ARTIFICIAL INTELLIGENCE RECENT TRENDS AND APPLICATIONS IN INDUSTRIES

K. Mashood[1], H. U. R. Kayani[2], A. A. Malik[3] and A. Tahir[4]

[3]Lahore Garrison University, Lahore
[1,2,4]The University of Lahore, Sargodha
Corresponding Author email: mcs07221004@student.uol.edu.pk

ABSTRACT: Artificial intelligence (AI) has become a powerful tool in many industries, transforming the way organizations operate and delivering significant benefits such as increased efficiency, accuracy, and productivity. With its ability to automate routine tasks, enhance decision-making, provide personalized experiences, and manage risk, AI is expected to play a critical role in shaping the future of many industries. This paperdiscusses the current state of AI in various industries, and the opportunities and challenges associated with its adoption. As AI continues to evolve and become more advanced, it has the potential to revolutionize the way organizations operate and provide a competitive edge. However, it is essential to ensure its implementation is ethical and sustainable, taking into account the impact on employment, privacy, and security.

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INTRODUCTION

Machine learning, a form of artificial intelligence that enables computers to continuously improve performance without explicit human instruction, is considered the most significant general-purpose technology of our era. Recent advancements have made machine learning more accessible, allowing for the creation systems that has the capacity to carry out tasks independently. As a result, firms in a variety of industries stand to benefit significantly from AI , just as prior general-purpose technologies have. While AI is currently utilized by numerous companies worldwide, there are still many untapped possibilities. Over the next decade, the effects of AI are expected to be amplified as nearly every sector of the economy, including production, retail, transportation, banking, healthcare, legal, marketing, healthcare, entertainment, and education, will integrate machine learning into their core operations and business models. The primary challenges facing the widespread implementation of AI are management, execution, and business innovation. This paper aims to elucidate the real potential of AI, its various applications in different industries, and the hurdles that must be overcome to successfully implement it(MCAFEE, 2017).

METHODOLOGY

This article comprehensively analyses artificial intelligence (AI) technology, its evolution over the years, and its key elements. The course of study starts by carefully going through the foundational tenets of AI. It examines the development of AI technology and highlights its accomplishments and innovations across various fields. The paper dives into crucial AI components, including machine learning, cognitive computing, and natural language processing (NLP). It further explored how AI technology is used in other sectors, including healthcare, the food industry, transportation, real estate, etc. It emphasizes AI's significant role in every sector, demonstrating how it improves workflows, increases productivity, and stimulates innovation. The article emphasises the need for ongoing progress while recognising the present contributions of AI in numerous domains. It points out areas inside each business where improvements in AI technology might improve performance even further, handle current problems, and open the door to a brighter future. The value of ongoing development is emphasised, and each industry's potential for growth is highlighted. By putting light on these elements, the research offers insights into the present situation and AI's potential for the future, imagining a more developed and significant role for AI across various fields.

Literature Review: Virtually every sector is being transformed by artificial intelligence (AI), which is fueling breakthroughs everywhere. Nearly every sector is developing novel applications for AI technology. A few of these methods, including those in financial technology, education, and even agriculture, are exceptionally inventive. The field of artificial intelligence is being propelled forward by innovative AI applications (Partida, 2022).According to a McKinsey report, technology giants such as Baidu and Google invested between $20 billion to $30 billion in AI in 2016, with the majority of funds, around 90%, allocated towards research and development

as well as implementation efforts. The remaining 10% was directed towards acquiring AI-related assets. The pace of investment in AI now is three times that of increase in foreign investment since 2013. The AI system **Netflix** employs to customize suggestions for its 100 million members across the world has also produced outstanding results, boosting search results and preventing subscription cancellations from disgruntled users who couldn't find what they were looking for. The ubiquitous computers that financial workers use to acquire market information are improved by methods like computer vision and natural language processing, according to financial data expert Bloomberg. Instead of using specialist technical commands, users may submit inquiries using plain language, which AI will evaluate and process.Uber has a core team that offers well before machine learning algorithms to its group of mobile app developers, map specialists, and self-driving teams on a subscription basis. With the use of computer vision and enhanced travel behavior prediction, these skills are also utilized to develop algorithms for the company's autonomous cars. To make digital customer service as effective as in-person engagement, Royal Bank of Scotland has unveiled a natural language processing AI bot that will respond to banking customers' inquiries and carry out basic banking functions like money transfers. AI and machine learning are transforming how businesses access and use data in order to become smarter, more effective businesses. Additionally, IT and predictive analysis teams are preparing for the enormous advantages that AI will bring to their companies (Rauch, 2023).

Evolution of AI: The AI wave has seen subtle falls and brilliant heights during the past century. However, because of the hype, organizations and governments spent money on developing artificial intelligence. The insufficient results led to the discontinuation of these endeavors. The advancement of algorithms and the availability of computing power are key factors that determine the success of data(Intelligence, n.d.). In the past, artificial intelligence was merely a concept in science fiction during the 1920s. However, in the 1950s, a significant step was taken to transform the idea of AI from fantasy to actuality. In his essay "Computing Machinery and Intelligence"Alan Turing introduced the Imitation Game, also known to as the Turing Test, is a technique to determine a machine's intelligence. It goes without saying that a device passes the test if a human judge interacting with it is unable to consistently tell the difference between a machine and a person.Marvin Minsky, John McCarthy, Shannon and Nathan Rochester, and others arranged the "Dartmouth Conference" in 1956, where the phrase The term "Artificial Intelligence" was initially coined as a legitimate scientific expression. After one year the introduction of the perceptron, American computer scientist Arthur Samuel introduced the term "machine learning." In 1965, Ukrainian mathematician Alexey Grigorevich proposed the concept of deep learning, which involves stacking multiple perceptron's on top of each other and is similar to the modern deep-learning structures based on Neural Networks (NN) that mimic the human brain. Despite a decade of dormancy in the **1970s,** AI had some notable breakthroughs before its decline, including backpropagation, a self-optimization technique for Artificial NN that does not require human interventionwas invented by Geoffrey Hinton et al in the 1980s. His achievement was achieved by varying the NN nodes' weights across several levels. The Convolutional Neural Network (CNN) for image identification was first introduced by Yann LeCun in 1989. Support Vector Machines (SVM) were developed in 1992 by Bernhard E. Boser,Isabelle M. Guyon, and Vladimir N. Vapnik to make it simple for natural language processing to interpret and categorize human speech. With order to aid in sequencing problems, Sepp Hochreiter developed the Recurrent Neural Network (RNN) in 1991. In 1997, Hochreiter and Jurgen Schmidhuber introduced the Long Short-term Memory (LSTM) technique to enhance speech to text translation. Hinton, who is credited with coining the term "deep learning," used pre-training with a deep belief network in 2006 before applying backpropagation. In **2012,** Hinton's team won the ImageNet competition by training a convolutional neural network (CNN) with 1.2 million images on two GPU cards. Another example of AI's increasing popularity is DeepMind's Reinforcement Learning Algorithm, which was first trained with CNN to play Atari games at a human level in 2013, and then, under **Google's auspices**, beat the GO world champion in 2016. These developments illustrate how AI has exploded in popularity since **2010**, resulting in a plethora of AI products and widespread implementation (mckinsey, n.d.).

How AI Works in above systems?

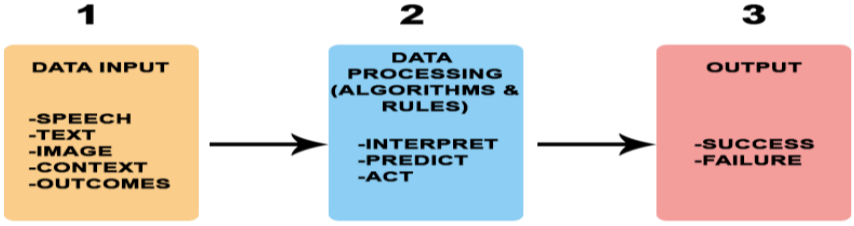

Figure:2.1, AI Working

- An AI system typically begins by ingesting data in the form of voice, text, images, or other types of input.
- It then leverages various algorithms and rules to interpret and make predictions about the data before taking action.
- Finally, the system provides a result based on the processed data, which could indicate success or failure depending on the nature of the input (Kanade, What Is Artificial Intelligence (AI)? Definition, Types, Goals, Challenges, and Trends in 2022, 2022).

The automated shifting of utilities at home is a typical use of AI that we see nowadays. The detectors in the room recognize your presence and switch on the lights when you go into a dark space. This is an illustration of a machine without memory. Some of the more sophisticated AI algorithms may even estimate your consumption behavior and activate appliances without your specific input. Some artificial intelligence (AI) algorithms can recognize your speech and respond appropriately. The TV will turn on when you command it to do so using its sound sensors. These are some common AI applications in our daily life(Simplilearn, 2022).

KEY Elements of AI

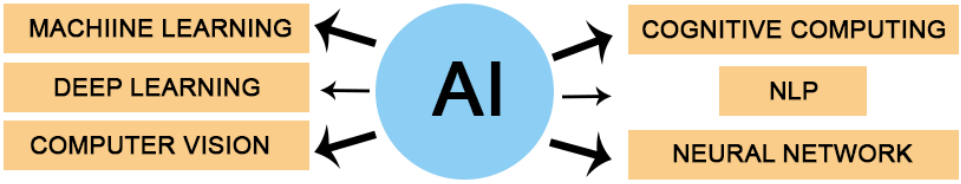

Figure: 3.1. Key Elements of AI(Kanade, what-is-ai, n.d.)

Machine Learning: An artificial intelligence (AI) application known as machine learning automatically learns up new abilities and improves upon those it already has without the need for explicit programming. (Kanade, what-is-ai, n.d.). With the aid of computer systems that can learn to solve a problem without being explicitly programmed, a set of techniques known as "machine learning" are frequently employed to tackle a wide range of real-world issues (JOHN R. KOZA, 1996). Humans analyze enormous amounts of data using abstract knowledge that aids in our comprehension of incoming data. Machine learning algorithms are able to simulate human cognition in a standalone setting because of their adaptive nature. Machine learning, however, is only a collection of techniques that make it possible to identify patterns in existing data, producing analytical models that may be used inside bigger IT artifacts (Niklas Kühl).

How AI & Machine Learning Work together:
The development of an AI system typically involves several steps.

1) First, machine learning algorithms and other techniques are used to create the system.
2) Next, machine learning models are generated by analyzing patterns in the data.
3) Based on these trends, data scientists fine-tune the machine learning models.
4) The process is iterated and improved until the models' accuracy meets the necessary standards for the given tasks(artificial-intelligence-vs-machine-learning/#process, n.d.).

Deep Learning: In the history of mankind, artificial intelligence (AI) represents the fourth industrial revolution. Modern machine learning techniques known as "deep learning" (DL) have attracted a lot of attention from across the world in recent years. Deep learning obviates the need for human feature engineering by utilizing representation-learning techniques that involve multiple levels of abstraction. By projecting high-dimensional data onto a lower-dimensional manifold, the system automatically identifies complex features within the data(Yann LeCun, 2015). In various areas, such as (NLP)natural language processing, (CV) computer vision, and speech recognition, it has been demonstrated that DL can attain much greater accuracy levels when compared to conventional approaches (Xiangyu Zhang, 2015; hin HC, 2016; Jonathan Tompson; Hinton G, 2012).

Computer Vision: AI research focused on computer vision aims to teach systems to extract and comprehend useful information from image and video data. By utilizing machine learning (ML) techniques to pictorial form, systems can recognize objects and even perform certain actions, such as unlocking a cellphone upon detecting the user's face. Computer vision has a wide range of applications beyond just managing an administrator's email, such as enhancing your images with cute fox filters or detecting anomalies in medical images of lungs. A computer vision software requires a substantial amount of computational power and enormous amounts of data to include machine learning methods. And if it can't find them, a management needs to be consulted. But an effective AI model that has been properly trained can be life-saving. Computer vision and

machine learning are being used by businesses in a wide range of sectors to extract useful insights from the enormous volumes of data they produce (Computer vision applications for AI: Unlock data faster to see more clearly, n.d.).

Cognitive Computing: Cognitive computing (CC) and artificial intelligence (AI) are currently receiving more interest from both academia and business (Gowida, Moussa, Elkatatny, & Ali, 2019). It is understood that approaches and procedures that are AI- and CC-enhanced open up a number of chances for improving both fundamental and sophisticated company operations, involving shipping, financial management, and industrial processes. In the disciplines of engineering, money management, tourism, air pollution control, and several more fields, AI-enhanced tools and approaches often provide more accurate findings (Visvizi, 2021). To imitate human mental processes using a digital model is the aim of cognitive computing. By utilizing self-learning techniques that make use of information retrieval, pattern classification, and natural language processing, the computer may be able to mimic how the human brain functions. Computers are way quicker and more efficient in calculations and processing tasks, however the tasks we may assume that are easy but computers may fail to perform those tasks easily for example tasks such as identification of different things in an image or understanding a language that is being spoken to a machine. (Marr, n.d.).

NLP: Natural language processing (NLP) consists of computer techniques that can be used to analyze and interpret naturally occurring text at various stages of linguistic analysis, with the goal of achieving human-like language processing across a range of activities and applications. This approach is based on a sound theoretical foundation(Liddy, 2001). The application of natural language processing can involve a range of machine learning methods, depending on the type of analysis being performed. This could be a simple approach, such as examining usage frequency or sentiment, or a more complex one. However, in all cases, an algorithm needs to be created. The Natural Language Toolkit (NLTK) is a set of Python-based tools and programs for symbolic and statistical natural language processing of English, which can aid in a variety of NLP tasks, including constructing text classification datasets, performing part-of-speech tagging, tokenization, and more.AI's ability to understand human language is key to its development. Even advanced AI systems struggle to fully understand human nature. As AI systems become more intelligent, the question of whether they can achieve consciousness becomes increasingly important(The role of natural language processing in AI, n.d.).

Neural Network: Neural networks have already had an impact on the amazing development that artificial intelligence has so far made (YEGNANARAYANA, 2009). In the realm of machine learning, artificial neural networks are a key technology. The term "neural" pertains to systems that take inspiration from the brain and strive to replicate its social learning mechanisms. Typically, neural networks are a set of input and output layers, as well as a hidden layer that comprises components responsible for converting inputs into data that can be used by the output layer. To enable a human programmer to extract and train a computer to perceive patterns, there are various complex and extensive tools at their disposal. Perceptron’s, another name for neural networks, have been a key component of artificial intelligence since 1940 (Hassoun, 1995). Additionally, neural networks are advancing the study of neurology and psychology. It is employed in neurology to examine the internal functioning of the brain and to simulate many elements of living things. The most intriguing feature of neural networks is the potential for "conscious" networks to develop in the future. According to some scientists, conscious brain networks are logical and genuine and consciousness is a "mechanical characteristic." We can maximize the potential of neural networks by working together with fuzzy logic, computing, AI, and ML (Vaishnavi, n.d.).

Industries Where AI is Making aSignificant Impact?: AI has been adopted across various industries and has become a key enabler for drivinginnovation, improving efficiency and enabling organizations to make data-driven decisions. Some of the key industries where AI is making a significant impact includes;
Overall, AI has the potential to transform virtually every industry, by improving productivity, reducing costs and improving customer experiences.

Healthcare: Artificial intelligence (AI) and associated technologies are permeating every aspect of business and society, including healthcare, as they continue to progress. Numerous facets of patient care as well as internal administrative processes for customers, providers, and pharmaceutical companies might be transformed by such technology. Several studies have already shown that AI has the ability of carrying out important healthcare duties, such as effectively detecting ailments. Algorithms can now outperform doctors in spotting deadly tumors and advising scientists on how to collect samples for pricey clinical tests. But for a number of reasons, we think it will be some time before AI entirely replaces humans in essential medical procedures (Kalakota, 2019).

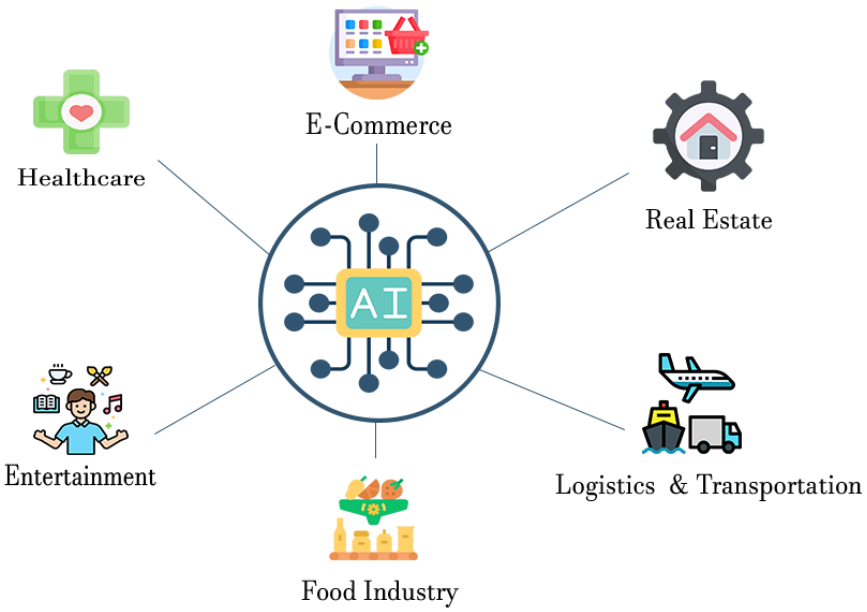

Figure 4.1: AI In Industries(Takyar, n.d.)

Diagnosis & Treatment Applications: Artificial intelligence (AI) has been primarily focused on the diagnosis and treatment of illnesses since the development of MYCIN in the 1970s by Stanford. MYCIN was created as a machine consultation system to aid doctors in identifying blood-borne bacterial infections and selecting the most suitable treatment option (MELLE, 1978)(Bush, 2018). Early rule-based techniques, including the MYCIN system, demonstrated potential for accurate diagnosis and treatment of illness. However, these systems were not widely implemented due to their limited superiority over human practitioners, and their lack of compatibility with clinical workflows and medical record systems. In recent years, the media has closely followed IBM's Watson, which has been promoted for its precision medicine applications, particularly in cancer diagnosis and treatment. Watson incorporates both machine learning and natural language processing techniques. Despite the potential benefits, clients grew less interested in utilizing Watson for cancer treatment due to challenges they faced in providing it with instructions for managing particular types of cancer and integrating it into their care processes and systems.(H.Shortliffe, 1984)(Swetlitz, 2017).Whether AI-based diagnostic and treatment suggestions are based on rules or algorithms, integrating them into healthcare systems and electronic health records (EHR) systems can be difficult. Several diagnostic and therapeutic capabilities based on AI that are provided by technology companies are either standalone or designed to address a specific aspect of care. Integration challenges have been a significant obstacle to the broader implementation of AI in healthcare, and these challenges have likely been more critical than any issues with the accuracy or effectiveness of AI-based suggestions(Lian Leng Low, 2015).

Patience Engagement & Adherence Applications: Patient interaction and compliance is being considered the "last mile" challenge in healthcare, as they represent the final obstacle to achieving positive health outcomes. The benefits of greater patient participation in their health and treatment, such as improved consumption, financial results, and member experience, are well-established. To address these issues, big data and AI are increasingly being used. Providers and hospitals frequently rely on their clinical experience when creating a care plan for acute or chronic patients. However, even the most well-crafted plan may not lead to positive outcomes if the patient fails to make the necessary changes in behavior, such as losing weight, scheduling follow-up visits, taking medication, or adhering to the treatment plan. Noncompliance is a significant issue that occurs when patients do not follow a prescribed course of therapy or take their medication as directed. Clinical professionals and healthcare executives were polled, and more than 70% said that less than 50% of their patients were highly interested, while 42% said that less almost a fraction of their patients was deeply involved (Thomas H. Davenport, 2018).In healthcare, there is growing interest in creating effective "choice architecture" that can predictively influence patient responses based on empirical data. Using information from electronic health record (EHR) systems of providers, biosensors, smartwatches, telephones, chatbots, and other devices, software may be used to tailor treatment options by correlating patient data to effective therapy pathways for groups that are similar to the patient. Physicians, patients,

nurses, call center agents, and care delivery coordinators can all offer these recommendations(Kalakota, 2019).

Administrative Applications: The healthcare industry has a vast array of administrative apps. While the use of AI in patient care may have more potential for revolutionary impact, the technology can still provide significant cost savings in this area. Healthcare relies heavily on administrative apps as they play a critical role. For instance, nurses in the US spend 25% of their work hours on administrative and regulatory tasks, making it essential to have such apps.(Berg, 2018). The healthcare industry has a vast array of administrative apps. While the use of AI in patient care may have more potential for revolutionary impact, the technology can still provide significant cost savings in this area. Administrative apps are crucial in healthcare because, for instance, the average US nurse spends 25% of their working hours on administrative and regulatory tasks (COMMINS, 2010). Several healthcare organizations have tested chatbots for E-health, mental health, and patient engagement. These NLP-based apps can be particularly useful for simple operations like scheduling appointments or updating medication. However, a study of 500 US respondents regarding the top five healthcare chatbots found that people had concerns about disclosing private information, dealing with serious illnesses, and poor app functionality (Four Robotic Process Automation (RPA) Applications in the Healthcare Industry, 2018).

Ethical Consequences for the use of AI in healthcare: The use of artificial intelligence in healthcare poses a variety of ethical issues. Historically, nearly all healthcare decisions were made by human beings, so incorporating intelligent machines in the decision-making process raises concerns about accountability, transparency, consent, and privacy. In terms of available technology, accessibility may be the most difficult problem to address. Many AI algorithms, particularly those used for image interpretation such as deep learning techniques, are extremely complex and difficult to understand. Patients who learn that a picture has resulted in a cancer diagnosis will probably wish to know how this determination was made. Even doctors who are knowledgeable about how deep learning algorithm's function may be unable to provide a clear explanation. Mistakes will inevitably be made by AI systems in diagnosing and treating patients, and it may be difficult to hold them accountable for these errors. AI systems in healthcare may not always provide the type of medical information that patients prefer to receive from a compassionate physician. Additionally, there is a risk of algorithmic bias in healthcare machine learning algorithms, which may wrongly predict an elevated risk of illness based on factors such as race or gender, even when those factors are not the underlying causes(Thomas H. Davenport and Keith J. Dreyer, 2018). The integration of AI into healthcare is expected to result in various ethical, medical, professional, and technical advancements. It is essential for healthcare institutions, as well as governmental and regulatory bodies, to establish mechanisms for monitoring key issues, responding appropriately, and creating governance frameworks to mitigate adverse effects. Given that this technology has a significant and enduring impact on society, ongoing attention and deliberate planning for the long term will be necessary.

Logistics and Transportation: When the infrastructure and users' actions make it difficult to estimate and anticipate traffic patterns, transportation problems occur. In order to address the issues of rising traffic volume, CO2 emissions, safety risks, and environmental degradation, AI is thought to be a positive addition for transportation systems. These issues are a result of rising society, especially in emerging nations, which has led to a continuous increase in rural and urban transportation. The goal of many experts in the twenty-first century is to develop a more sustainable transportation system that has fewer negative effects on people and the climate. It might be used by drivers, other road users, vehicles, and the transport networks. The development and application of AI in transportation has taken several forms. Three of those are the key cases that this research study will focus on. (i) Employing AI for business planning, management, and decision-making. This is crucial to solving the problem of a limited quantity of roads and a continually expanding need. To better estimate volume of traffic, traffic patterns, and incidents, this includes making greater use of precise prediction and detection models. (ii) Applications of AI aimed at enhancing public transportation are also covered in It's because many view public transit as a sustainable form of transportation. (iii) Connected and autonomous cars, which aim to increase production by lowering the accident rate on roads, are the following prospective AI application in transportation(Rusul Abduljabbar, 2019).

Applications in the Transportation Industry: Automated Driving: AI has become increasingly prominent in advanced driver assistance systems (ADAS) and the development of automated driving features. Deep learning techniques like CNN and DRL have played a vital role in these systems. To create a reliable and robust automated driving system (ADS), it is necessary to combine different AI techniques. Autonomous driving relies on perceiving the surroundings and understanding the scene, which involves identifying other drivers, traffic signs, and objects along the roadside. Deep neural networks, particularly CNNs, have demonstrated effectiveness in recognizing, tracking, and categorizing various road users like vehicles, pedestrians, and cyclists. Although detecting individuals can be challenging due to obstructions and adverse weather, there has been

significant progress in using deep learning for human identification. Deep learning-based approaches using camera data enable the detection and tracking of moving obstacles by determining their positions and sizes (T. Yuan W. B., 2019) (C. Badue, 2019). Looking ahead, advancements in AI and machine learning will continue to enhance the prediction of intentions and behavior of other road users.

Traffic flow and public transport travel time prediction: Various combinations of AI algorithms have been utilized to predict traffic flow and journey times in public transportation. These forecasts serve as valuable tools for managing traffic congestion, vehicle dispatching, and route planning. Predicting traffic patterns and travel durations is a challenging task influenced by multiple factors, including geographical connections, temporal dependencies, and environmental conditions. Different methodologies, such as segment-based and path-based estimations, have been employed to forecast journey times. More recently, researchers have been exploring integrated deep learning (DL) techniques that combine both segment-based and path-based approaches. The integration of DL with conventional techniques has shown promising results in this field (T. Yuan W. B., 2019). Open public transportation data from cities often contains vehicle locations, public transportation schedules, route IDs, and other relevant information. This continuous stream of open data has enabled the development of prediction algorithms for Estimated Times of Travel (ETA) using machine learning (ML). In recent times, researchers have been incorporating diverse external data sources, such as weather conditions, traffic data, and passenger information, to enhance the accuracy and effectiveness of machine learning models in this area of study (T. Reich, 2019).

Electronic Commerce: In previous years, e-commerce has been making significant progress. Consumers continue to appreciate the convenience that e-commerce provides while also wanting to get more from it. The growth of AI techniques creates new possibilities and patterns for e-commerce. By 2020, with the use of artificial intelligence jobs has been replaced from humans to AI in more than 80% of customer support positions, predicts market research firm. Artificial intelligence technologies will be leveraged by companies such as Alibaba, Rakuten, and Amazon to handle vast amounts of data, perform sentiment analysis, develop chatbots, and provide product recommendations. E-commerce is seeing a substantial increase in the use of artificial intelligence (AI), which has previously shown useful in sectors including transportation, healthcare, food industry and many more.

Artificial Intelligence (AI) Assistant: An AI assistant, commonly referred to as a Chatbot, utilizes natural language processing technology to automatically respond to customer inquiries, perform basic voice commands, and offer product suggestions. In e-commerce and mobile websites, chat interactions with customers are customized through machine learning algorithms. Chatbots have the ability to aid customers in locating the right items, checking availability, comparing products, and guiding them through the payment process.Virtual assistants offer a convenient means for customers to communicate with service staff in case of any inquiries or concerns, using various mediums such as text, speech, and images. In March 2017, Alibaba introduced Shop Xiaomi, an AI service robot and chatbot for Taobao merchants. The deployment of virtual assistants can help reduce labor costs, improve service quality, increase nighttime traffic, and provide support to customer service in addressing repeated inquiries, with approval from the merchant and proper debugging.

Recommendation Engine: A suggestion platform that utilizes machine learning algorithmsas its foundation is known as a recommendation system.By leveraging AI algorithms, these systems can analyzevast datasets and use statistical programming, deep learning,and predictive analytics to anticipate customer behavior and predict the best-selling products. Based on prior searches by prospective buyers, the recommendation engine's machine learning algorithm is able to capture important information about the sought product. The recommendation systems then create relevant Recommendations for the client and lists them on a private profile using the computation, thereby benefiting clients in discovering the product fast. Artificial intelligence recommendation system transformation is enabled by the use of dimensionality reduction algorithms. The most significant shift brought about by artificial intelligence in the recommendation system is that it is now seen as the entire pattern of human-computer interaction rather than just a collection of recommendations. The dynamic nature of both the system as well as the users may be accomplished by including the time dimension. Several e-commerce companies, including Amazon, Alibaba, Taobao, and JD.com, utilize recommendation engines to pinpoint their target market for products.

Techniques for artificial intelligence have advanced, and as technology becomes more sophisticated and widespread, it is having an increasing influence on a variety of factors, including consumer happiness and retention in e-commerce transactions. Artificial intelligence will eventually play a significant role in the evolution of e-commerce. To fill the void between personalization and privacy, e-commerce will have a wider development outlook with the use of artificial

intelligence technology. This is advantageous for the formation of better management of customer relationships and the promotion of sales (Xia Song, 2019).

Food Industry: AI has gradually been used into the food business for a variety of tasks, including food sorting, categorization, parameter forecasting, quality assurance, and maintaining food safety. The food business uses artificial intelligence (AI) in a variety of methods, including expert systems, fuzzy logic, ANNs, adaptive neuro-fuzzy inference systems (ANFIS), and machine learning. Prior to the use of AI, study on the food business was ongoing and aimed at advancing public awareness of food as well as findings pertaining to its production and features (Mohammad Shafiur Rahmana, 2011)(Rahman NA, 2012)(M. Reza Mozafari, 2008)(S. D. Jayasooriya, 2004).

Expert Systems that utilize knowledge-based techniques in the food industry: A system that leverages information, data, and knowledge from multiple sources to tackle complex problems is referred to as a knowledge-based system. It can be defined into three subtypes: expert systems, knowledge-based artificial intelligence, and knowledge-based engineering. An expert system based on knowledge is a particular kind of knowledge-based system that employs a computer system to mimic the decision-making of a human expert, commonly utilized in various industries. Here is an outline of the breakdown of the knowledge-based system(Karolina Szturo, 2015). Expert systems (ES) have been widely used in the food industry for diverse functions, particularly in decision-making, due to their demonstrated effectiveness. In white winemaking, a knowledge-based expert system is utilized for tasks such as data retrieval, intelligent control, and monitoring during the fermentation process (Sipos, 2020). Furthermore, the development of ES has aided small and medium-sized enterprises (SMEs) in acquiring the necessary data to comply with food production license requirements. A web-based application has also been created using ES to determine the nutritional value of food for customers(Irfan Ardiansah, 2020). ES applications that are directly linked to food safety have been extensively utilized in the design phase, safety systems, assessment of food quality, and risk assessment, since food safety is crucial for the food industry(Matthias Filter, 2015). Moreover, a model information technology tool, along with recommendations and corrective measures, has been developed for the food industry after researching several crucial factors such as food safety, nutrition, quality, and cost(Olaug Taran Skjerdal, 2017).

Smart Farming: The practice of managing farms using modern information and communication technologies is referred to as "smart farming" in order to increase product quality and quantity while reducing the requirement for labor-intensive human labor (Sciforce, 2022).

How to utilize AI for yield prediction & optimization: Since there are so many factors at play, including the climate and genetics, predicting crop yield is difficult. We can predict future yields with accuracy if we understand how these variables impact agricultural production. This is where artificial intelligence can assist. The relevant datasets may be given to appropriate computers in order to anticipate crop yield. By comparing historical crop production data to more recent data, AI systems can accurately anticipate agricultural productivity over time. To calculate the amount of light the plant life of their crops receives, farmers deploy AI algorithms. If particular crops are not receiving enough sunshine, crop spacing can be adjusted to allow for sunlight penetration. It is costly and time-consuming to personally examine the foliage gap. Systems based on AI with perceptual capabilities may potentially monitor and assess every day in plants to determine their pace of growth. These systems can use data from infrared sensors, satellite imagery, and thermal cameras (MAHENDRA, n.d.).

Real Estate: An essential element of successful real estate maintenance and investing is making use of data to your advantage. Applications of AI in real estate improve decision-making, and data patterns discovered using machine learning and AI methods may lead to unexpected conclusions. With improved insights into property values and more efficient business and multi-family real estate security, AI real estate firms are revolutionizing the real estate sector (Pedersen, 2022).

It aids in the generation of leads: AI-enabled software for b2b eCommerce chatbot creation collects consumer data. Separate programs are also available for using machine learning settings to enhance managerial and marketing initiatives.

It changes the way people look for homes: Consumers' house searches have been significantly facilitated by technology, beginning with online listing. Most other search engine strategies can restrict real estate brokers and potential buyers based on listing specifications like the number of bedrooms, toilets, and apartments, but this strategy offers everyone a range of options.

It makes transaction easier: Agents are assisted by artificial intelligence in the management of their firms at the conclusion of a contract. Examples include the widespread usage of autonomous data reading and item reporting in Customer Relationship Management (CRM) systems. Real estate brokers spend less time using computers thanks to AI, and it also reduces the possibility of human error during data entry.

It makes the property evaluation procedure easier: Furthermore, one of the key skills that professionals rely on is the ability of artificial intelligence (AI) and machine learning in real estate to "predict" the future. It is highly useful for figuring out property assessments and rental rates. The automatic A.I. testing and assessment model may collect information from public records, alternative routes, crime data, and local school estimates in order to produce a set of defined value analyses in this circumstance. During the coronavirus outbreak, this version of the computer test was useful. Furthermore, real estate agents are better able to research the investor-related market before deciding to add new residences to their portfolios.

It changes how you approach the loans: Last but not least, AI has an effect on the financial sector. Any real estate agent or buyer is aware that several papers are required as part of the testing procedure in order to decide whether you would lend to a potential lender. However, the personal computers exam application uses artificial intelligence to read and evaluate the key papers before sending them to the underwriters. Even while the human component of this process cannot entirely be replaced by computer writing, it is a relatively rapid substitute (Panchal, n.d.).

Banking and Finance: Among the many recent IT advances, the advancement in AI stands out. In a summary, artificial intelligence (AI) is the term used to describe robots that are capable of thinking similarly to humans. For enterprises and their customers, this can result in considerable efficiency gains. The promise for AI to increase profitability led the banking sector to be one of the earliest to experiment with the technology. Therefore, it is crucial to look more closely at the potential contribution of AI to the digital transformation of banks (Kaya O. , 2019).

There is ongoing testing of AI-powered fraud detection and prevention for online banking. Credit card fraud has become one of the most prevalent types of fraud in recent years, as a result of the rapid expansion of electronic and mobile payments. In order to identify fraudulent activity, AI systems utilize real-time feasibility assessments on customer credit card payments and comparing of purchases to past amounts and locations. AI will interrupt transactions if it finds dangers(2018).

To verify clients' identities, AI is being used in KYC (Know Your Customer) procedures. AI systems review client paperwork and evaluate the data's accuracy by comparing it to online data. AI algorithms that detect inconsistencies provide a warning signal, causing bank employees to perform a more complete KYC check. As an implementation of AI technology, **banks are also** testing with chatbots. Without employing a bank employee, chatbots are digital assistants who interact with consumers through text or voice communication to address their needs. Moreover, banks are testing the use of AI to display and extract important information through files like financial statements and legal contracts. AI systems build models on their own after analyzing the data and doing back validation to improve accuracy and learn from their mistakes. Two outstanding examples are online cash flow tools that help consumers make smarter spending and saving decisions and **Robo-advisors** that offer total automation in some financial advisory services. More advanced digital banking systems employ additional techniques for automatically scanning data and finding trends. Banks appear to be studying AI applications primarily to replace expensive, time-consuming, and repetitive tasks in their effort to become more efficient. The emphasis is on prospects for cost savings, such chatbots or robo-advisors, as well as operational risk management improvements like fraud detection or enhanced KYC (Kaya O. , 2019).

Entertainment: Films have historically showed us how terrifying AI may develop. Ironically, artificial intelligence was used to help create these films, including in pre-production and editing. It's time we looked at tech and media interactions from the standpoint of artificial intelligence since they have been lot more harmonious than science fiction films would have us believe. With features like hyper personalization, SEO, enhanced augmented reality and virtual reality, and many more, AI has already begun to transform the Entertainment Industry. Consequently, this is a fantastic chance for business experts to invest in and grow their media businesses. Not to forget, tech lovers are moving towards a job that combines AI with entertainment in the ideal method(Rahman, 5 Ways AI Is Changing The Entertainment Industry, n.d.).

Content Personalization: Finding the ideal 2-hour movie requires hours of searching through dozens of movies and songs. It is really difficult to narrow down your web suggestions and trailer selections for binge-watches. Hyper personalization powered by AI provides a solution to this issue. The historical preferences and genre inclinations of a person may be gathered, curated, and prioritized by AI-driven software into complex databases. The system can then locate the ideal movie or music for the user from there. Aligning the client with the ideal is an example of personalization.

- Movie duration by genre
- Preferred actors/directors, subjects, etc.

This is something that Netflix and Spotify frequently do to accommodate to client preferences and so boost user retention. Customers' willingness to pay higher fees for subscriptions has made this business model profitable, which has encouraged the adoption of streaming services throughout the globe(Rahman, 5 Ways AI Is Changing The Entertainment Industry, n.d.).

AR & VR: Unless artificial intelligence steps in, the use of augmented reality and virtual reality is severely constrained. By giving people more immersive experiences, AR and VR raise the bar for enjoyment. no longer constrained by two dimensions. A lot of athletic events, museums, and lectures employ augmented reality. Users may learn about their surroundings in real time thanks to this. Contrarily, virtual reality enables users to experience a completely alternative reality of their choosing. Meta has already invested a large amount of money in VR, which is expected to increase in popularity. Through deep learning, artificial intelligence can rapidly mine thenecessary information, greatly enhancing the user experience. Applications for AR and VR are constantly developing because to machine learning (ML) and access to a wealth of datasets(Rahman, 5 Ways AI Is Changing The Entertainment Industry, n.d.).

SEO and Advertising: Due to its access to vast data sets, artificial intelligence increases the effectiveness of search engine optimization (SEO). Given that consumer tastes are always changing, SEO and advertising must adopt an automated strategy. For firms to remain competitive, staying up to date with changes in real-time is crucial. A customized marketing that employs deep learning to focus on people's tastes rather than obsolete assumptions can help businesses save a considerable amount of money. As a result, there is a large improvement in the possibility that a client will discover their fit, which raises customer happiness and helps to boost profit margins. Due to its increased usage in today's society, which has sped up machine learning (ML) development, AI in marketing is expected to continue to advance(Rahman, 5 Ways AI Is Changing The Entertainment Industry, n.d.)

Streaming Quality: To maintain the viewers' content, streaming quality must be improved. This is particularly important since if the user is unhappy with the interface, they'll probably stop watching the show and unsubscribe from the streaming service. Websites can be compared to this. Customers will leave and look for alternatives if they don't like the front end of the website's design or find it tough to navigate. Among many other strategies, Netflix employs ML to enhance its front-end, back-end, and UI\UX on a regular basis to keep customers the excellent viewing quality is a major factor in Netflix's early popularity.

Additionally, AI can identify trends in cyberattack warnings to speed up the process of efficiently catching phishing and other nefarious hacking attacks. As the details of these breaches are stored in Big Data, future occurrences of similar intrusions can be avoided(Rahman, 5 Ways AI Is Changing The Entertainment Industry, n.d.).

AI- Industries with Potential Areas for further Development

Table 1. Potential areas for further developments

	Industry	Current AI Applications	Potential Areas for future Development
1	Healthcare	**Medical imaging analysis, drug discovery, disease diagnosis**	**Predictive analytics for patient outcomes, virtual assistants for patient care, personalized medicine**
2	Logistics & Transportation	**Autonomous vehicles, predictive maintenance,route optimization**	**AI-powered traffic management, fleet management optimization, personalized travel experiences**
3	E-Commerce	**Personalization, Image and Voice Recognition, Fraud Detection, Supply Chain Optimization, Voice Assistants and Chabots**	**Advanced personalization algorithms, Development of AI-powered visual and voice search, Improved accuracy of fraud detection**
4	Food Industry	**Crop management, Predictive maintenance, Supply chain optimization**	**Integration with IoT devices, Development of AI-powered precision farming tools**
5	Real Estate	**Property valuation, demand forecasting, personalized recommendation**	**AI-powered property management, virtual property tours, personalized property investment recommendations**
6	Banking & Finance	**Fraud detection, predictive analytics, Investment recommendations**	**Explain-ability and transparency of AI systems, Improved accuracy of predictive models**
7	Entertainment	**Content recommendation, personalized advertising, audience analysis**	**AI-generated content, virtual reality experiences, AI-powered content creation**

It's important to note that these are just potential developments and there's no guarantee that all of these will come to fruition. Additionally, there may be other advancements in AI in the future that aren't included in this table. However, the potential for AI to revolutionize various industries is an exciting prospect, and it will be interesting to see how these developments unfold in the coming years.

Future of AI: Artificial intelligence (AI) has rapidly transformed a wide range of industries, from healthcare and finance to transportation and manufacturing. Its ability to analyze vast amounts of data and identify patterns has led to the development of innovative applications that improve efficiency, accuracy, and productivity. In healthcare, AI is already being used to assist in diagnoses, develop personalized treatment plans, and even perform surgeries. The finance industry has also embraced AI, with its ability to analyze data helping to identify fraudulent activities and make more accurate predictions. In transportation, AI is powering autonomous vehicles, which have the potential to significantly reduce accidents and increase the efficiency of transportation networks. And in manufacturing, AI is improving supply chain management, quality control, and production processes. Looking to the future, AI will continue to play a crucial role in shaping many different industries. It has the potential to further enhance the accuracy and speed of diagnoses in healthcare, facilitate personalized treatments based on individual genetics, and even develop new drugs. In the finance industry, AI will continue to improve fraud detection and risk management. In transportation, autonomous vehicles will become increasingly common, changing the way people and goods are transported. And in manufacturing, AI will help optimize supply chains and improve the efficiency of production processes. However, there are also concerns about the impact of AI on society. As AI systems become more advanced and ubiquitous, there are concerns about job displacement, privacy and security, and even the potential for AI to be used for nefarious purposes. It will be important for industry leaders, policymakers, and researchers to work together to ensure that the benefits of AI are balanced with ethical considerations and potential risks. In conclusion, AI has already changed and will continue to transform many different industries in the future. While there are potential challenges to be addressed, the potential benefits of AI are vast and promising. With thoughtful planning and responsible implementation, AI can help improve our lives and create a more efficient and productive society.

Conclusion: Artificial Intelligence is changing the way we live and work. Its ability to analyze vast amounts of data and identify patterns is transforming processes and operations across many different areas. The increased efficiency, accuracy and productivity brought by AI is benefiting organizations of all sizes, from small businesses to multinational corporations. AI is helping to automate routine tasks, freeing up human resources to focus on more complex and value-adding activities. This in turn, is leading to increased innovation, creativity, and problem-solving abilities. The applications of AI is also improving the decision-making process, enabling faster and more informed responses to changing circumstances and market conditions. Furthermore, AI is enhancing the quality of customer service, providing more personalized and customized experiences. This is helping to build stronger customer loyalty and satisfaction, which is critical to the success of any business. In conclusion, the impact of AI is being across many different industries, transforming the way we do business and improving outcomes for organizations and individuals. While the technology is still evolving, the potential benefits are vast, and we can expect AI to continue changing the world as we know it.

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