection, cyber security, and data privacy have all become major concerns. Implementing AI systems in automation may become ideal for cyber-attacks with digitalization and the use of the Internet of Things. Significant issue in terms of security and privacy needs to be addressed seriously if leaked or exploited.
- The application of artificial intelligence (AI) in a variety of industries has posed an issue in terms of job loss. By replacing humans with technology, it has changed the nature of work. It is challenging to transmit technological skills to low-skilled people and to upgrade education programmes to prepare our future workforce for new jobs.
- Excellent automated computer systems are required to implement AI technologies in real life. To build trust between humans and these devices shall be a tedious task in future.
- In an accident involving a self-driving car or a failure in robotic assisted surgery, it can be difficult to ascertain who is accountable for damage caused by an AI-operated technology or service.
- AI systems can also pose a threat to democracy since it can be used to make very realistic fake video, audio, and images, known as deepfakes, which can result in financial losses, reputational harm, and decision-making challenges.

4.2 Recommendations

In order to limit the detrimental influence of AI on society and resolve the challenges posed by AI, the following recommendations have been made.

- Companies must be transparent about how they use client data. Data privacy legislation can also benefit from appropriate levels of transparency.'
- Encourage researchers to have more access to data without jeopardizing users' personal privacy.
- Some employees may be concerned that AI will result in their job loss. Companies must highlight where machines can't replace humans.
- Promote an innovative digital education model that improves employees skills required in the economy of twenty-first century.
- To ensure that AI technologies benefit mankind as a whole. International and national rules and regulatory frameworks are required to be framed and implemented in spirit.
- Encourage businesses to invest in creating and deploying AI supportive economic growth models through investment in AI research and development that builds public trust in new technologies.
- The final step is to always keep a human touch. The importance of humans in the consumer experience cannot be overstated. Clients need to know that they can talk to a live person whenever they want. A human backup models must support AI system to deal emergency situations.

V. CONCLUSION

Artificial intelligence has deeply rooted in all spheres of our society, and the main goal of AI is to help mankind in making advanced decisions with far-reaching consequences. Each and every AI technologies have positive as well as negative consequences on the society, but humans must remain careful and concerned while using such technologies. AI poses numerous benefits to the society. As a result, the scope of their relations and association with the world will be a topic of research in the nearest future and for all times to come.

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