Indian Journal of Computer Science and Technology
Volume 5, Issue3 (September-December 2026), PP: 121-124.
www.indjcst.com
ISSN No: 2583-5300

Artificial Intelligence in Healthcare: A Review of Applications, Challenges and Future Directions

Dr. A. Antony Prakash[1], Deepak Jose M[2], Christy S[3], Tamilselvan S[4]
[1]Head and Assistant Professor, Department of Information Technology, St. Joseph's College, Tiruchirappalli, Tamil Nadu, India.
[2,3,4] PG Student, Department of Information Technology, St. Joseph's College, Tiruchirappalli, Tamil Nadu, India.

To Cite this Article: *Dr. A. Antony Prakash[1], Deepak Jose M[2], Christy S[3], Tamilselvan S[4], "Artificial Intelligence in Healthcare: A Review of Applications, Challenges and Future Directions" Indian Journal of Computer Science and Technology, Volume 05, Issue 03 (September-December 2026), PP: 121-124.*

Abstract: *Artificial Intelligence (AI) is rapidly transforming the healthcare sector by enabling intelligent systems to support diagnosis, clinical decision-making, disease prediction, treatment planning, patient monitoring, and healthcare management. This review examines the major applications of AI, including machine learning, deep learning, natural language processing, computer vision, generative AI, and predictive analytics across healthcare domains such as medical imaging, disease diagnosis, personalized medicine, drug discovery, clinical risk assessment, robotic surgery, and electronic health record analysis. AI-based approaches can improve diagnostic accuracy, facilitate early disease detection, optimize clinical workflows, and support data-driven personalized care. However, the widespread adoption of AI in healthcare is constrained by challenges related to data quality and availability, patient privacy, algorithmic bias, lack of interpretability, cybersecurity, interoperability, ethical concerns, regulatory uncertainty, and limited real-world validation. Future directions include the development of explainable and trustworthy AI, privacy-preserving learning, multimodal AI, generative AI, robust clinical validation, standardized regulatory frameworks, and human-centered AI systems. The review emphasizes that successful healthcare AI should augment rather than replace healthcare professionals, ensuring patient safety, transparency, accountability, equity, and clinical effectiveness. Responsible integration of AI with healthcare practices has the potential to improve healthcare outcomes while creating more efficient, accessible, and personalized healthcare systems.*

Key Word: *Artificial Intelligence, Healthcare, Machine Learning, Disease Prediction, Clinical Decision Support, Patient Data, Flask.*

I. INTRODUCTION

Healthcare systems generate large volumes of patient information through clinical observations, laboratory measurements, monitoring devices, and electronic records. Analysing this information manually can require considerable time and depends on the availability of healthcare professionals. Artificial Intelligence and Machine Learning provide computational methods for identifying patterns in healthcare data and supporting tasks such as disease prediction, diagnosis assistance, patient monitoring, and clinical decision-making[1].

The proposed work focuses on an AI-based disease-prediction system that accepts patient-related attributes such as age, gender, symptoms, blood pressure, glucose level, heart rate, body temperature, BMI, and cholesterol level. After preprocessing, machine learning models can learn relationships between these parameters and disease outcomes. For a new patient, the trained model can generate a possible disease prediction, which can then be stored and displayed through a web interface[2].

The paper presents the literature background, problem statement, proposed system, architecture, technologies, implementation approach, expected results, applications, limitations, and future directions.

II.LITERATURE REVIEW

Existing healthcare research has increasingly investigated machine learning for clinical prediction and decision support. Classical supervised-learning algorithms such as Logistic Regression, Decision Tree, Random Forest, and K-Nearest Neighbours can be applied to structured patient datasets for classification tasks. More advanced AI approaches can also process complex medical information, but their practical usefulness depends on data quality, validation, interpretability, privacy, and the clinical setting in which the system is used [3].

The supplied research proposal emphasizes structured patient attributes and conventional machine-learning models. This provides a practical basis for an educational prototype in which healthcare data are preprocessed, models are trained and evaluated, and predictions are presented through a web-based decision-support interface[4].

Comparative Summary of AI-Based Healthcare Approaches

Approach	Primary Use	Key Characteristic
Manual Clinical Analysis	Patient assessment	Human-driven; time-intensive for large datasets
Rule-Based Decision Support	Guideline / rule checking	Uses predefined rules

Traditional ML Classification	Disease prediction	Works well with structured patient attributes
Deep Learning	Complex clinical data	Can learn high-dimensional patterns
Proposed AI System	Disease prediction support	Preprocessing + ML + web interface

Table 1: Comparative summary of approaches relevant to AI-based healthcare decision support

The proposed system concentrates on structured patient information and supervised machine-learning classification. Its purpose is to demonstrate how patient parameters can be transformed into a computational prediction while retaining a clear distinction between automated decision support and professional diagnosis[5] [6].

III. PROBLEM STATEMENT

Traditional healthcare diagnosis and analysis may require considerable time and depends on the availability of healthcare professionals and accurate interpretation of patient information. Large volumes of patient data can also be difficult to analyse manually[7]. Therefore, an AI-based decision-support system is required to analyse patient data and identify possible disease conditions efficiently, whSile supporting healthcare professionals in making data-driven decisions [8]

The system must also handle practical data issues such as missing values, categorical variables, different feature scales, and the need to evaluate predictive performance using suitable metrics. The output should be presented as a prediction for decision support rather than as an autonomous medical diagnosis.

IV.PROPOSED SYSTEM AND OBJECTIVES

The proposed system collects patient information and preprocesses the healthcare dataset by handling missing values, encoding categorical data, and scaling relevant features. Machine-learning models are then trained using the prepared dataset [9]. When new patient data are provided, the trained model analyses the input parameters and predicts the possible disease condition. The prediction and relevant patient information can be stored in a database and displayed through a web interface.

Objectives

- To study the applications of Artificial Intelligence in healthcare.
- To develop an AI-based system for predicting possible diseases from patient data.
- To analyse healthcare parameters such as symptoms, age, blood pressure, glucose level, and heart rate.
- To preprocess and prepare healthcare datasets for machine learning.
- To train and evaluate suitable machine-learning models for disease prediction.
- To improve the speed, accuracy, and efficiency of healthcare decision support.

V.SYSTEM ARCHITECTURE AND WORKFLOW

The architecture of the proposed system is organized into five sequential stages: patient-data acquisition, data preprocessing, machine-learning model processing, disease prediction, and result storage/display. Figure 1 illustrates the overall workflow from patient input to the final decision-support output.

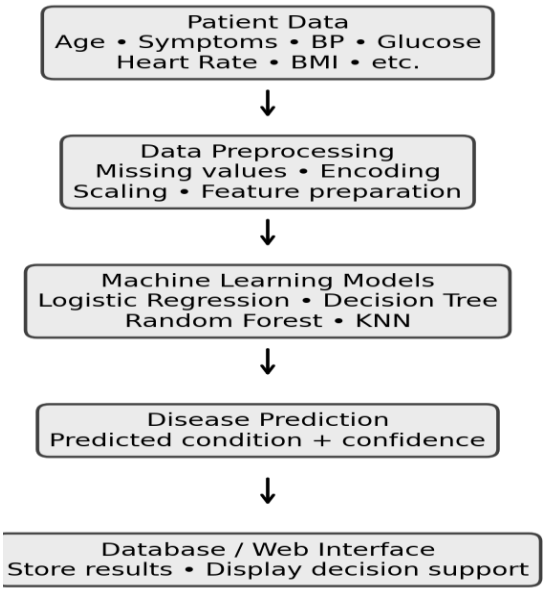

Figure 1: Overall system architecture and workflow of the proposed AI-based healthcare system

Stage 1: Patient Data Acquisition

The system receives patient-related attributes such as Patient ID, age, gender, symptoms, blood pressure, blood glucose level, heart rate, body temperature, BMI, and cholesterol level. These attributes form the input feature set used by the prediction pipeline[10].

Stage 2: Data Preprocessing

The collected dataset is prepared for machine learning by handling missing values, encoding categorical attributes, and scaling relevant numerical features. Proper preprocessing helps maintain consistent input representation and reduces problems caused by incomplete or differently scaled data.

Stage 3: Machine-Learning Model

The prepared dataset is used to train suitable supervised-learning models. The supplied proposal identifies Logistic Regression, Decision Tree, Random Forest, and KNN as candidate models. Model performance can be evaluated using standard classification metrics.

Stage 4: Disease Prediction

When new patient information is entered, the same preprocessing operations are applied before the data are supplied to the trained model. The model then predicts a possible disease condition based on the learned relationship between the input parameters and the target variable. The prediction should be interpreted within the scope of the dataset and model evaluation rather than as a definitive clinical diagnosis.

Stage 5: Database and Web Output

The prediction and relevant patient information can be stored in a MySQL or SQLite database. A Flask-based web interface can display the submitted patient parameters and the generated prediction. The interface provides a practical way to demonstrate the decision-support workflow.

Figure 2: Decision-support workflow for patient data and disease prediction

5.1 Technologies Used

The proposed system uses Python for programming, Pandas and NumPy for data processing, Scikit-learn for machine learning, Matplotlib and Seaborn for visualization, Flask for the web framework, MySQL or SQLite for data storage, and HTML, CSS, and JavaScript for the frontend.

Component	Technology Used
Programming Language	Python
Data Processing	Pandas / NumPy
Machine Learning	Scikit-learn
Visualization	Matplotlib / Seaborn
Machine Learning Models	Logistic Regression / Decision Tree / Random Forest / KNN
Web Framework	Flask
Database	MySQL / SQLite
Frontend	HTML, CSS, JavaScript

Table 2: Technologies used in the proposed AI-based healthcare system

5.2 Implementation

The implementation of the proposed system can be divided into three major modules: the data-preparation and training module, the disease-prediction module, and the web/database administration module.

5.2.1 Data Preparation and Training Module

The dataset is loaded using Pandas and inspected for missing values, categorical attributes, inconsistent records, and feature ranges. Missing data are handled using an appropriate preprocessing strategy, categorical values are encoded, and numerical features can be scaled where required. The prepared dataset is then divided into training and testing portions, after which the selected machine-learning models are trained [11].

5.2.2 Disease-Prediction Module

This module receives new patient information and applies the trained preprocessing pipeline before generating a prediction. Candidate models include Logistic Regression, Decision Tree, Random Forest, and KNN. The model can be selected based on measured performance and the requirements of the application [12] [13]

5.2.3 Web and Administration Module

The Flask-based module provides a web interface for entering patient information and viewing the generated prediction. MySQL or SQLite can be used to store patient inputs and prediction records. The interface can also be extended with basic reporting and visualization functions.

VI.RESULTS AND DISCUSSION

The proposed system is intended to demonstrate an end-to-end AI workflow for healthcare decision support. During evaluation, the candidate machine-learning models can be compared using standard metrics such as accuracy, precision, recall, F1-score, and a confusion matrix. The final model should be selected and reported based on the measured results obtained from the chosen dataset and test procedure.

The supplied proposal does not provide a completed experimental dataset or numerical model results. Therefore, specific accuracy values, precision values, or claims of clinical effectiveness are not stated here. Such values should be added after the actual dataset is processed and the trained models are evaluated.

In practical deployment, performance may vary with dataset size, class balance, missing information, feature quality, population characteristics, and the similarity between training data and real-world patient data. These factors should be documented when interpreting experimental results.

6.1 Limitations of The Study

AI-based healthcare prediction is dependent on the quality, representativeness, and completeness of the underlying dataset. A model trained on a limited or biased dataset may not generalize to different patient populations. Missing values, noisy measurements, class imbalance, and inconsistent clinical records can also affect predictive performance.

The proposal does not establish clinical validation, regulatory approval, or real-world diagnostic performance. Privacy, security, interpretability, informed use, and responsible handling of patient information are important considerations before any healthcare AI system is used beyond a research or educational setting.

VII. CONCLUSION AND FUTURE WORK

This paper presents an Artificial Intelligence-based healthcare decision-support system for analysing patient-related information and predicting possible disease conditions. The proposed workflow combines data preprocessing, supervised machine learning, database storage, and a Flask-based web interface. Patient attributes such as age, gender, symptoms, blood pressure, glucose level, heart rate, body temperature, BMI, and cholesterol level can be used as model inputs.

The system is designed to reduce manual analysis effort and provide faster, data-driven assistance. However, the prediction output is intended to support healthcare professionals rather than replace professional medical diagnosis. The effectiveness of the system must be established through dataset-specific evaluation and, for clinical use, appropriate validation and governance.

Future work can include larger and more representative datasets, improved feature engineering, hyperparameter tuning, explainable AI methods, stronger privacy and security mechanisms, model monitoring, integration with healthcare information systems, and rigorous validation on independent clinical datasets.

REFERENCES

[1] Omar Ali, Wiem Abdelbaki, Anup Shrestha, Ersin Elbasi, Mohammad Abdallah Ali Alryalat, and Yogesh K. Dwivedi, “A systematic literature review of artificial intelligence in the healthcare sector: Benefits, challenges, methodologies, and functionalities,” 2023. DOI: 10.1016/j.jik.2023.100333

[2] Pranjal Kumar, Siddhartha Chauhan, and Lalit Kumar Awasthi, “Artificial Intelligence in Healthcare: Review, Ethics, Trust Challenges & Future Research Directions,” 2023. DOI: 10.1016/j.engappai.2023.105894

[3] Marios D. Dritsas and Maria Trigka, “Recent Advances of Artificial Intelligence in Healthcare: A Systematic Literature Review,” 2023. DOI: 10.3390/app13137479

[4] Xian Gao, Peixiong He, Yi Zhou, and Xiao Qin, “Artificial Intelligence Applications in Smart Healthcare: A Survey,” 2024. DOI: 10.3390/fi16090308

[5] Betelhem Zewdu Wubineh, Fitsum Gizachew Deriba, and Michael Melese Woldeyohannis, “Exploring the opportunities and challenges of implementing artificial intelligence in healthcare: A systematic literature review,” 2024. DOI: 10.1016/j.urolonc.2023.11.019

[6] Sergei Polevikov, “Advancing AI in healthcare: A comprehensive review of best practices,” 2023. DOI: 10.1016/j.cca.2023.117519

[7] Md Mobashir Hasan Shandhi and Jessilyn P. Dunn, “AI in medicine: Where are we now and where are we going?” 2022. DOI: 10.1016/j.xcrm.2022.100861

[8] Golnar Karimian, Elena Petelos, and Silvia M. A. A. Evers, “The ethical issues of the application of artificial intelligence in healthcare: A systematic scoping review,” 2022. DOI: 10.1007/s43681-021-00131-7

[9] Jiamin Yin, Kee Yuan Ngiam, and Hock Hai Teo, “Role of Artificial Intelligence Applications in Real-Life Clinical Practice: Systematic Review,” 2021. DOI: 10.2196/25759

[10] Arav Kumar, Savya Vats, Anvi Kumar, and Avimanyou Vatsa, “Challenges and Applications of AI in Healthcare: A Review,” 2023. DOI: 10.1109/ISEC57711.2023.10402195

[11] Zhenyu Zhao, Laith Alzubaidi, A. Alwzwazy, et al., “A systematic review of artificial intelligence-driven decentralized learning in healthcare: emerging techniques, applications, challenges and future directions,” 2026. DOI: 10.1007/s10462-026-11540-7

[12] Mohamed A. et al., “Applications of artificial intelligence/machine learning approaches in cardiovascular medicine: a systematic review with recommendations,” 2021. DOI: 10.1093/ehjdh/ztab054

[13] Dr A Antony Prakash , Aakash Gerry A , Akash R, “Evolving Nature Of Cybersecurity And Data Privacy In The Age Of Artificial Intelligence” Jaafr - Journal Of Advance And Future Research, ISSN:2984-889X, Vol.4, Issue 2, Page No.804-808, February-2026, Available :Https://Rjwave.Org/JAAFR/Papers/JAAFR2602435.Pdf