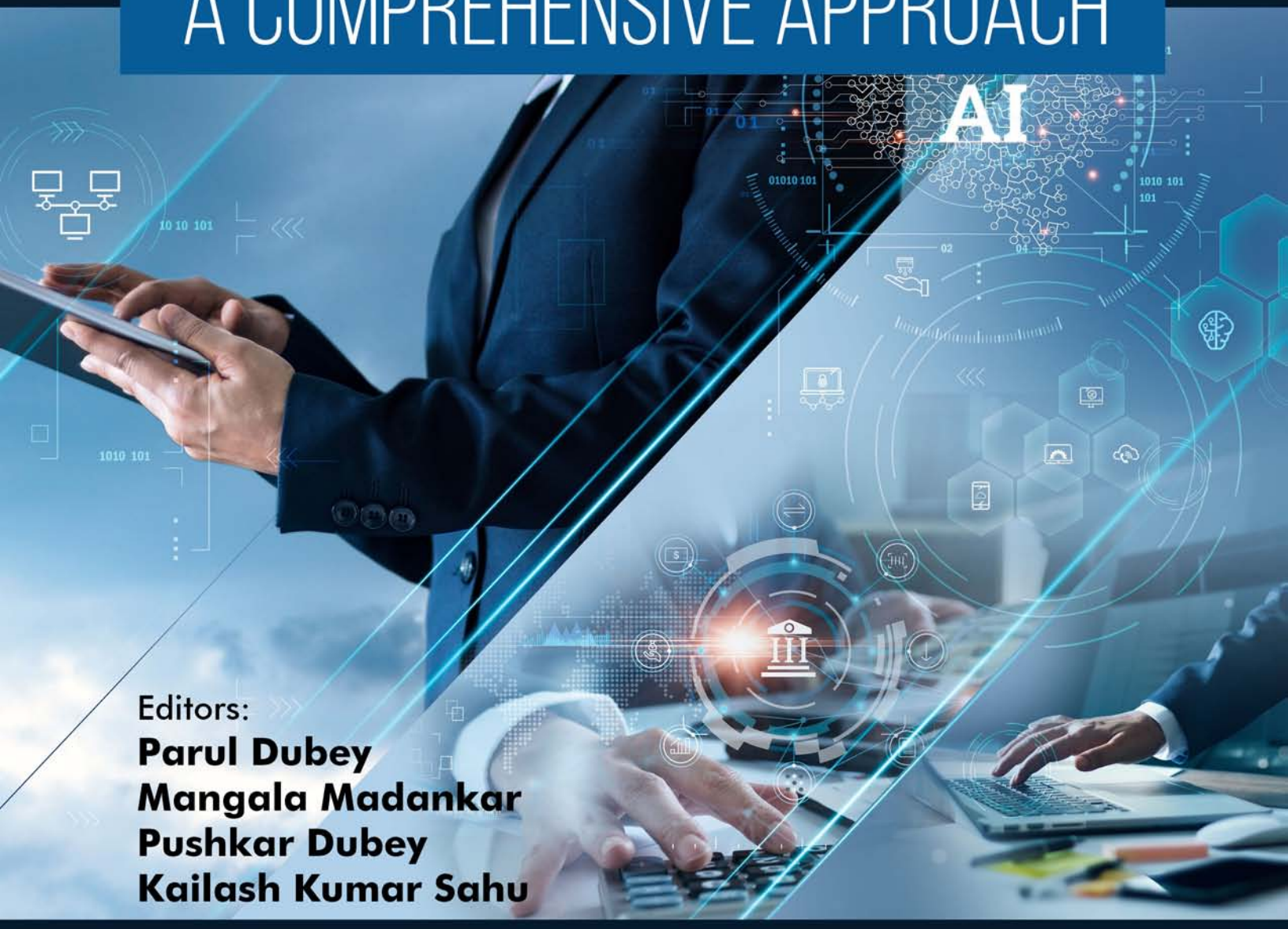
AI IN THE SOCIAL AND BUSINESS WORLD:

A COMPREHENSIVE APPROACH



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AI in the Social and Business World: A Comprehensive Approach

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CONTENTS

PREFACE

In this day and age of fast technological growth, the incorporation of Artificial Intelligence (AI) has emerged as a revolutionary force, dramatically influencing both the social fabric and the economic environment. "AI in the Social and Business World: A Comprehensive Approach" is an edited book that draws on the knowledge of a wide range of authors to give a nuanced and comprehensive examination of AI's multidimensional function.

This collaborative effort unfolds across 13 chapters, each authored by experts in their respective domains. Together, these chapters form a comprehensive tapestry that not only elucidates the theoretical foundations of AI but also delves into its practical applications across various sectors.

As editors, our intention is to present a holistic view of AI, addressing its societal implications and strategic relevance for businesses. The journey begins with an introduction to the historical evolution of AI, setting the stage for a deeper exploration into its impact on our social structures and cultural dynamics.

The subsequent chapters navigate the intricate terrain of AI in business, offering strategic insights, case studies, and a critical analysis of its integration. From enhancing customer experiences to reshaping human resources and marketing strategies, the chapters weave together a narrative that reflects the diverse and dynamic nature of AI applications.

We extend our gratitude to the contributing authors whose expertise and insights have enriched this collection. Their collective knowledge forms the backbone of this book, providing readers with a valuable resource for understanding the complexities and possibilities that AI brings to our social and business environments.

We urge you to explore the many viewpoints offered on these pages, whether you are a researcher, practitioner, or enthusiast interested in understanding the significant implications of AI. May this book serve as a guiding light in traversing the vast expanse of artificial intelligence, promoting intelligent debate and educated decision-making in the ever-changing world of technology.

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CHAPTER 1

The State of Artificial Intelligence Research and Development in the Present-Day Scenario

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Abstract: Artificial intelligence is a field of computer science that focuses on human-like intelligence in machines. Artificial intelligence is advancing in many areas to increase the efficiency, accuracy, and speed of the decision-making process. The chapters of this book provide a detailed overview of the AI journey and provide readers with insights to improve their knowledge of AI. The chapters also cover the evolution of artificial intelligence and the techniques used to create it. As artificial intelligence continues to evolve and integrate into our daily lives, the chapters of this book discuss the ethical and social implications of AI and the unpredictable growth and impact of artificial intelligence in society. This chapter also contains thoughts on the future of artificial intelligence, which has the potential to transform business, drive innovation, solve complex problems, and provide justice to social and governance issues in a better-explained way. Overall, this book chapter shapes one's mind with the entire concept of artificial intelligence.

Keywords: Artificial Intelligence, Computer science, Evolution, Human like intelligence, Machines.

INTRODUCTION

Artificial intelligence (AI) refers to the branch of computer science that centers on building clever machines that can perform tasks that regularly require human insights. AI develops and improves all areas of society, introducing new solutions, increasing productivity, and improving the overall quality of life. The current relevance of AI lies in its ability to solve complex problems, produce bits of knowledge from expansive volumes of information, and support human capabilities in many areas (Biersmith *et al.*, 2022). The rapid deployment of AI applications has led to increased scrutiny and monitoring in various sectors, including infrastructure,

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

consumer products, and home applications. Policymakers often lack the technical knowledge to assess the safety and effectiveness of emerging AI technologies. This work provides an overview of AI legislation, directives, professional standards, and technological society initiatives, serving as a resource for policymakers and stakeholders. Moreover, these chapters look into the future, that is, a future where artificial intelligence becomes an agent of change. They demonstrate the potential of AI to drive business transformation, take innovation to new heights, solve complex problems, and bring justice to competition and regulation. Every sentence and every chapters are tied together to show the complexity of intellectual skills and create a good understanding in the minds of the readers.

THE AI REVOLUTION

The origin of the AI revolution has infused machines with the intellectual ability to reflect the complexity of the human mind. As algorithms evolve from lines of code to virtual minds capable of understanding, learning, and thinking, the possibilities are expanding in surprising ways. This revolution has proved effective in various fields around the world. Fig. (**1**) shows the evolution of AI in various fields.

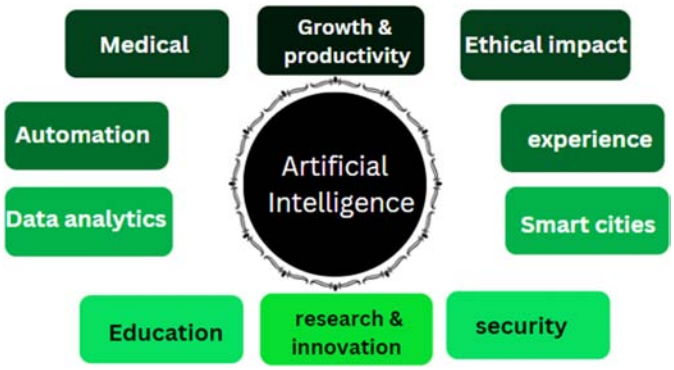

Fig. (1). The revolution of AI in various fields.

The above diagram shows the revolution of AI in various fields like medicine, education, research, and many more, as shown in the diagram.

Evolution of Artificial Intelligence

The development of artificial intelligence (AI) has been an exciting journey with major advances and breakthroughs (O'leary *et al.*, 1995). Understanding the history of AI applications from key conferences is important for several reasons; it provides insight into scientific and non-academic pioneers. This chapter is an

introduction to the history of artificial intelligence applications since the 1940s. Here is a summary of the important stages in the development of intelligence: Fig. (**2**) focuses on the roadmap of AI evolution.

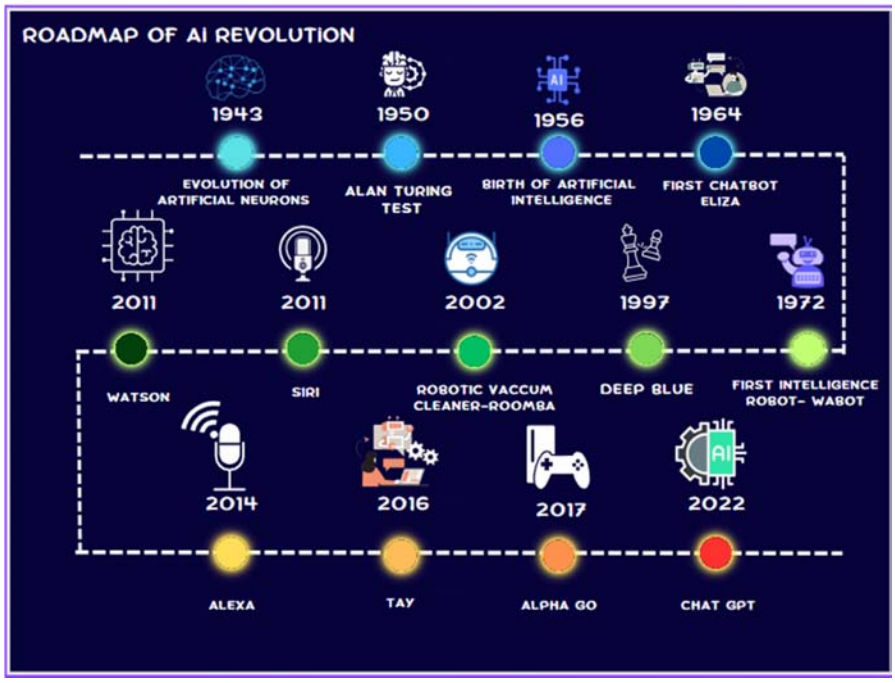

Fig. (2). Roadmap of AI evolution.

Beginning of AI (1940s-1950s)

Artificial Neurons

The Mcculloch-Pitts neuron is one of the earliest structures of the neural brain. Introduced by Warren Mcculloch and Walter Pitts in 1943, it is a binary threshold unit that functions as the main function of biological neurons. It takes binary input and produces binary output according to predefined thresholds.

Alan Turing Test

The Alan Turing test, proposed by the English mathematician and computer researcher Alan Turing in 1950, is a test planned to decide whether a machine shows shrewd behavior that is vague compared to that of a human. The main idea of the Turing test is that a person decides that they are communicating with a machine, and a person communicates with text.

CHAPTER 2

Social Welfare and Artificial Intelligence's Role: A Comprehensive Summary of the Study

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Abstract: AI is a strong instrument with the potential to transform social welfare systems and improve individuals' and communities' overall well-being. This research study examines the uses, advantages, ethical issues, and possible obstacles of artificial intelligence in social welfare in depth. The concept of social welfare and its fundamental objectives of promoting social justice, equality, and overall quality of life are explained in detail at the beginning of the paper. It then digs into the different ways in which artificial intelligence is being utilized to resolve complex social issues and improve social government performance. Eliminating poverty is one crucial area where AI has significant potential. By utilizing artificial intelligence innovations, for example, information examination, prescient display, and choice of emotionally supportive networks, state-run administrations, and associations can more readily grasp destitution elements, distinguish weak populations, and configure designated mediations to ease neediness and upgrade social versatility. Man-made intelligence likewise assumes a vital role in further developing medical care access and conveyance. AI-powered systems have the potential to revolutionize healthcare by enhancing diagnostic accuracy, lowering costs, and facilitating personalized and preventive care, all the way through to optimizing treatment plans and drug discovery. Training is another space where computer-based intelligence can have a groundbreaking effect. AI-based assessment tools, adaptive learning platforms, and intelligent tutoring systems can meet individual learning needs, make it easier to get a personalized education, and close educational gaps, making education more accessible and fairer to everyone. In addition, AI technologies aid in crime prediction and prevention, which contributes to public safety. AI algorithms can identify high-risk areas, detect suspicious activities, and enable proactive law enforcement strategies by analyzing vast amounts of data, such as crime patterns, social media feeds, and surveillance footage. This enables improved outcomes for public safety. While the advantages of man-made intelligence in friendly government assistance are critical, moral contemplations cannot be neglected. The transparency and accountability of AI systems, algorithmic bias, and privacy concerns are all examined in depth in this paper. It stresses the significance of developing and

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

implementing AI in a manner that upholds social values, fairness, and individual rights. In addition, the research paper discusses potential obstacles to applying AI to social welfare, such as the requirement of trustworthy data, digital infrastructure, and workforce upskilling.

Keywords: AI, Algorithmic predisposition, Customized training, Comprehensive society, Information examination, Medical care, Moral contemplations, Neediness easing, Prescient displaying, Public wellbeing, Simulated intelligence, Schooling.

INTRODUCTION

The introduction of artificial intelligence (AI) has resulted in substantial alterations across a wide range of fields, revolutionizing industries and redefining how people live and work. The 21st century (from 2000 to 2015) has seen an upward growth trend in the field of artificial intelligence (AI). With dramatic revolutions influenced by both ideas and methodologies, the evolution of AI has promoted the development of human society in our day and age [1, 9]. Social welfare is one of the areas where AI has a lot of potential. Social welfare includes attempts to promote people's and communities' well-being and quality of life by addressing social problems and ensuring equitable access to resources and services. Artificial intelligence in social welfare can change present approaches, enabling more efficient, targeted, and responsive treatments [2]. Data analytics, machine learning, and natural language processing are a few examples of AI technology that provide strong tools for analyzing large volumes of data, extracting insights, and making data-driven choices [3, 35]. Governments, organizations, and policymakers may use AI to optimize resource allocation, discover patterns and trends, and forecast results, resulting in more effective and focused social interventions. Furthermore, AI can automate mundane work, freeing up human resources to connect with beneficiaries in more personalized and meaningful ways. However, the integration of AI into social welfare also raises important ethical considerations. In order to secure the equitable and responsible application of AI systems, fundamental challenges, including algorithmic bias, data privacy and security, transparency, and accountability, must be addressed. Safeguarding individual rights, maintaining fairness, and avoiding unintended consequences are crucial aspects of AI-enabled social welfare. This chapter aims to examine the potential impact, benefits, ethical considerations, and challenges of AI in social welfare and provide a comprehensive overview. By researching AI applications in critical areas of social welfare like poverty alleviation, healthcare access, education, environmental sustainability, and public safety, we want to shed light on how AI may strengthen social welfare programs and promote inclusive and sustainable communities [10]. This chapter will look at case studies, best practices, and insights into the possible benefits and downsides

of AI in social welfare. We will investigate the extraordinary capability of simulated intelligence in upgrading administration conveyance, further developing dynamic cycles, and advancing fair results. In addition, we will discuss, while using AI, its ethical consequences and contributing variables, highlighting the significance of ethical frameworks, transparency, and stakeholder participation. Fig. (**1**) shows the application of AI in healthcare and traffic monitoring (Admin, 2022).

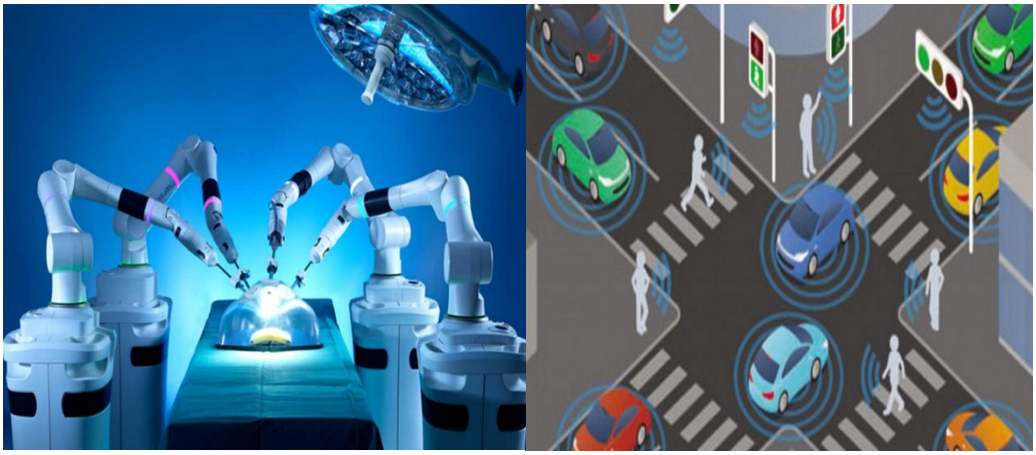

Fig. (1). Application of AI in healthcare and traffic monitoring (Admin, 2022).

In conclusion, the goal of this chapter is to add to the ongoing discussion about how AI affects social welfare. By breaking down its applications, benefits, and moral contemplations, we endeavor to give a complete comprehension of the capability of man-made intelligence to change social government assistance frameworks. Through efficient organization and a cautious route of difficulties, computer-based intelligence can possibly change social government assistance, guaranteeing that assets are distributed productively and impartially, and advancing the prosperity of people and networks.

Background on Social Welfare Programmes

Social welfare programs include a variety of activities aimed at tackling social difficulties, fostering social fairness, and safeguarding fundamental human rights. Poverty reduction, healthcare access, education, housing, social protection, and environmental sustainability are examples of such programs. They are intended to help disadvantaged populations by empowering people and communities to thrive and overcome socioeconomic hurdles.

CHAPTER 3

Application of Artificial Intelligence Techniques in Healthcare

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Abstract: The integration of Artificial Intelligence (AI) into healthcare promises improved medical evaluation, provided therapeutic solutions, and enhanced patient care. Various AI branches, including machine learning, deep learning, and computer vision, adeptly handle vast healthcare datasets ranging from electronic health records to wearable data. These techniques extract vital patterns, forecast early-stage diseases, and personalize patient treatments. In diagnostics, AI tools excel at identifying diseases and predicting patient outcomes by automating image readings and pinpointing health risks. AI also optimizes healthcare logistics, resource allocation, and overall patient care, reducing clerical tasks and promoting data-driven decisions. Yet, there are challenges. Concerns about data privacy, legislative compliance, ethics, and the need for transparent AI results are paramount. Addressing these is crucial for successful AI integration in healthcare. In essence, AI's integration into healthcare promises revolutionary diagnostic and therapeutic advances. Navigating the challenges requires collaboration between medical experts, AI specialists, lawmakers, and ethicists to fully realize AI's transformative potential.

Keywords: Artificial intelligence, Deep learning, Healthcare, Machine learning, Patient data.

INTRODUCTION

The fusion of artificial intelligence (AI) into the healthcare sector is reshaping its landscape in remarkable ways. At its core, AI is an offshoot of computer science

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

that is dedicated to crafting systems endowed with capabilities that traditionally warrant human intellect. The healthcare domain, brimming with copious patient data coupled with monumental strides in computational prowess and cutting-edge machine learning paradigms, is ripe for the integration of AI. Such an amalgamation has ushered in transformative applications spanning from the pinpointing of diseases, devising therapeutic strategies, and interpreting medical imagery to streamline overall healthcare administration [1].

AI's value in healthcare is anchored in its transformative capacity to refine medical protocols, bolster patient results, amplify operational proficiency, and catalyze novel advancements. AI methodologies excel at dissecting intricate health data, discerning underlying trends, and furnishing pivotal insights that bolster clinical determinations [2]. Harnessing the power of AI equips medical practitioners with precise and contemporaneous data, paving the way for sharper diagnostic accuracy, tailored therapeutic trajectories, and elevated standards of patient welfare.

The integration of AI in healthcare also addresses the challenges faced by the industry, such as the increasing burden on healthcare systems, rising healthcare costs, and the need for better resource allocation. AI-powered technologies, including predictive analytics, robotics, and virtual assistants, streamline workflows, automate routine tasks, and optimize resource utilization, ultimately contributing to a more efficient and sustainable healthcare ecosystem [3].

Furthermore, AI offers the potential for early disease detection, enabling timely interventions, and potentially saving lives. It opens new avenues for research and drug discovery by analyzing large datasets and identifying potential therapeutic targets. AI-driven wearable devices and remote monitoring systems empower patients to actively participate in their own care, facilitating preventive healthcare and chronic disease management [4].

Despite the tremendous opportunities AI presents, its implementation in healthcare comes with challenges. Ethical considerations, privacy concerns, data security, regulatory frameworks, and the need for collaboration between healthcare professionals and AI systems are crucial aspects that require careful attention [5].

Thus, this chapter endeavors to offer an exhaustive examination of AI's role in healthcare, delving into its merits, impediments, and prospective trajectories. Illuminating the historical context and importance of AI within healthcare, this segment primes readers to grasp the game-changing implications of AI in the medical sphere and its prospective boon for enhancing both patient results and the overall healthcare paradigm [6].

Objectives of the Chapter

• To provide a comprehensive understanding of the background and significance of artificial intelligence (AI) techniques in the healthcare industry [7].

• To explore the various applications of AI in healthcare, including disease diagnosis, medical imaging, personalized medicine, drug discovery, health monitoring, and healthcare data management [8].

• To examine the different AI techniques used in healthcare, such as machine learning, deep learning, natural language processing, computer vision, and robotics [9].

• To highlight the benefits and impact of AI in healthcare, including enhanced diagnostic accuracy, improved treatment planning, efficient healthcare management, and patient engagement [10].

• To discuss the challenges and ethical considerations associated with the integration of AI in healthcare, including data privacy, regulatory implications, and the adoption of AI in healthcare systems [11].

• To present case studies and success stories showcasing the practical application of AI in healthcare, particularly in areas like oncology, decision support systems, and remote patient monitoring [12].

• To provide insights into the future directions and emerging trends in AI applications in healthcare, including the potential of AI-enabled technologies and their impact on healthcare delivery [13].

• To offer a conclusion summarizing the key points discussed and highlighting the implications of AI in shaping the future of healthcare.

• By addressing these objectives, the chapter aims to provide a comprehensive overview of the application of AI techniques in healthcare, showcasing its transformative potential, benefits, challenges, and future directions [14].

OVERVIEW OF ARTIFICIAL INTELLIGENCE IN HEALTH CARE

Definition and Concept of Artificial Intelligence

Artificial intelligence (AI) refers to the field of computer science that focuses on the development of intelligent systems capable of performing tasks that typically

CHAPTER 4

Advancements in Remote Heart Monitoring: Wearable Technology and AI-based Approaches for Cardiovascular Disease Detection

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Abstract: In the era of precision medicine and individualized approaches, remote monitoring and control of heart function have emerged as critical components of patient evaluation and management. The integration of consumer-grade software and hardware devices for health monitoring has gained popularity as technological advancements become increasingly integrated into daily life. The cardiology community must adapt to the demands of distant and decentralized care, as highlighted during the COVID-19 pandemic. Wearable technology, such as vital sign monitors, holds significant potential for monitoring heart disease and associated risk factors. This book chapter explores the expanding applications of wearable technology in cardiology, focusing on examples such as Holter-event recording and electrocardiogram (ECG) patches. Textile-based sensors and wristbands are implemented across various patient groups, emphasizing real-time deployment and the evolving role of wearables in arrhythmia, cardiovascular disorders, and associated risk factors. The importance of conducting clinical trials and using proper terminology for clinical validation is also highlighted. To enhance the accuracy and efficiency of ECG signal analysis, this chapter proposes a novel approach that combines AI-based unsupervised Long Short-Term Memory (LSTM) with a recursive-based Ensemble Neural Network (ENN). The LSTM component effectively denoises raw ECG signals and enables faster convergence. The ENN, with its built-in deep layers, provides an improved classification of cardiovascular diseases (CVD) present in the input ECG data. The recursive approach employed by the ENN efficiently utilizes the available parameters, even in the presence of noisy labels. The proposed method demonstrates enhanced prediction and classification of CVD, with high precision, recall, and F1 score. The objective is to derive a checkpoint between clinical and research potentials, identify gaps, and address potential risks associated with CVD detection using ECG measurements. By leveraging wearable technology and advanced AI techniques, clinicians and researchers can benefit from improved diagnostic accuracy, remote

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patient monitoring, and personalized care. The insights gained from this chapter will contribute to the ongoing advancements in remote heart monitoring and facilitate the adoption of innovative approaches in cardiovascular disease management.

Keywords: Artificial intelligence, Big data-mining, Cardiovascular disease, Electrocardiogram, Internet of Things (IoT), Long Short-Term Memory, Medical signal processing, Recurrent Neural Network, Remote health monitoring, Wearable technology.

INTRODUCTION

Cardiovascular disease (CVD) has remained the leading cause of mortality worldwide for several decades, despite significant advancements in modern medicine. Prevalent types of CVD in India include coronary artery disease and ST-elevated myocardial infarction (STeMI), which are characterized by rapid disease progression and high mortality rates. The prevalence of this disease is nearly twice as high in the rural population compared to the urban population. Moreover, patients with acute STeMI who have previously contracted COVID-19 are experiencing significantly higher mortality rates, which is a concerning trend.

The electrocardiogram (ECG) is a very old and commonly known technique that is used for monitoring heart rhythm and obtaining related information. Annually, approximately 0.3 billion ECGs are recorded, with a significant portion existing after interpreting computer-based analysis of ECG signals. The literature in the past discussed different de-noising methods involving digital filters to realize noise-free ECG signals for efficient cardiac risk analysis [1]. However, classical algorithms, which have traditionally focused on diagnosing PQ, RR, and QT interval indicators, may have limitations in differentiating between various indications.

Diagnosing cardiac anomalies from ECG signals manually is more difficult, even for an experienced cardiologist, and also becomes inefficient. The huge amount of electronic health records necessitates the interpretation of digital devices and processing for complex tasks. Artificial intelligence (AI) enables more precise and robust handling of this data, which can mimic decision-making like humans in medicine and healthcare systems, facilitating diagnostics and treatment. The handling of medical big data mining, pattern recognition, and classification tools in accordance with clinicians' guidance is considered a remarkable achievement in medicine. While deploying AI algorithms has shows significant growth in medical imaging, medical signal processing still presents significant challenges.

Unsupervised learning networks involve discovering unknown patterns or details present in the data, whereas supervised learning includes predicting or classifying

labeled output data. The discovery of unknown patterns in human and animal studies supports the application of unsupervised learning. AI-based ECG analysis can enhance clinicians' efficacy by accurately distinguishing between abnormal and normal signals, considering every minute detail. Machine and deep learning models of AI can efficiently predict cardiac defects based on previously stored datasets. A clinical study of a single-lead ECG signal with a powerful DL algorithm has shown performance outcomes equivalent to those of cardiologists [2]. End-to-end evaluation and classification of ECG signals using deep neural network algorithms proved to be powerful in achieving high accuracy and scalability. Establishing transparency in humans understanding of computer intelligence still happens to be a significant challenge. Existing prediction model approaches require a fair and unbiased evaluation, which is essential [3]. The application of AI-oriented algorithms to ECG signals has started to gain traction and could potentially bridge the gap between engineering and medical techniques going forward.

A combination of unsupervised long short-term memory (LSTM) and recursive-based ensemble neural networks (ENN) has been proposed for self-training from the raw input ECG signals. LSTM provides a powerful denoising effect and enables faster convergence on raw ECG signals. ENN with built-in deep layers achieves better classification of CVD present in the input ECG data. The recursive approach to ENN efficiently utilizes the parameters present in the data, even amidst noisy labels. Additionally, better prediction and classification of CVD can be achieved through high precision, recall, and F1 scores. The proposed project sheds light on the application of artificial intelligence in ECG analysis and its importance. The objective of the chapter is to analyze the clinical risks, research solutions, hazards, and challenges encountered during CVD detection from ECG signals.

ST-Elevated Myocardial Infarction (STEMI)

The physiological parameters include monitoring of blood pressure, heart rate, irregular rhythm (arrhythmia), and more commonly, atrial fibrillation. However, the identification of acute coronary syndrome and STeMI (commonly referred to as a heart attack) is not feasible with the available wearable commercial devices. Timely and accurate diagnosis of these diseases is important to prevent fatal moments, initiate speedy treatment, and further the prognosis of the disease. Big data handling, medical image or signal pattern identification, segmentation, and classification have recorded tremendous development in the medical world. Introducing a single-channel smart wristband based on an artificial intelligence model can revolutionize medicine and healthcare systems for the diagnosis of coronary heart diseases.

CHAPTER 5

Signs Unveiled: The Power and Promise of AI-Based Sign Recognition Systems

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Abstract: Artificial intelligence (AI) has revolutionized the field of sign recognition, enabling machines to accurately interpret and respond to signs, symbols, and gestures. This chapter explores the dynamic landscape of AI-based sign recognition systems, unveiling their components, functionalities, applications, and advantages over traditional methods. By leveraging machine learning and computer vision, these systems offer remarkable accuracy, adaptability, and real-time responsiveness. Their impact extends across social and business domains, enhancing inclusivity for the hearing impaired, enabling cross-cultural communication, and transforming industries such as transportation and healthcare. Challenges and ethical considerations are also addressed. The future trajectory of AI-based sign recognition promises a world where machines seamlessly bridge the gap between human communication and technological innovation.

Keywords: AI-Based Sign Recognition Systems, Communication, Computer Vision, Inclusivity, Innovation, Machine Learning.

INTRODUCTION

In the realm of technological innovation, few advancements have been as remarkable and transformative as artificial intelligence (AI). Among the myriad applications that AI has ushered in, the development of AI-based sign recognition systems stands out as a testament to the integration of cutting-edge technologies with everyday communication and interaction. These systems leverage the capabilities of machine learning and computer vision to unravel the language of

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

signs, symbols, and gestures—a language deeply woven into human communication and interaction.

From the towering road signs that guide our journeys to the subtlest of facial expressions that convey emotions, signs are integral to how we navigate, understand, and interact with the world around us. They provide instantaneous communication, transcending linguistic barriers and enabling us to process complex information with ease. The marriage of AI and sign recognition extends this capability beyond the human realm, endowing machines with the ability to interpret and respond to signs just as humans do.

This chapter delves into the heart of AI-based sign recognition systems, exploring their components, functionalities, applications, and the challenges they surmount. We will embark on a journey through the intricate landscapes of computer vision models, machine learning algorithms, and real-time processing, uncovering the synergy between technology and human-machine interaction. Moreover, we will navigate the diverse domains where these systems play a pivotal role, from revolutionizing autonomous vehicles to enhancing accessibility for individuals with disabilities.

As we delve into the depths of this chapter, we will unravel the inner workings of AI-based sign recognition systems and their potential to reshape the way we communicate with and through technology. From the bustling streets to the quiet corners of healthcare, these systems are making their mark, promising a future where understanding signs goes beyond the realm of human capability, enriching our lives with newfound dimensions of efficiency, accessibility, and safety.

LITERATURE REVIEW

The impact of various hardware problems on the precision of AI applications must be well understood. In one publication, we present our novel fault injection framework for TensorFlow and the first results of our trials with a traffic sign classifier built using a Convolutional Neural Network (CNN) [1]. These findings support the viability of the fault injection architecture. In particular, they are useful for determining which aspects of a tested neural network are of the utmost importance.

Due to limitations in current sign recognition technology, users may need to filter through a long list of possibilities before finding the correct one. Researchers [2] provide a hybrid search technique to speed up this search, where users start with a video-based query and then filter the search results by linguistic factors like handshape. The authors surveyed 32 ASL students on their ideal search results page, including the content, appearance, and filtering options. Twenty American

Sign Language (ASL) students participated in a between-subjects experiment, in which their hybrid search system outperformed a video-based search system on a variety of satisfaction and performance metrics. Their research has implications for the development of future video-based sign-language dictionary search systems, among other applications.

To account for the impact of training resources in recognition performance, researchers [3] produced numerous versions of their sign recognition system by incrementally increasing the number of training photographs. Under both favorable (clear and bright) and inclement circumstances, the highly trained system showed decreased susceptibility to sign recognition (cloudy and snowy). The proposed method is more likely to miss older engineering-grade sheeting signs at night due to a study that takes into consideration numerous reflectivity characteristics such as sheeting type, lighting circumstances, and signage. The purpose of this study was to develop a novel sign recognition system using automated object identification technology in order to evaluate its viability, limitations, and prospects for application in conjunction with other forms of advanced driver assistance.

Another study [4] uses public datasets from the Chinese traffic sign research database (TSRD) and the Mapillary image database to provide a novel approach to picture identification based on a 3D color-texture based feature. An artificial neural network and other machine learning approaches, like image identification classifiers, are used to evaluate the use of a 3D color texture feature for traffic sign recognition. Both of the datasets we used in this study are widely considered to be the most comprehensive collections of traffic sign annotations ever assembled. Datasets of images are now freely available to researchers in the academic community. For example, on the Chinese TSRD and Mapillary datasets, the results obtained by using a back-propagation neural network (NN) classifier are superior to those obtained by using any of the other ML techniques, while the results obtained by using a support vector machine (SVM) cubic are superior to those obtained using any of the other ML techniques. For image classification of traffic signs on the Mapillary dataset, rational quadratic Gaussian process regression achieves the best results. The results were also compared to similar creative initiatives from other institutions. Research that compared the new method to previous ones on both datasets found that it was superior. The results of the research demonstrate that the proposed combined 3D color-texture feature-based approach significantly enhances the performance of image recognition.

CHAPTER 6

Traffic Sign Detection and Recognition Using Convolutional Neural Networks

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Abstract: The advent of technology has brought about seismic shifts in our lives. It is hard to imagine the world without the very technology that was considered groundbreaking a while back, such as smartphones, the internet, *etc.* One such field that has seen a tremendous rise in recent years is the field of artificial intelligence, along with computer vision. Object detection and recognition is, and will continue to be, one of the most important fields of research in the coming years due to our ever-increasing demand for various technologies to substitute for the human eye. Traffic sign detection and recognition is an important subset of this, having far-reaching real-world benefits. Various methods and algorithms have been proposed to achieve this in the past few years, with more novel technologies improving upon the previous works. The emergence of advanced driving assistance systems (ADAS), used for driving assistance, has led to many companies testing various systems on their novel car models for better accuracy and reliability. There is still some way to go until object recognition algorithms are deployed on these ADAS systems worldwide. One such important part of this system is traffic sign detection and recognition. This work proposes one such traffic sign recognition method. The proposed system is implemented in two processes, namely detection and recognition. The former is implemented using the You Only Look Once (YOLO) detection algorithm, which performs grid classification on the image to predict the bounded boxes. This is followed by finding the probability of a particular object's presence in a particular grid. For the latter process, a 4-layer CNN model is deployed to classify the object into 43 separate classes. The model is trained using the German traffic sign benchmark dataset. Upon testing with other standard models such as VGGNet and ResNet-50, the proposed model was found to be more accurate. Real-time implementation of the proposed model gives a training accuracy of 99.51%, while the testing accuracy is found to be 97.13%.

Keywords: Convolutional Neural Network, ResNet50, Traffic Sign Detection, VGG19, You Only Look Once (YOLO).

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

INTRODUCTION

Recent developments and innovations in technology have increased the automation of a lot of day-to-day tasks. One of the major fields where automation is advancing rapidly is the field of self-driving cars.

Computer vision plays an important role in the operation of self-driving cars. Cameras and sensors attached to self-driving cars can accurately determine how the car is to be maneuvered while on the road. For this purpose, the software techniques used are to be robust, and thus the predictive models are made to be highly accurate. One such model is used for traffic sign detection. This helps in determining many factors, such as speed limits, turn signs, and special roads for the car.

Extracting features from the image and comparing them with standard data are found to be inefficient in getting maximum results in the stipulated time in real-time implementations. Color space thresholding [3] could be offset by a change in hue due to flashlights, sunlight, or other factors. Spatial feature extraction also comes with the caveat of less accuracy, as many real-world factors affect the model's ability to accurately predict spatial features. CNNs have thus been found to be an efficient tool for object recognition problems. Other state-of-the-art object recognition models generally used are ResNet50 and VGGNet, which give varying degrees of accuracy. The accuracy of the models depends on various factors, such as the datasets used for training and testing and the number of neural network layers used in the model. Considering all the above factors, a novel method is proposed to achieve an efficient model with higher accuracy than the standard object detection and recognition models. The motivation behind this work is to develop a model that can accurately detect traffic signs in various conditions. This will help reduce traffic-related problems such as accidents, overspeeding, and traffic jams by reducing human errors while driving cars and other motor vehicles. It will also reduce the number of accidents with pedestrians, as the model will be able to detect pedestrian crossings and react accordingly.

The work is divided into two parts, namely detection and recognition.

1. A "You Only Look Once" (YOLO) standard algorithm is used for the object detection part, which isolates the region of interest from the entire frame.

2. Recognition is done using a 4-layer CNN model.

3. A 3-layer CNN, VGG16, and ResNet50 models are used as points of comparison.

RELATED WORK

Traffic sign recognition and detection through image processing, thresholding, and color-shape detection are very popular and common nowadays. Cao *et al*. [3] used a two-front model, achieving the detection part by using the HSV color space for spatial threshold segmentation, thus detecting the traffic signs by their spatial features. Finally, the classical LeNet-5 convolutional neural network is used to improve the model. This work was based on the German Traffic Sign Recognition Benchmark, which achieved 99.75% accuracy with an average processing time per frame of 5.4 ms. Vennelakanti *et al*. [6] worked on an ensemble of convolutional neural networks (CNN) for the recognition of the traffic sign. They have used Belgium and German data sets to achieve an effective accuracy of over 99%, but this accuracy is limited for circular signs. TensorFlow is used for the implementation of CNN.

Shi *et al*. [8] proposed a novel model using image processing, bilateral Chinese transform, and vertex and bisector transform techniques. Feature vectors are formed using the histogram of gradients (HOG), which is followed by a support vector machine (SVM) to detect the traffic sign. The bilateral Chinese transform, vertex transform, and bisector transform are used to isolate the area of the traffic sign from the image. Final recognition is again performed by a neural network. Another novel work was achieved by Kamal *et al*. [9], wherein the two segmentation techniques, SegNet and U-Net, are merged to form a new network called SegU-Net to detect traffic signs from video sequences. The Tversky loss function is used for training the model, which is constrained by an L1 term. In contrast with the other works, the CURE-TSD dataset is used for their training model to achieve precision and recall of 94.60% and 80.21%, respectively. Testing is done on the German dataset benchmark, achieving precision and recall of 95.29% and 89.01%, respectively.

Most works have been based on the process of isolating the region of interest from the input image, followed by processing and recognition of the said image to give the required outputs. Abedin *et al*. [10] worked on the fuzzy rules-based color segmentation method for the detection of traffic signs, followed by speeded-up robust features (SURF) descriptor-based recognition, using an artificial neural network (ANN) classifier. They also separated the region of interest from the main image to detect the sign, followed by the recognition step using an artificial neural network (ANN). Rahmad *et al*. [11] used HSV and Gabor wavelets for the extraction of features from traffic signs, where HSV is used to obtain a region of interest image from the entire existing image, while the Gabor wavelet identified the types of signs detected. An accuracy of 93.33% is achieved using the Gabor Wavelet bank of 5 scales and 8 orientations.

CHAPTER 7

Unlocking Business Insights: Leveraging the Synergy of Business Intelligence and Artifical Intelligence for Effective Data Analytics

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Abstract: Nowadays, the market is full of a variety of products for a single item, which makes it very difficult for customers to choose which product is best for them according to their price range. At the same time, it also creates a huge problem for manufacturers and business people to sell their products in this market, with a variety of customers who have different needs and expectations from the products they purchase. One of the most important factors in selling a product is its price and standard, which determine its sales and demand in the market. So, it is most important to sell the product as per the customer's needs and also at a price so that they can afford it. As there is a rapid evolution of technology, it is being used by other sectors to make a profit and also to understand market needs and their performance in the market. So, it is also very necessary to implement the technology in this sector, as it deals with a huge number of customers and is very important for the businessperson to make a huge amount of profit. A business intelligence tool is used, and its purpose is to analyze the market. It collects complete information about a product in a huge quantity, which helps it predict future results more accurately. By applying this tool in business, it predicts the future sale of the product in the market, and if they decide to come up with a new product in the market, what should be the selling price they need to fix for its sale, and how can they increase the demand for that product in the market? One of the biggest advantages of using this tool is that it also predicts the performance of the manufacturer in the market and the different areas they should focus on to improve their productivity. This concludes that using business intelligence in business solves many problems for the manufacturer, starting from analyzing the market to understanding the needs and expectations of the customers. Not only does it help businesses, but it also helps customers so that they can purchase the product that meets their expectations.

Keywords: Business, Business Intelligence, Customer, Manufacturer, Market, Technology.

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

INTRODUCTION

Artificial intelligence and business intelligence are two important technologies that revolutionize the way businesses work and make decisions. Artificial intelligence is primarily concerned with the development of intelligent computers that learn from experience and perform activities that would normally require human-level intelligence. BI, on the other hand, requires the use of tools and analytics to collect, analyze, and transform data into actionable insights. The convergence of AI and BI is becoming increasingly important as companies seek to harness the value of large volumes of data. AI-powered BI solutions can help businesses analyze and understand large volumes of data faster and more efficiently than humans. Improving decision-making, detecting fraud, increasing operational efficiency, and improving the customer experience are among the ways AI and artificial intelligence are transforming the enterprise sector.

Artificial Intelligence

In this era of artificial intelligence, humanity is progressively relying on technology [1]. Artificial intelligence (AI) is swiftly reshaping the entire business landscape. AI denotes the capacity of computers and machines to perform tasks typically requiring human intellect, encompassing functions like natural language processing, problem-solving, decision-making, and image and speech recognition. AI holds the potential to revolutionize various sectors, ranging from healthcare and finance to transportation and entertainment. Evidently, AI exerts a substantial and far-reaching influence on organizational operations and choices. AI has the potential to revolutionize both organizations and industries by facilitating data-driven decision-making and automating repetitive tasks, thus enhancing efficiency, fostering innovation, and increasing customer satisfaction [2]. Multiple approaches exist for developing AI technology, including rule-based systems, machine learning, and deep learning, each with its own strengths and weaknesses, depending on the specific problem at hand. As AI technology advances, there is a growing imperative for ethical guidelines and regulations to ensure responsible AI usage, addressing issues such as data privacy, bias, fairness, and accountability. The ultimate aim is to harness AI technologies for the betterment of society while minimizing potential harm. A recent survey by the MIT Sloan Management Review revealed that over 80% of organizations view AI as a strategic opportunity, with nearly 85% recognizing AI as a means to gain a competitive edge [3]. Fig. (**1**) shows the different primary types of artificial intelligence.

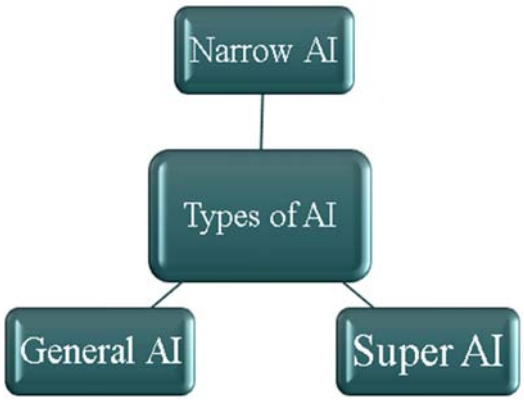

Fig. (1). Shows the three types of Artificial Intelligence (AI).

There are primarily three types of AI - Reactive or Narrow AI, General AI, and Super AI.

Reactive or Narrow AI

Reactive AI, or narrow AI, is designed to perform a specific task and does not have intelligence beyond its programmed task. Some common examples of reactive AI include speech recognition, image recognition, and autonomous vehicles.

For Example: chatbots, search engines, autonomous vehicles.

General AI

General AI can perform a variety of tasks similar to those performed by humans. It can think, reason, and make decisions like humans. However, this technology has yet to be developed and widely used.

For Example: cognitive computing, personal assistants, robotics.

Super AI

Super AI refers to an exceedingly sophisticated artificial intelligence that outstrips human intelligence. It represents a theoretical concept of AI with the capability to execute any cognitive task within human capacity. The development of such AI is still pending, and it sparks extensive discussions concerning its safety and ethical ramifications.

For Example: Sophia, Watson, Deep Mind.

CHAPTER 8

Multi-Agent Trading System Using Artificial Intelligence

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Abstract: Multi-agent systems are concerned with decision-making tasks where multiple agents act in a shared environment. Agents can observe their environment (partially or fully), act to impact the environment, and might have different or aligned goals. Multi-Agent Systems Artificial Intelligence (MAAI) is used for simulating end-user requirements. The models designed are examples of the use of AI in the business world.

The concept of reinforcement learning can be applied to stock price prediction for a specific stock, working in an agent-based system to predict higher returns based on the current environment. The agent's reward will be either profit or loss. A multi-agent system will use three types of agents: agent 1 (forecasting agent using a basic machine learning algorithm), agent 2 (judgmental agent; the background algorithms to work on it are reinforcement learning or fuzzy neural networks), and agent 3 (based on simple trading rules or neural networks). Alert Agent (AA) guarantees proficient conveying inside the schema. Signals are one of the alerts. The alert agent sends the foundation agents (Agent 1, Agent 2, and Agent 3) signals (verdict) delivered by the superior agent. Depending on these verdicts, the superior policies are understood to be presented to the users (traders). Depending on the verdict by Superior, investment risk can be minimized. The multi-agent framework verdict is combined with sentiment collected from finance news for a particular company. The cognizant behavior of agents in the stock market is also considered future research work for this framework. AI-based stock trading systems must be strengthened in the future with the use of various security measures.

Keywords: AI, Multi-agent systems, MAAI, Reinforcement Learning, Stock Market, Trading.

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

INTRODUCTION

Smart agents are applications designed with code that perform instead of humanoid or additional schemes to implement difficult tasks, such as tracing, retrieving facts from various sources, resolving discrepancies, clarifying inappropriate facts, and blending facts from varied sources.

These applications are able to perform tedious tasks, make users ready for forthcoming happenings or structural fluctuations, collect and review multifaceted possibilities, and acquire knowledge based on earlier performance. They also provide preferences in the form of replacement options for the same problem. Some of the key points in multi-agent systems are:

• A multi-agent system approach is natural for stock market monitoring because the multiple control threads in a complex model are a natural match for the distributed and ever-changing nature of the underlying sources of data and news that affect the higher-level decision-making process.

• A multi-agent system can more easily manage the detection and response to important time-critical facts that could appear suddenly at any of a large number of different sources.

• A multi-agent system provides a natural mapping of the multiple types of expertise for the management of decision-making.

• This system can be called a medial-layer application amongst the request side of facts (clients that are stockholders) and the resource side of facts (information available on the World Wide Web).

The parts of multi-agent system for stock market analysis include:

1. **Stock information retrieval** — a basic required data provisioning function.

2. **Old Transaction information** — like four prices (open, high, low, current), volume for given company on particular date.

3. Various graphical charts.

4. Highest and lowest trading companies. Ascending and descending earnings.

Related Work

Recent research on multi-agent based stock market uses artificial stock traders. Artificial neural networks (ANNs), grow by means of discrete and social learning

to trade profitably. The artificial traders [1] demonstrate stable and satisfactory learning abilities during the simulation regardless of the different types of stocks.

Multi-agent framework named Bat-Neural Network Multi-Agent System (BNNMAS) is used to forecast [2] stock price. The model has a four-layer multi-agent framework to predict approximately eight years of DAX stock price. BNNMAS is considered as an appropriate model for predicting stock price for long period. PSSPAM [3] is a platform for stock market simulation with the parallel agent-based modelling. A communication system is designed for interaction between agents and the stock market.

MASST system architecture, provisions dynamic data and information interchange between the agents [4]. MASST uses an active blackboard as a communication medium to simplify data, rule, and command interchange between agents. This is an example of AI-based distributed problem-solving using agent methodology.

Petri nets are used for system modeling and simulation, whereas for validation [5], which is completed with process mining, the processes are classified as concurrent and not isolated. The process execution processes are dependent on each other, like buying and selling stocks.

The activities of agents are exhibited [6] by using genetic programming to present a blend of social and individual learning. Agents are classified as rational or irrational. A rational agent has a knowledge base such as real-time series data. An irrational agent uses social learning and interdependent rules based on the cognizant behavior of the stock market. It uses a pool of decision-based rules.

The trading strategy in the agent-based structure is designed to avoid risky investment decisions. The system is named A-Trader [7], where predictions are accurate based on online trading, dynamic changing scenarios, and the robustness of market capital. Heterogeneous agents—almost 2,000 agents—trade amongst each other on an artificial stock market. The agents use double auction trading. The agents design or evolve new agents with a better strategy, taking the best-performing agent's behavior and replacing the worst-performing strategy with a genetic programming approach.

Framework Diagram

Defining the Agent

The software application acting as an agent notices the facts; thereafter, a model is generated, with input as the initial state and output as various policies depending

CHAPTER 9

Neural Network Models for Feature Extraction and Empirical Thresholding

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Abstract: Neural Network Models for Feature Extraction and Empirical Thresholding study the combination of neural network models and empirical thresholding methods to improve the procedure for extracting features. For researchers and practitioners working in the fields of feature extraction and machine learning, it illustrates the advantages, approaches, and difficulties connected with this integration and offers helpful insights. The basic concepts of feature extraction are covered in this book chapter, along with an overview of the several neural network models that can be used to accomplish this task, such as auto-encoders, convolutional neural networks (CNNs), and recurrent neural networks (RNNs). This book chapter emphasizes the benefits, methodologies, and challenges associated with this integration, providing valuable insights for researchers and practitioners in the fields of feature extraction and machine learning. This book chapter is useful for statistical analysis, domain expertise-driven threshold selection, and validation metrics-based threshold choice as efficient techniques for enhancing feature quality and lowering noise.

Keywords: Autoencoders, Convolutional neural networks (CNNs), Data pre-processing, Empirical thresholding, Recurrent neural networks (RNNs).

INTRODUCTION

This chapter "Neural Network Models for Feature Extraction and Empirical Thresholding" is an in-depth examination of the techniques, approaches, and applications of neural networks [1] designed specifically for feature extraction and empirical thresholding. The capacity to extract relevant and meaningful features from raw data is critical for solving complicated issues and producing high-performance solutions in the fields of artificial intelligence and machine learning. Feature extraction acts as a link between raw data and effective decision-making, allowing neural networks to gather and exploit the most important data for a variety of applications [1].

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

An Overview of Empirical Thresholding Strategies

Empirical thresholding strategies are data-driven methodologies for determining optimal thresholds for feature extraction and decision-making. These tactics use observed patterns and statistics in the data to create acceptable thresholds. Here's a rundown of several common empirical thresholding strategies:

Statistical Thresholding

To determine thresholds, statistical measurements such as mean, median, or standard deviation are used. Statistical thresholding approaches that are regularly utilized include:

Global Thresholding

A fixed threshold is established based on a statistical measure derived from the entire dataset. Pixels or features that exceed the threshold are classified as belonging to one class, while those that fall below the threshold are labeled as belonging to another.

Adaptive Thresholding

The statistical features of different regions or subgroups within the dataset may vary. Adaptive thresholding approaches dynamically alter the threshold based on local statistics, allowing for more accurate feature extraction over many locations.

Clustering-Based Thresholding

Clustering-based thresholding approaches involve splitting the data into distinct clusters and calculating thresholds based on the cluster characteristics. These strategies are especially beneficial when the data contains numerous classes or the feature distribution is not well defined. Some clustering-based thresholding algorithms are as follows:

K-means Clustering

The K-means technique is used to divide the data into K clusters. Thresholds can be defined based on the borders between these clusters, allowing for class separation.

Gaussian Mixture Models (GMM)

GMMs depict the data distribution as a collection of Gaussian components. Thresholds can be established based on Gaussian mixture model characteristics such as means and variances to differentiate various classes.

Adaptive Thresholding

Adaptive thresholding approaches try to modify thresholds dynamically based on the features of the data or specific regions of interest. When working with non-uniform or dynamic data, these strategies are especially beneficial. Adaptive thresholding approaches include the following:

Otsu's Approach

By maximizing the inter-class variation of pixel intensities, Otsu's approach determines an appropriate threshold. It automatically selects the appropriate threshold for distinguishing between foreground and background classes.

Local Adaptive Thresholding

Rather than employing a single global threshold, local adaptive thresholding separates the image into smaller sections and adjusts thresholds for each region separately based on local statistics. This enables more accurate feature extraction in situations with variable light or contrast.

INTRODUCTION TO FEATURE EXTRACTION IN NEURAL NETWORKS

Feature extraction is critical to neural network performance because it converts raw input data into useful and representative feature representations. The process of detecting and selecting significant characteristics from input data that are most helpful for the job at hand is referred to as feature extraction in the context of Artificial Intelligence and machine learning. These collected features form the basis of neural network decision-making and pattern recognition. In the context of artificial intelligence and machine learning, the process of identifying and selecting significant qualities from input data that are most beneficial for the task at hand is referred to as feature extraction. The neural network's decision-making and pattern-recognition processes are built on these gathered features.

The evolution of feature extraction has been driven by neural networks' capacity to learn intricate patterns and representations. Instead of relying on manually created features, neural networks may automatically learn and extract discriminative features from raw data, doing away with the need for feature engineering. This makes it easier for neural networks to successfully process high-dimensional, unstructured, and raw input data, including images, audio, and text [2].

Many processes are frequently involved in feature extraction in neural networks. Raw input data must first undergo preprocessing, which may include techniques

CHAPTER 10

Comparing Different Machine Learning Techniques for Detecting Phishing Websites

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Abstract: Phishing site URLs are designed to gather confidential data such as user identities, passwords, and transactions involving online money. Phishing strategies have begun to advance quickly as technology advances; this could be avoided by using anti-phishing tools to identify phishing. Employing machine learning techniques to identify fraudulent websites was previously suggested and put into practice. This project's primary goal is to develop the system in a way that is highly efficient, accurate, and economical. Delivered to the system, the dataset of genuine and phishing URLs is pre-processed to put the data in a format that can be used for analysis. Each category has unique, defined phishing features against a dataset of real and fake URLs. We evaluated the classifier's performance using a different test set after training it and its values. A classifier has been created for phishing websites and tested for effectiveness with a set of labeled phishing and legal URLs. When compared to seven different classifiers of machine learning, the proposed model scored the greatest test accuracy of up to 97.5% with the Gradient Boosting Classifier.

Keywords: Classifier, Image Processing, Machine Learning, Phishing, Pre-processing, URL.

INTRODUCTION

Along with the online security of regular users, social engineering assaults continue to be among the strongest and most significant threats to an organization's total cyber security posture [1]. While the Internet has given many people incredible convenience in handling their money and assets, it also gives criminals the ability to commit large-scale fraud at little cost. Contrary to hardware and software systems, where obstacles to technological compromise have greatly grown, fraudsters can control users instead of such systems. One of the most common types of online fraud is phishing. It focuses on the theft of private data, including credit card numbers and passwords [2].

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Phishing is an attempt to obtain personal data about a target, so it is important to find tools that can assist people, especially security analysts, in handling these kinds of attacks [3].

Attackers also learn more about the people who will be the targets of their emails. These efforts are known as spear-phishing attacks, and the data collected on victims is either made available to the public or obtained through social engineering [4]. Anti-phishing strategies are necessary to reduce the phishing problem. Solutions that aid in identifying and preventing phishing attacks must exist. Anti-phishing strategies need to be more effective.

Recent phishing research has concentrated on domain features like website content, integrating website URLs and content, website source code, and website screenshots [5]. An organization needs strong anti-phishing software that can spot malicious URLs in order to protect its users. If harmful code is placed onto the website, hackers might steal user information and spread viruses, posing a serious risk to website security and user privacy. Malicious URLs on the Internet can be easily and quickly found by using machine learning (ML) techniques [6]. The standard approach of URL detection is based on a blacklist, which is a list of unsafe URLs gathered through user reports or professional opinions.

There are certain methods that use real-time client-side evaluation against the content or behavior of the website when an end user accesses it to address the problem of incomplete blacklists. Unfortunately, run-time overhead complicate those systems. Additionally, depending on the attack's nature, customers may already be at risk from such malicious websites because the contents have already been downloaded before analysis even starts. The most crucial component of phishing security is the accurate and quick detection of phishing websites. End users will receive a warning when tricked into visiting a phishing site in the case that phishing URLs are successfully recognized and banned [7].

A computation-innovative class of artificial intelligence known as Intelligent machine learning is the machine learning algorithm [8]. It is a dependable technique that can be used to protect against phishing assaults. It has already been proposed and tested to use machine learning techniques to identify phishing websites. The three categories of algorithms utilized in machine learning (ML) are supervised learning, unsupervised learning, and reinforcement learning. Classification and regression are two other categories that apply to supervised learning. The methods that are widely employed include Linear supervised, linear regression, logistic regression support, K-vector machines, nearest neighbor, random forest algorithms, K-means, artificial neural networks, and clustering algorithms [9].

In this chapter, we explaines a strong detection apparatus that automatically scans page to determine if they are harmful or not. We want a blacklist provider to use our system so they can automatically create and keep a current blacklist of such spam sites. Our system has a wide range of elements that reflect many sorts of fundamental properties of the webpage content or activity, which make it difficult or impossible for criminals to hide their activities. Based on a trained classifier, this system may proactively crawl and analyze a given URL, classifying it as valid, phishing, or malicious.

The remaining paper was embellished as follows: The history, inception, and current approaches to lung cancer detection were covered in sections 1 and 2. The mathematical model for detecting lung cancer using an adaptive hierarchical heuristic has been proposed in Section 3. The experimental findings have been shown in Section 4. Section 5 brings the study article to a close.

LITERATURE REVIEW

There are many studies that have been performed in this field, and some of the literature includes:

In order to build learning models that are resilient to minor variations in upcoming unidentified phishing data instances, machine learning algorithms can integrate common attack patterns like keywords, hidden fields, and page layouts across various phishing data instances. On the basis of publicly accessible datasets of genuine and phishing websites, researchers created fresh sets of features in previous machine learning algorithms. Although these methods have shown good results in identifying phishing websites, they also have significant drawbacks because of adversarial sampling, as we illustrate in the discussion that follows:

In 2017, there were 182.6% more URL obfuscation-based phishing attacks than in 2016, according to a Symantec analysis [6]. Attackers may utilize vulnerable terms like “login”, “secure”, or “https”, as well as misspelling the targeted domain name or utilizing it in other sections of the URL, such as the sub-domain.

Lexical, length, and distance-related criteria were established by Verma *et al*. [10] for the detection of phishing URLs. In addition to other features, to recognize phishing websites, they applied the two-sample Kolmogorov-Smirnov statistical test. On four substantial, confidential datasets, they conducted a number of tests, and the outcomes revealed an accuracy of 99.3% and a false positive rate of less than 0.4%.

Jiang *et al*. [11] integrated information from the DNS and the URL to develop a deep neural network (DNN) with NLP to detect phishing attacks. In contrast to

CHAPTER 11

Cloud Integration in Artificial Intelligence (AI)

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Abstract: We have entered the new era of the cloud age. Cloud integration has been adopted by companies and is still growing in a rapid way. On the other hand, advances in artificial intelligence have opened up new possibilities that can be used to improve existing cloud technologies. This book chapter explores the integration of cloud computing and artificial intelligence and focuses on the advantages and challenges associated with this integration. It explores the economic benefits of cloud-based AI systems, the cost-effectiveness of cloud integration in AI, potential security and privacy issues associated with storing and processing sensitive AI data in the cloud, and how the use of cloud-based AI platforms helps in resource optimization, knowledge sharing among AI learners and integration of cloud services and AI development projects. The study concludes with a comprehensive assessment of the current state of cloud integration in AI and recommendations for organizations looking to adopt cloud-based AI solutions.

Keywords: AI platforms, Artificial intelligence, Cloud integration, Cost-effectiveness, Privacy, Resource optimization, Security.

INTRODUCTION

Artificial intelligence (AI) is the branch of computer science that deals with developing intelligent machines that can carry out tasks that usually require human intelligence. AI aims to develop computer systems with capabilities comparable to those of human intelligence, including perception, reasoning, learning, and action.

Artificial intelligence covers a wide range of disciplines and methodologies, including machine learning, cloud integration, natural language processing, computer vision, robotics, expert systems, and more. The advancement of intelligent systems with particular capabilities is made possible by these subfields,

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

which contribute to various facets of AI [3]. However, AI also brings up significant ethical and societal issues, including privacy, bias, job loss, and the potential effect on human autonomy. As AI develops and is increasingly integrated into our daily lives, these issues need to be carefully addressed.

INTRODUCTION TO CLOUD COMPUTING

Cloud computing is a paradigm that enables online, on-demand access to a shared pool of computing resources, such as servers, storage, databases, networking, and software applications. It provides an adaptable and scalable infrastructure for hosting and implementing AI applications and services. Organisations and developers can use the power of AI with barely any upfront investment in hardware and infrastructure due to cloud computing. By democratising access to powerful computing resources and AI services, cloud computing has transformed the landscape of AI. It has lowered entry barriers for AI development, speeds up innovation, and made AI available to businesses of all sizes [5].

Characteristics of Cloud Computing are shown in Fig. (**1**) as follows:

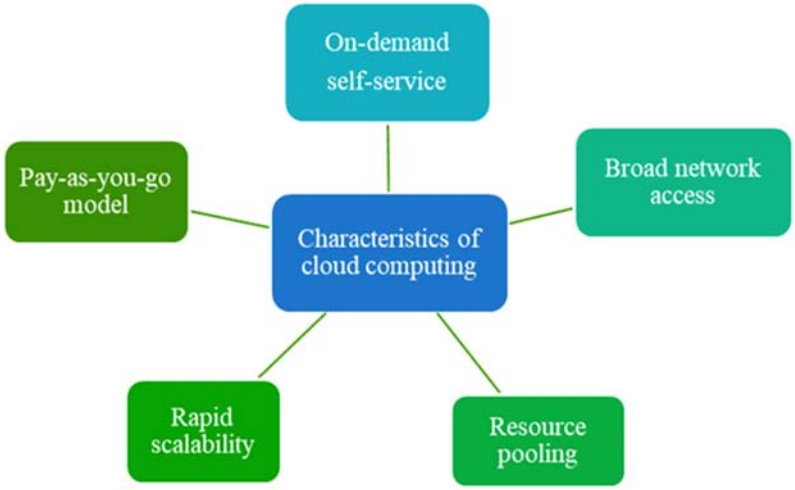

Fig. (1). Characteristics of Cloud Computing.

On-demand Self-service

Without the intervention of service providers, users can access resources, such as computing power or storage, as needed.

Broad Network Access

Cloud services can be accessed *via* the internet through a variety of devices, including desktops, laptops, smartphones, and tablets.

Resource Pooling

Cloud service providers combine resources from numerous users, enabling effective allocation and use of computing resources. While maintaining privacy and security, users share these resources.

Rapid Scalability

Cloud resources can be quickly scaled up or down depending on demand. Due to this elasticity, businesses are able to adapt their computing infrastructure to accommodate changes in workload.

Pay-as-you-go Model

Users are only charged for the resources that they actually use, providing cost-effective pricing models. This method removes the need for initial investments in hardware and software.

Benefits of Cloud Computing

Cost Savings

Cloud computing eliminates the requirement for initial hardware, software, and maintenance of infrastructure expenses. Users pay for the resources they use, which lowers capital expenses and increases cost predictability.

Scalability and Flexibility

Cloud resources can be quickly scaled up or down to accommodate shifting workloads. Businesses do not need to make large hardware changes or reconfigure their IT infrastructure in order to simply expand or contract their IT infrastructure.

Accessibility and Mobility

Cloud services may be accessed from any location with an internet connection, making it possible to work remotely, collaborate with others, and access data and apps from various devices.

High reliability and availability are ensured by the use of geographically dispersed data centers, which are frequently used by cloud service providers. To reduce downtime, they use strong infrastructure and disaster recovery techniques.

CHAPTER 12

Various Applications of Internet of Things-Based Artificial Intelligence in the Agriculture Sector

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Abstract: India is the most populous country in the world hence the challenge of feeding the growing population is a matter of concern. Indian economy is dependent upon agriculture, which is affected by various factors viz. climate change, drought, heavy rain, insect attacks, *etc*. A few decades ago, agricultural practices were performed by conventional techniques only but in the present era, Artificial Intelligent (AI) has been introduced in the agriculture sector which brought a tremendous revolution in this field. According to the World Economic Forum (WEF), over 7,000 farmers in India use AI-based technologies in the agriculture field to improve the productivity of crops, crop yield prediction, soil testing, crop monitoring, disease diagnosis, spraying, prediction of weather, crop infestation alert, precision forming, *etc*. There are more than 1000 agriculture-based start-ups in India that provide solutions in different stages of farming. It may also be used to maintain records of crops, digital marketing, market prediction, digital finance, micro insurance, *etc*. However, it takes a very long time to achieve the goal because of a lack of access to data, a high cost of operations, and a lack of technical experts. In the long run, AI-powered machines and other techniques may provide benefits to the farmers in such a way that they can make better decisions and benefit. In this chapter, various applications have been discussed in the field of AI-based agriculture. Various challenges have also been discussed so that the obstacles can be reduced to achieve our goal in the AI-based agriculture sector.

Keywords: Artificial Intelligence, Agriculture, Crop, Economy, IoT, Irrigation, Soil.

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

INTRODUCTION

The population of the whole world is increasing day by day, and it is estimated that it will reach 10 billion by 2050. This huge population requires more production in agriculture fields; hence, the agriculture sector must increase crop production, which is possible when new technologies are used. Many investigations has been performed in this area to achieve high quality and quantity of crop yields. India is a developing country, and even after the availability of advanced technologies, Indian farmers use traditional techniques, which yield less crop per hectare. In the last few decades, many steps have been taken by the government itself to make the agriculture sector more advanced, which is possible with the introduction of internet-based artificial intelligence techniques. In this chapter, various applications of the IoT and artificial intelligence have been discussed, which may be used to automate and digitize agriculture. Recent advancements in information and communication technologies, in association with the Internet of Things and artificial intelligence, are the key technologies for the revolution in modern and advanced agriculture practices. Digitization in the agriculture sector can be done, which may help collect different data from the fields and may be used for various purposes. Using the IoT [1]-based AI technologies [2], precision and systematic planning can be done, which may help farmers in the following ways:

• It may enhance the production of crops, which reduces the food shortage.

• It may reduce the requirement for labor.

• It may provide real-time analysis, which may be used for effective spraying, land and water management, and land surveillance.

• It may reduce the various costs over the long term.

• It may reduce poverty worldwide.

Below is the organization of the book chapter. Section 2 investigates IoT technology. Section 3 illustrates the use of IoT in smart agriculture. Sections 4 and 5 mention hardware components and software used in smart agriculture, respectively. Section 6 explains various methods for data collection. Section 7 discusses data processing techniques. Section 8 explains hybrid technologies in smart agriculture. This section discusses various challenges and their future scope.

IoT Technology

IoT is a network of various devices connected through the internet to send or receive data [3]. On the other hand, IoT is anything that can be connected to the Internet for different purposes, viz.

• Sensing the parameter

• Collection of data

• Storing the data

• Sharing the information.

IoT is a layered architecture integrated with sensors [4, 5]. These sensors are used to sense various parameters. Sensors and other devices transfer the signals to the user so that the right decision can be made. In our day-to-day lives, many smart devices are used, which consist of different types of sensors. Some of the IoT-based smart devices are:

• Mobile phone

• Laptop

• Smart Watch

• Automated washing machine

• Refrigerator

• Automobiles

• Home appliances

Using IoT-based devices, life becomes more comfortable because these devices work automatically rather than manually. Fig. (**1**) illustrates various applications of IoT.

Smart Agriculture using IoT

The Indian economy is dependent on the agriculture sector. In the present scenario, most of the farmer use traditional techniques, but the government has taken many steps to make the agriculture sector smarter so that crop requirements can be fulfilled. Smart farming [6] is possible using IoT technologies [7, 8]. IoT systems use different types of sensors for various purposes [9]. Various

CHAPTER 13

The Role of Artificial Intelligence in Social Welfare: Harnessing AI For Positive Societal Impact

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Abstract: This chapter explores the transformative role of Artificial Intelligence (AI) in promoting social welfare and advancing the well-being of individuals and communities. AI, with its remarkable capabilities in data analysis, pattern recognition, and decision-making, has the potential to revolutionize various aspects of social welfare, ranging from healthcare and education to poverty alleviation and disaster response. The chapter begins by providing an overview of the concept of social welfare and its significance in fostering inclusive and equitable societies. It highlights the challenges faced by traditional approaches in addressing complex social issues and how AI can act as a catalyst for change. The chapter explores how AI can enhance access to quality healthcare, especially in underserved regions, and contribute to improved health outcomes for vulnerable populations. Education is another domain greatly influenced by AI. The chapter examines the potential of AI in personalized learning, adaptive tutoring, and intelligent assessment systems. It explores how AI technologies can bridge educational gaps, promote lifelong learning, and support inclusive education for students with diverse needs.

Furthermore, the chapter discusses the role of AI in poverty alleviation and social safety net programs. AI-driven analytics and predictive modeling can help identify vulnerable populations, optimize resource allocation, and design targeted interventions to reduce poverty and inequality. It emphasizes the importance of ethical considerations and safeguards to ensure that AI solutions do not perpetuate biases or deepen existing social divides. In addition, the chapter highlights the significance of AI in disaster response and humanitarian aid. AI-powered algorithms can analyze vast amounts of data from various sources, such as social media and satellite imagery, to facilitate timely and effective disaster management. It explores how AI can enable rapid needs assessment, aid distribution, and post-disaster recovery efforts, ultimately saving lives and minimizing human suffering. Finally, the chapter addresses the challenges and ethical implications associated with the use of AI in social welfare.

Keywords: Economic Growth, Revolutionary Education, Risk Assessment..

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Parul Dubey, Mangala Madankar, Pushkar Dubey and Kailash Kumar Sahu (Eds.)

INTRODUCTION

The Evolving Landscape of Artificial Intelligence

The landscape of artificial intelligence (AI) has been rapidly evolving over the past few years and continues to do so. Fig. (**1**) shows the evolving landscape of Artificial Intelligence. Here are some key aspects that highlight the evolving nature of AI:

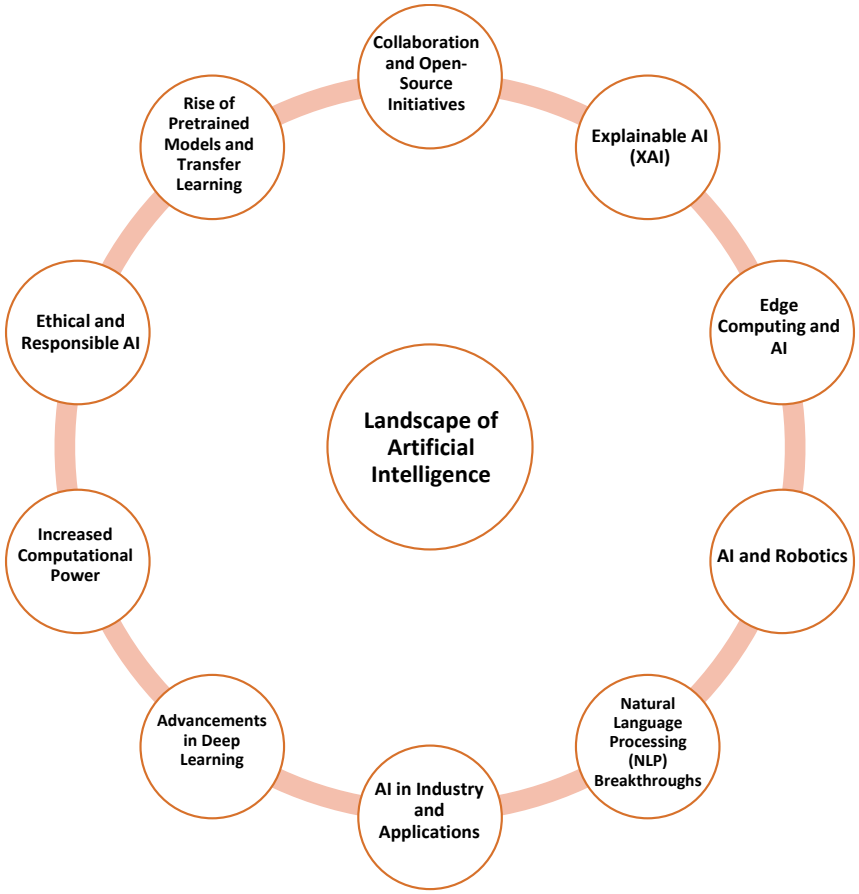

Fig. (1). The evolving landscape of artificial intelligence.

Shifting Perspectives: AI Beyond Economic Growth

Artificial Intelligence (AI) has undoubtedly made a significant impact on economic growth and productivity across various industries. However, it is important to recognize that the potential of AI extends far beyond its economic

benefits. Shifting perspectives to consider AI's broader implications can help us explore its potential to address societal challenges, foster innovation, and promote human well-being. Fig. (**2**) shows this in detail.

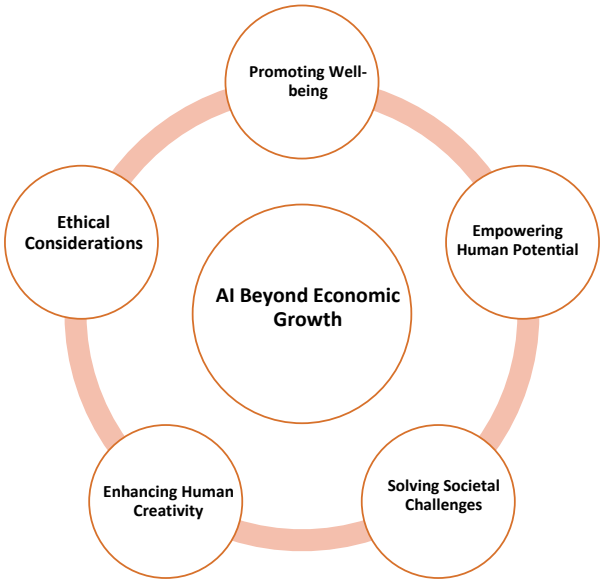

Fig. (2). Shifting perspectives: AI beyond economic growth.

ENHANCING HEALTHCARE DELIVERY

Enhancing healthcare delivery requires a multifaceted approach that combines technological advancements, patient-centered care, interdisciplinary collaboration, and a focus on continuous improvement. By embracing innovation and addressing systemic challenges, healthcare systems can provide better care and improve the overall health and well-being of populations [1]. Enhancing healthcare delivery involves improving various aspects of the healthcare system to provide better care, increase efficiency, and improve patient outcomes. This can be seen in detail in Fig. (**3**). There are several ways in which healthcare delivery can be enhanced:

REVOLUTIONIZING EDUCATION

Intelligent Tutoring Systems

Intelligent Tutoring Systems (ITS) are computer-based educational tools designed to provide personalized and adaptive instruction to learners. These systems combine artificial intelligence (AI) techniques with educational theories to create interactive and responsive learning environments. The primary goal of intelligent tutoring systems is to enhance the learning process by providing individualized

SUBJECT INDEX

A

B

C

D

E

F

G

H

I

L

M

N

P

R

S

T

V

W

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