IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 7, July 2025

DOI: 10.17148/IJARCCE.2025.14705

AI IN HEALTHCARE

Dr. Kavyashree N*[1], Deeksha Prakash[2]

Assistant Professor, Department of MCA, SSIT, Tumkur, Karnataka, India.[1]

4th Sem MCA, SSIT, Tumkur, Karnataka, India.[2]

Abstract: Artificial Intelligence (AI) is transforming healthcare by offering solutions for diagnosis, treatment, and patient care through machine learning and other cognitive technologies. AI algorithms analyze vast amounts of data to provide insights for more accurate diagnoses, personalized treatment plans, and efficient healthcare delivery. While AI holds great promise, ethical considerations, data privacy, and the need for collaboration between AI experts and medical professionals are crucial for responsible implementation.

AI can analyze medical images (like X-rays and MRIs) and patient data to detect diseases at earlier stages, improving accuracy and speed. AI algorithms can analyze individual patient data to tailor treatment plans, predict patient outcomes, and optimize drug discovery.

Keywords: Surveillance, Object Detection, Motion Detection, AI, Machine Learning, CNN, OpenCV, Real-Time Monitoring.

I. INTRODUCTION

Artificial Intelligence (AI) is a rapidly evolving field of computer science that aims to create machines that can perform tasks that typically require human intelligence. AI includes various techniques such as machine learning (ML), deep learning (DL), and natural language processing (NLP). Large Language Models (LLMs) are a type of AI algorithm that uses deep learning techniques and massively large data sets to understand, summarize, generate, and predict new text-based content. LLMs have been architected to generate text-based content and possess broad applicability for various NLP tasks, including text generation, translation, content summary, rewriting, classification, categorization, and sentiment analysis. NLP is a subfield of AI that focuses on the interaction between computers and humans through natural language, including understanding, interpreting, and generating human language. NLP involves various techniques such as text mining, sentiment analysis, speech recognition, and machine translation. Over the years, AI has undergone significant transformations, from the early days of rule-based systems to the current era of ML and deep learning algorithms.

AI has evolved since the first AI program was developed in 1951 by Christopher Strachey. At that time, AI was in its infancy and was primarily an academic research topic. In 1956, John McCarthy organized the Dartmouth Conference, where he coined the term "Artificial Intelligence. "This event marked the beginning of the modern AI era. In the 1960 and 1970 s, AI research focused on rule-based and expert systems. However, this approach was limited by the need for more computing power and data.

In the 1980 and 1990 s, AI research shifted to ML and neural networks, which allowed machines to learn from data and improve their performance over time. This period saw the development of systems such as IBM's Deep Blue, which defeated world chess champion Garry Kasparov in 1997. In the 2000s, AI research continued to evolve, focusing on NLP and computer vision, which led to the development of virtual assistants, such as Apple's Siri and Amazon's Alexa, which could understand natural language and respond to user requests.

Today, AI is transforming healthcare, finance, and transportation, among other fields, and its impact is only set to grow. In academia, AI has been used to develop intelligent tutoring systems, which are computer programs that can adapt to the needs of individual students. These systems have improved student learning outcomes in various subjects, including math and science. In research, AI has been used to analyze large datasets and identify patterns that would be difficult for humans to detect; this has led to breakthroughs in fields such as genomics and drug discovery. AI has been used in healthcare settings to develop diagnostic tools and personalized treatment plans. As AI continues to evolve, it is crucial to ensure that it is developed responsibly and for the benefit of all.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 7, July 2025

DOI: 10.17148/IJARCCE.2025.14705

II. LITERATURE REVIEW

A literature review on AI in healthcare reveals its transformative potential in diagnostics, treatment, and patient care, but also highlights challenges related to data privacy, ethical considerations, and implementation hurdles. AI is being leveraged for medical imaging analysis, personalized treatment plans, predictive analytics, and virtual patient care, but requires careful consideration of ethical and legal frameworks.

The literature review thoroughly investigates ten articles dedicated to the field of multi-disease prediction based on symptoms, specifically within the context of an AI healthcare system for identifying the nearest doctor. This examination employs a diverse range of machine and deep learning methods, showcasing various approaches in the analyzed works. The proposed solutions address challenges such as explainability, data privacy, and model stability, incorporating stateof-the-art algorithms and innovative strategies. The intersection of machine learning and healthcare underscores the interdisciplinary nature of healthcare data mining throughout the literature.

The research emphasizes the necessity for holistic techniques in predicting multiple diseases through symptom-based approaches. Additionally, the reviewed papers suggest potential avenues for future research, including refining models and exploring multi-tasking model applications. This forward-thinking perspective underscores the dynamic nature of the field, with researchers consistently aiming to enhance forecast accuracy, customize interventions, and ultimately improve healthcare outcomes. In essence, this literature review provides an evolving overview of the developing field of multi-disease prediction, highlighting various achievements and outlining the direction of future developments in healthcare data analytics.

represents an innovative healthcare assistant designed to predict various ailments using Artificial Intelligence and machine learning. AI-DOC allows users to input medical parameters for disease forecasts, offering a user-friendly platform that reduces time and expenses for initial checkups. This method aims to support healthcare professionals by providing early aid to patients, emphasizing simplicity for easy understanding of medical reports and promoting informed decision-making. With a commitment to privacy, AI-DOC integrates a login feature to safeguard personal medical data, contributing to enhanced health outcomes for users. Dr. Meera Gandhi and her team have developed, an interactive AI-driven medical assistant. This application utilizes AI to analyze symptoms, diagnose medical conditions, and offer personalized treatments based on user input and health metrics. With features like medication reminders and health report generation, it aims to transform healthcare by enhancing accessibility, efficiency, and personalization for both users and healthcare providers.

In , the article explores how AI impacts the diagnostic process in dermatology, streamlining it by separating prediction and judgment aspects. Dermatologists' attitudes towards AI vary, with some uncertain and others highlighting its data processing speed. Ethical considerations are discussed, stressing the need for a new mindset and involving medical professionals in AI design for effective integration. conducts a comprehensive examination of AI-based medical assistant chatbots, exploring their design, implementation, and applications in healthcare. It delves into chatbots across medical consultation, mental health interventions, and diabetic patient support, scrutinizing diverse models using technologies like natural language processing and machine learning.

The document delves into the progress, hurdles, and forthcoming prospects within smart healthcare systems, emphasizing the use of AI and machine learning. It explores the transition towards personalized healthcare frameworks to accommodate the increasing population affected by chronic ailments and meet the needs of diverse demographics.

offers an extensive examination of Natural Language Processing (NLP) in smart healthcare, highlighting its techniques and applications. It scrutinizes various NLP approaches and their utilization across healthcare domains, addressing issues like the COVID-19 pandemic and mental health.

Healthcare Services (CPHS) to overcome existing limitations. The document underscores the necessity for smart healthcare systems, emphasizing the role of AI, ML, and speech recognition in providing affordable technical solutions while upholding care standards. It proposes an innovative smart healthcare system rooted in speech recognition and integrates edge/fog/cloud computing. The paper examines the creation of a contextual chatbot tailored for healthcare applications through deep learning techniques, presenting a methodology for development and showcasing its efficacy in providing pertinent responses to user inquiries.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 7, July 2025

DOI: 10.17148/IJARCCE.2025.14705

III. METHODOLOGY

Supervised Learning:
Algorithms are trained on labeled data (e.g., images with and without tumors) to predict outcomes (e.g., presence of a tumor) or classify data.
Unsupervised Learning:
Algorithms explore unlabeled data to discover patterns and relationships, such as clustering patients based on their characteristics.

Reinforcement Learning:
Algorithms learn through trial and error, receiving rewards or penalties for their actions, which can be useful in optimizing treatment plans or robotic surgery.

Deep Learning:
- Neural Networks: These complex algorithms, inspired by the structure of the human brain, can analyze vast amounts of data, including images, text, and sensor data, to identify subtle patterns and make predictions.
- Convolutional Neural Networks (CNNs): Used for image analysis, such as identifying tumors in medical images.
- Recurrent Neural Networks (RNNs): Used for sequential data, such as time-series data from patient monitoring devices or analyzing patient records.

A. Preproccessing:
With all the advances in medicine, effective disease diagnosis is still considered a challenge on a global scale. The development of early diagnostic tools is an ongoing challenge due to the complexity of the various disease mechanisms and the underlying symptoms. AI can revolutionize different aspects of health care, including diagnosis. ML is an area of AI that uses data as an input resource in which the accuracy is highly dependent on the quantity as well as the quality of the input data that can combat some of the challenges and complexity of diagnosis. ML, in short, can assist in decision-making, manage workflow, and automate tasks in a timely and cost-effective manner. Also, deep learning added layers utilizing Convolutional Neural Networks (CNN) and data mining techniques that help identify data patterns. These are highly applicable in identifying key disease detection patterns among big datasets. These tools are highly applicable in healthcare systems for diagnosing, predicting, or classifying diseases.

B. Feature extraction:
AI tools can improve accuracy, reduce costs, and save time compared to traditional diagnostic methods. Additionally, AI can reduce the risk of human errors and provide more accurate results in less time. In the future, AI technology could be used to support medical decisions by providing clinicians with real-time assistance and insights. Researchers continue exploring ways to use AI in medical diagnosis and treatment, such as analyzing medical images, X-rays, CT scans, and MRIs. By leveraging ML techniques, AI can also help identify abnormalities, detect fractures, tumors, or other conditions, and provide quantitative measurements for faster and more accurate medical diagnosis.

Clinical laboratory testing provides critical information for diagnosing, treating, and monitoring diseases. It is an essential part of modern healthcare which continuously incorporates new technology to support clinical decision-making and patient safety. AI has the potential to transform clinical laboratory testing by improving the accuracy, speed, and efficiency of laboratory processes. The role of AI in clinical microbiology is currently progressing and expanding. Several ML systems were developed to detect, identify, and quantify microorganisms, diagnose and classify diseases, and predict clinical outcomes. These ML systems used data from various sources to build the AI diagnosis such as genomic data of microorganisms, gene sequencing, metagenomic sequencing results of the original specimen, and microscopic imaging. Moreover, gram stain classification to gram positives/negatives and cocci/rods is another essential application of using deep convolutional neural networks that reveal high sensitivity and specificity. A published systematic review showed that numerous MLs were evaluated for microorganism identification and antibiotic susceptibility testing; however, several limitations are associated with the current models that must be addressed before incorporating them into clinical practice. For malaria, Taesik et al. found that using ML algorithms combined with digital in-line holographic microscopy (DIHM) effectively detected malaria-infected red blood cells without staining. This AI technology is rapid, sensitive, and cost-effective in diagnosing malaria.

IV. CONVOLUTIONAL NEURAL NETWORK

Convolutional Neural Networks (CNNs) are a powerful type of AI, particularly useful in healthcare for analyzing medical images and improving diagnostic accuracy. CNNs excel at identifying patterns in images, making them ideal for tasks like disease detection, organ segmentation, and image enhancement.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁐ Peer-reviewed & Refereed journal ⁐ Vol. 14, Issue 7, July 2025
DOI: 10.17148/IJARCCE.2025.14705

Their ability to learn hierarchical features from medical imaging data has led to significant advancements in healthcare, including faster diagnosis and better patient outcomes.

CNNs automatically learn to extract relevant features from images, such as edges, shapes, and textures, without the need for manual feature engineering. CNNs are widely used for analyzing X-rays, CT scans, MRI scans, and other medical images to detect diseases like cancer, diabetic retinopathy, and pneumonia. They can assist in the early and accurate diagnosis of various medical conditions by analyzing medical images and providing diagnostic suggestions.

CNNs can provide real-time guidance to surgeons during procedures, helping them identify anatomical structures and safe dissection zones. CNNs can be used to analyze images of cells and tissues to identify potential drug targets and accelerate the drug discovery process.

V. RANDOM FOREST

An interpretable random forest model exhibited the highest discriminatory performance in SAP prediction. Interpretation with LIME plots could be useful for individualized prediction in a clinical setting. A nomogram comprising albumin, serum creatinine, glucose, and pleural effusion is a useful predictor of SAP.

The random forest (RF) is a hierarchical collection of tree structured base classifiers. Text data usually have many number of dimensions. The dataset contains a large number of irrelevant attributes. Only few important attributes are informative for classifier model. RF algorithm uses a simple predetermined probability to select the most important relevant attribute. Breiman formulated the RF algorithm using sample data subsets and to construct multiple decision trees by mapping random sample of feature subspaces. The RF algorithm associated with a set of training documents D and N_f features can be described as follows:

1. Initial: $D1$, $D2$,…….D_K sampled by predetermined probability with replacement.
2. For each document D_K construct a decision tree model. The training documents are randomly sampled using its subspace of m-try dimension from the available features. Calculate all possible probability based on the m-try features. The leaf node produces the best data split. The process will be continued till it reaches the saturation criterion
3. Combine the K number of unpruned trees $h_1(X_1)$, $h_2(X_2)$,…….. into a random forest ensemble and use the high probability value for classification decision.

VI. AI VIRTUAL HEALTHCARE ASSISTANCE

With continuously increasing demands of health care services and limited resources worldwide, finding solutions to overcome these challenges is essential. Virtual health assistants are a new and innovative technology transforming the healthcare industry to support healthcare professionals. It is designed to simulate human conversation to offer personalized patient care based on input from the patient.

These digital assistants use AI-powered applications, chatbots, sounds, and interfaces. Virtual assistants can help patients with tasks such as identifying the underlying problem based on the patient's symptoms, providing medical advice, reminding patients to take their medications, scheduling doctor appointments, and monitoring vital signs. In addition, digital assistants can collect information daily regarding patients' health and forward the reports to the assigned physician. By taking off some of these responsibilities from human healthcare providers, virtual assistants can help to reduce their workload and improve patient outcomes.

Furthermore, these tools can always be available, making it easier for patients to access healthcare when needed . Another medical service that an AI-driven phone application can provide is triaging patients and finding out how urgent their problem is, based on the entered symptoms into the app.

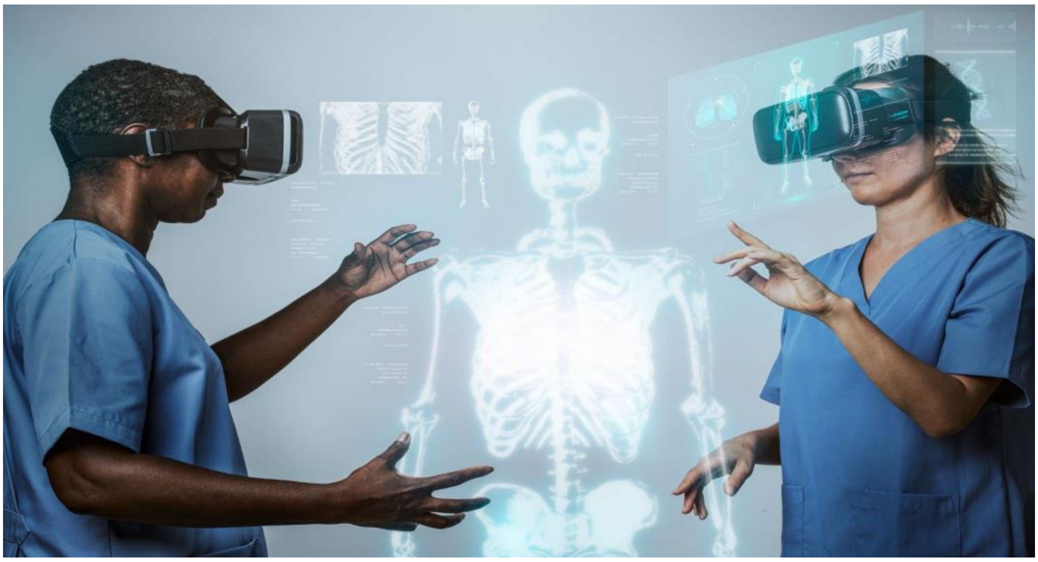
In addition, introducing intelligent speakers into the market has a significant benefit in the lives of elderly and chronically ill patients who are unable to use smartphone apps efficiently. Overall, virtual health assistants have the potential to significantly improve the quality, efficiency, and cost of healthcare delivery while also increasing patient engagement and providing a better experience for them.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.471 ⁒ Peer-reviewed & Refereed journal ⁒ Vol. 14, Issue 7, July 2025

DOI: 10.17148/IJARCCE.2025.14705



VII. CONCLUSION

The integration of AI in healthcare has immense potential to revolutionize patient care and outcomes. AI-driven predictive analytics can enhance the accuracy, efficiency, and cost-effectiveness of disease diagnosis and clinical laboratory testing. Additionally, AI can aid in population health management and guideline establishment, providing real-time, accurate information and optimizing medication choices. Integrating AI in virtual health and mental health support has shown promise in improving patient care. However, it is important to address limitations such as bias and lack of personalization to ensure equitable and effective use of AI.

Public perception of AI in healthcare varies, with individuals expressing willingness to use AI for health purposes while still preferring human practitioners in complex issues. Trust-building and patient education are crucial for the successful integration of AI in healthcare practice. Overcoming challenges like data quality, privacy, bias, and the need for human expertise is essential for responsible and effective AI integration.

REFERENCES

[1]. 1.Lee, P., A. Abernethy, D. Shaywitz, A. V. Gundlapalli, J. Weinstein, P. M. Doraiswamy, K. Schulman, and S. Madhavan. 2022. Digital Health COVID19 Impact Assessment: Lessons Learned and Compelling Needs. NAM Perspectives. Discussion Paper, National Academy of Medicine, Washington, DC. https://doi.org/10.31478/202201c.

[2]. 2. Lee, Y., Y. S. Kim, D.-I. Lee, S. Jeong, G.- H. Kang, Y. S. Jang, W. Kim, H. Y. Choi, J. G. Kim, and S.-H. Choi. 2022. The application of a deep learning system developed to reduce the time for RTPCR in COVID-19 detection. Science Reports 12(1234). https://doi.org/10.1038/s41598-022- 05069-2.

[3]. 3.. Leslie, D., A. Mazumder, A. Peppin, M. K. Wolters, and A. Hagerty. 2021. Does "AI" stand for augmenting inequality in the era of covid-19 healthcare? BMJ 372:1-5. https://doi.org/10.1136/bmj.n304.

[4]. Lin, D., T. Nazreen, T. Rutowski, Y. Lu, A. Harati. E. Shriberg, P. Chlebek, and M. Aratow. 2022. Feasibility of a Machine Learning-Based Smartphone Application in Detecting Depression and Anxiety in a Generally Senior Population. Frontiers in Psychology 13. https://doi.org/10.3389/fpsyg.2022.811 517.

[5]. Leslie, D., A. Mazumder, A. Peppin, M. K. Wolters, and A. Hagerty. 2021. Does "AI" stand for augmenting inequality in the era of covid-19 healthcare? BMJ 372:1-5. https://doi.org/10.1136/bmj.n304. 72. Lin, D., T. Nazreen, T. Rutowski, Y. Lu, A. Harati. E. Shriberg, P. Chlebek, and M. Aratow. 2022. Feasibility of a Machine Learning-Based Smartphone Application in Detecting Depression and Anxiety in a Generally Senior Population. Frontiers in Psychology 13. https://doi.org/10.3389/fpsyg.2022.811 517.

[6]. http://www.datasciencecentral.com/profiles/blogs/10-great-healthcare-data-sets

[7]. JASON 2013, A Robust Health Data Infrastructure. JSR-13-Task-007.

[8]. JASON 2014, Data for Individual Health. JSR-14-Task-007.

[9]. https://www.cbinsights.com/research/artificial-intelligence-startups-healthcare

[10]. JASON 2017, Perspectives on Research in Artificial Intelligence and Artificial General Intelligence Relevant to DoD. JSR-16-Task-003.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.471 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 14, Issue 7, July 2025
DOI: 10.17148/IJARCCE.2025.14705

[11]. 11.Opportunities and Obstacles for Deep Learning in Biology and Medicine, CS Greene et al., bioRxiv preprint first posted online May. 28, 2017; doi: http://dx.doi.org/10.1101/142760.

[12]. The Parable of Google Flu: Traps in Big Data Analysis, David Lazer, Ryan Kennedy, Gary King, Alessandro Vespignani, SCIENCE 343, 1203, 2014

[13]. 2016: Retinal Imaging Techniques for Diabetic Retinopathy Screening, James Kang Hao Goh, Carol Y. Cheung, Shaun Sebastian Sim, Pok Chien Tan, Gavin Siew Wei Tan, and Tien Yin Wong, Journal of Diabetes Science and Technology 2016, Vol. 10(2) 282–294

[14]. 14.2016: Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs, Varun Gulshan, Lily Peng, Marc Coram, Martin C. Stumpe, Derek Wu, Arunachalam Narayanaswamy, Subhashini Venugopalan, Kasumi Widner, TomMadams, Jorge Cuadros, Ramasamy Kim, Rajiv Raman, Philip C. Nelson, Jessica L. Mega, Dale R.Webster, JAMA. 2016;316(22):2402-2410. doi:10.1001/jama.2016.17216.

[15]. 14.2017: A Portable, Inexpensive, Nonmydriatic Fundus Camera Based on the Raspberry Pi® Computer, Bailey Y. Shen and Shizuo Mukai, Journal of Ophthalmology, Volume 2017, Article ID 4526243, 5 pages, https://doi.org/10.1155/2017/4526243

