IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Special Issue 1, March 2024

1st International Conference on Machine Learning, Optimization and Data Science

Organized by

Department of Computer Science and Engineering, Baderia Global Institute of Engineering and Management, Jabalpur, India

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 || Monthly Peer Reviewed & Refereed Journal |

| "1st International Conference on Machine Learning, Optimization and Data Science"|

Organized by

| Department of Computer Science and Engineering, Baderia Global Institute of Engineering and Management, Jabalpur|

|| Volume 12, Special Issue 1, March 2024 ||

Machine Learning in Healthcare: A Deep Dive into Classification, Limitations, Prospects, And Hurdles

Gulafsha Anjum, Neha Thakre, Kuldeep Soni

Assistant Professor, Dept. of CSE, Baderia Global Institute of Engineering & Technology, RGPV University, Jabalpur, Madhya Pradesh, India

ABSTRACT: Recently, a range of advanced techniques, such as artificial intelligence and machine learning, have been used to analyse health-related data. Machine learning applications are helping medical practitioners become more proficient in diagnosing and treating patients. Numerous academics have used medical data to find trends and diagnose illnesses. There aren't many papers in the literature right now that discuss using machine learning algorithms to increase the efficiency and accuracy of healthcare data. We investigated how well time series healthcare parameters for heart rate data transfer (accuracy and efficiency) may be enhanced using machine learning methods. We explored a number of machine learning techniques for use in healthcare applications in this research. Following a thorough introduction and analysis of supervised and unsupervised machine learning algorithms.

KEYWORDS: Machine Learning; Healthcare; Supervised learning; Unsupervised machine learning ; Efficiency; Data; Treatment; Mobile health.

I. INTRODUCTION

There are more options for illness diagnosis and treatment because to the growing application of machine learning in healthcare. One excellent characteristic of machine learning is its ability to continuously enhance data for accurate prediction and classification in illness analysis. As more data are acquired, the forecasting model will acquire knowledge how to make accurate predictions. [5] Machine learning techniques can be employed to extract relevant data from patient datasets included in electronic health records. By utilizing disease-causing variables from electronic health records, machine learning algorithms can assist in the diagnosis of diseases by analysing data and forecasting the underlying causes of an ailment. When it came to classification, prediction, and clustering tasks, machine learning became more popular than the conventional bio statistical method for analysing and integrating massive volumes of data.[2]

1. Supervised Machine Learning in Healthcare: This section discusses various machine learning models' performance and limitations within the healthcare domain. [8]Supervised learning involves training models on labelled data, allowing them to make predictions or decisions based on input-output pairs.
2. Unsupervised Machine Learning in Healthcare: Here, the paper examines the advantages and disadvantages of unsupervised machine learning models in healthcare settings, particularly when labelled data are scarce or unavailable. [6]Unsupervised learning involves identifying patterns and structures in data without explicit guidance from labelled outcomes.
3. Comparative Analysis of Machine Learning Models: This category provides a comprehensive analysis of different machine learning models utilized in healthcare, including their performance metrics. By comparing various models, the paper aims to guide researchers towards more informed decisions when selecting and implementing machine learning-based solutions in healthcare.

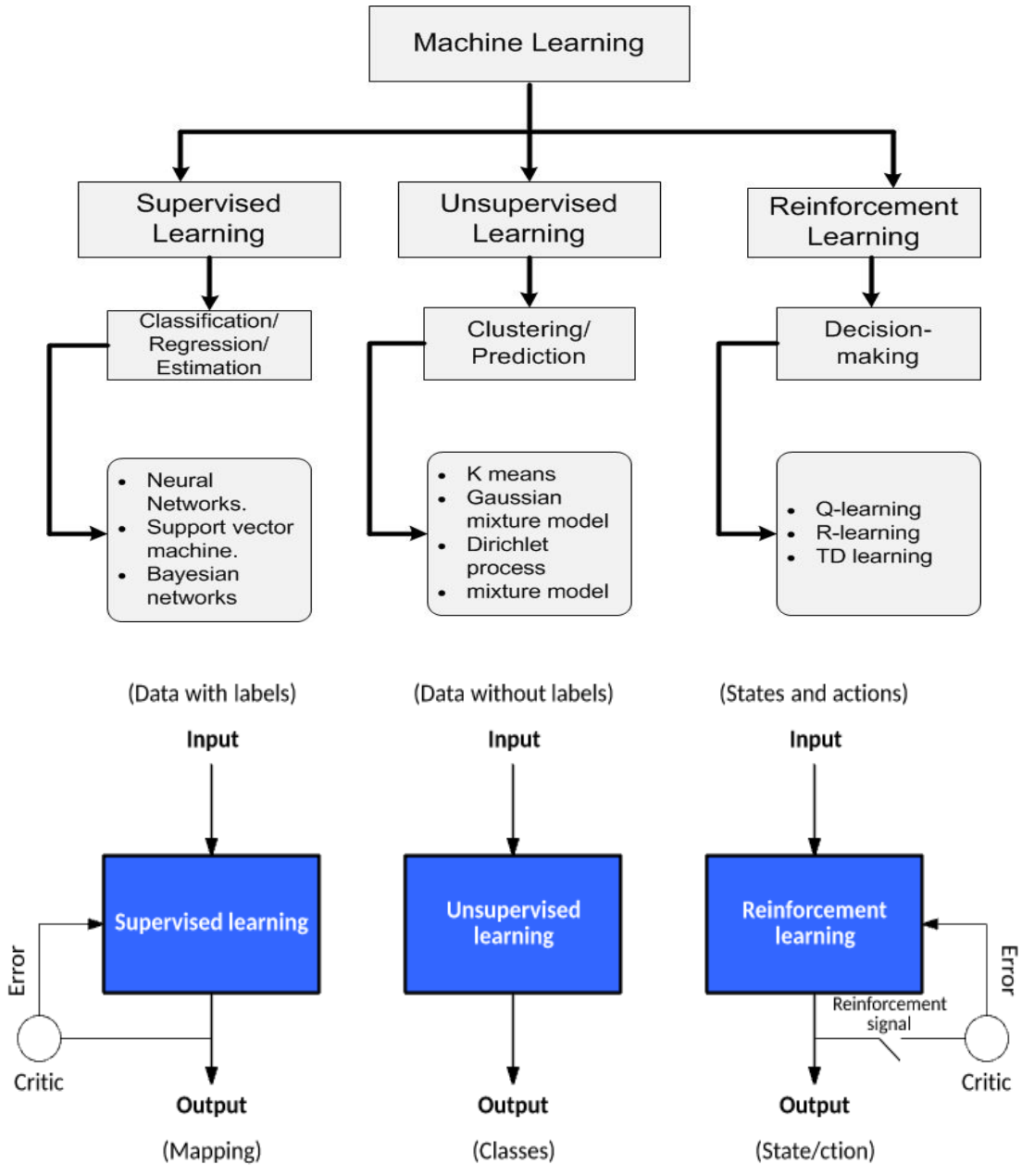
Overall, the paper seeks to bridge the gap in knowledge regarding the application of machine learning techniques in healthcare and offers insights into their effectiveness and potential future directions in the field.

II. RELATED WORK

Supervised Learning: In supervised learning, algorithms are trained on a labelled dataset, where each input is associated with a corresponding output. The goal is to learn a mapping from inputs to outputs so that the algorithm can make predictions on unseen data. [7]Supervised learning is commonly used for classification tasks, where the algorithm predicts the category or class of an input, and regression tasks, where the algorithm predicts a continuous value.

Examples of supervised learning algorithms include decision trees, support vector machines, and neural networks.

Unsupervised Learning: Unsupervised learning involves discovering patterns or structures within a dataset without explicit supervision or labelled output. [6]The algorithm explores the data and identifies inherent relationships or groupings.
Clustering is a common task in unsupervised learning, where the algorithm groups similar data points together based on their features. Unsupervised learning can also be used for dimensionality reduction, anomaly detection, and generative modelling. Examples of unsupervised learning algorithms include k-means clustering, hierarchical clustering, and principal component analysis (PCA).
By categorizing machine learning into supervised and unsupervised learning, you provide a clear framework for understanding how algorithms learn from data and make predictions or uncover patterns. This distinction is fundamental in guiding the selection and application of appropriate machine learning techniques based on the task at hand.



Categorization of machine learning techniques

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 || Monthly Peer Reviewed & Refereed Journal |

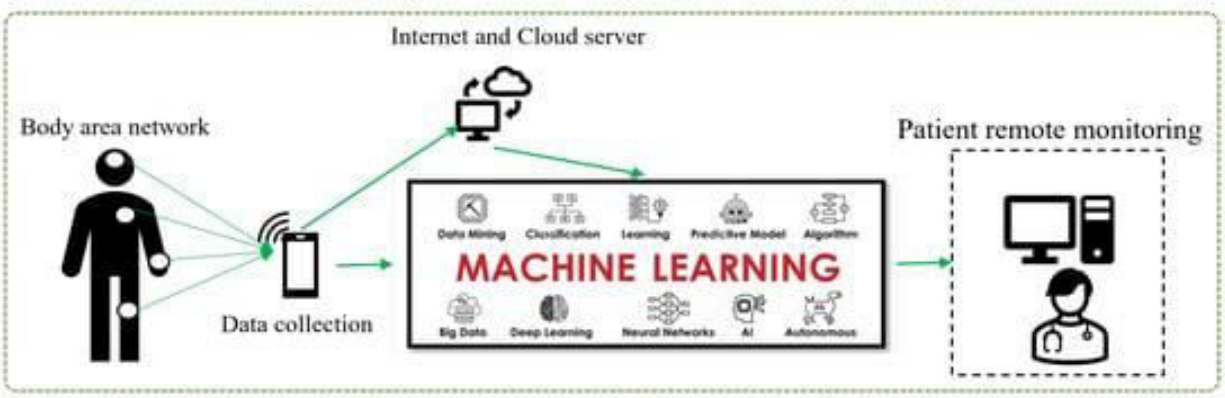
| "1st International Conference on Machine Learning, Optimization and Data Science"|

Organized by

| Department of Computer Science and Engineering, Baderia Global Institute of Engineering and Management, Jabalpur|

|| Volume 12, Special Issue 1, March 2024 ||

Overview of Machine-Learning in Healthcare



Machine Learning in Health Care

Overview of **Summary of the result of the supervised learning** in Healthcare:
A Table of Classification Algorithm Results-

Classification Algorithms	Task
Decision trees	Reduction in data volume. Prediction of heart disease.
Support vector machine (SVM)	Speech recognition, picture recognition, voice recognition, facial detection, and sickness detection and prevention.
Naïve Bayes	Detection of skin diseases. Detection of heart diseases.
K-nearest neighbors	Diagnosis of heart disease.

An overview of the accuracy of **Existing Unsupervised learning** in the healthcare sector

Common Hard Clustering Algorithms	Task
K-means	Some Common Soft Clustering Algorithms
K-medoids	Anomaly detection in smart healthcare
Hierarchical clustering	Mental health prediction

Common Soft Clustering Algorithms	Task
Fuzzy c-means	Examination of how patients perceive satisfaction
Gaussian Mixture Model	Detection of Anomaly
Hidden Markov Model	Categorization of audio events in healthcare

III. APPLICATION FOR HEALTHCARE

The field of medicine stands to benefit greatly from machine learning, which could transform a number of areas of medical practice such as drug development, diagnosis, treatment planning, and patient monitoring. These are a few examples of applications:

1.**Medical Imaging Analysis**: To help with the identification and diagnosis of conditions including cancer, tumours, fractures, and anomalies, machine learning algorithms can examine medical pictures (MRIs, CT scans, X-rays, etc.). Convolutional neural networks (CNNs), one type of deep learning technology, have demonstrated impressive success in this field.

2. **Predictive Analytics**: Readmission probability, mortality risk, and disease progression are just a few of the patient outcomes that machine learning models can forecast. This facilitates early intervention, individualized treatment programs, and efficient resource allocation by healthcare practitioners.

3**. Analysis of Electronic Health Records (EHRs)**: Machine learning can be used to find trends, gain new perspectives, and enhance clinical judgment by examining EHRs. It can help with things like patient stratification, disease classification, and spotting possible drug interactions.

4**. Personalized medicine**: By analysing clinical and genomic data, machine learning algorithms can customize medicines based on a patient's unique genetic composition, lifestyle choices, and medical background. This strategy reduces side effects while increasing treatment efficacy.[9]

5**. Pharmacological Development and Discovery**: By predicting molecular interactions, finding potential drugs, and optimizing pharmacological attributes, machine learning speeds up the drug discovery process. It can also help with the repurposing of current medications for novel uses.

6**. Healthcare Chat bots and Virtual Health Assistants**: Chat bots and virtual assistants that offer individualized health advice, respond to medical inquiries, book appointments, and assist in managing chronic illnesses are powered by machine learning.

7**. Remote Patient Monitoring**: Wearable tech, like fitness trackers and smart watches, can be used to continuously monitor patient data thanks to machine learning. These algorithms have the ability to recognize abnormalities, forecast a decline in health, and instantly notify medical professionals.

8**. Clinical Trial Optimization**: Through the identification of appropriate patient populations, trial result prediction, and recruitment strategy optimization, machine learning enhances clinical trial design. This produces more reliable data and expedites the conclusion of trials.

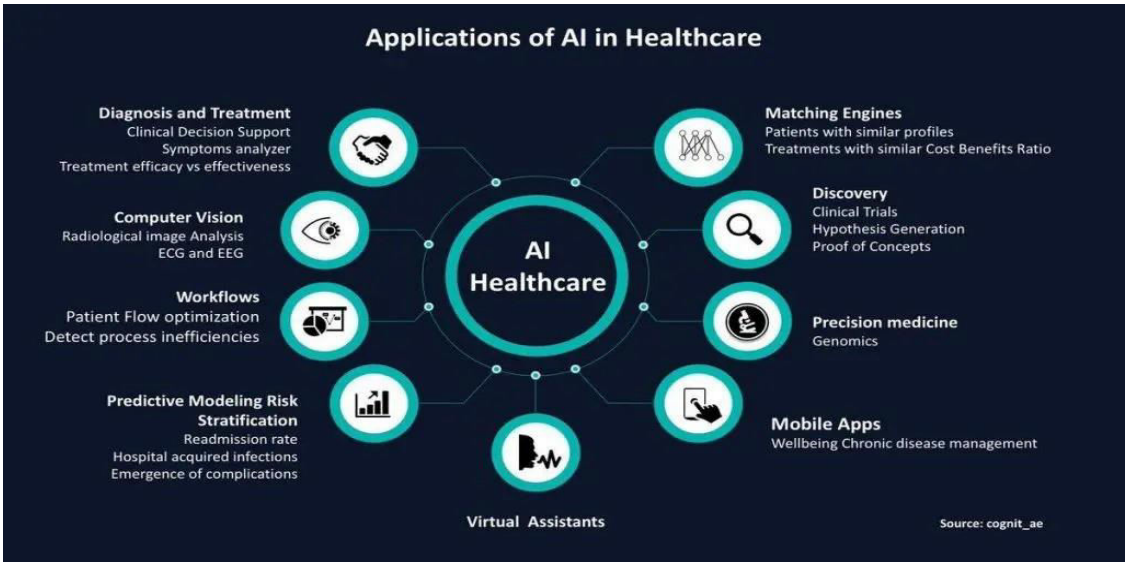
9**. Healthcare Management and Fraud Detection**: Machine learning algorithms are capable of identifying fraudulent activity in insurance, billing, and claims related to healthcare. They contribute to the improvement of healthcare management efficiency and the decrease of healthcare fraud.

10**. Public Health Surveillance**: To track epidemiological patterns, monitor disease outbreaks, and guide public health initiatives, machine learning tools analyse large-scale data, including social media posts, search queries, and electronic health records.[11]

These examples show the various ways that machine learning is changing the healthcare industry, resulting in better patient outcomes, lower costs, and increased system wide efficiency.

ML is being utilized in the healthcare industry to address a number of issues. Patients' quality of life is enhanced when they can receive the appropriate therapy, and the health care system may ensure effective use of resources by providing appropriate treatment plans for individuals. A value-based approach to cancer care may benefit from machine learning (ML), and in order to make this a reality,[4] it will be crucial for different public and private stakeholders to collaborate and have access to linkable health data. The organizational and administrative facets of healthcare delivery, including

patient and bed management, remote monitoring, appointment scheduling, duty roster compilation, and other duties, greatly benefit from this technology.[11] Every day, healthcare personnel are prevented from providing the essential care because they are occupied with repetitive tasks like processing claims and maintaining and administering records.



Application of AI in Healthcare

IV. CONCLUSION AND FUTURE WORK

Machine learning holds immense promise for catalyzing technological transformations within the healthcare sector. It possesses the capability to uncover intricate patterns and insights within patient data, augment diagnostic precision, optimize administrative workflows, and facilitate personalized treatment strategies. Yet, the integration of machine learning in healthcare encounters formidable obstacles, encompassing apprehensions regarding data privacy, ethical quandaries, and imperatives for robust regulation and validation frameworks. Realizing the potential of machine learning in healthcare demands a holistic comprehension of the dynamic healthcare milieu, fostering collaborative synergy between healthcare practitioners and data science experts, and upholding ethical and responsible utilization of machine learning to advance patient welfare.

REFERENCES

1. Balaha, H.M.; Hassan, A.E.S. Skin cancer diagnosis based on deep transfer learning and sparrow search algorithm. *Neural Comput. Appl.* **2023**.
2. Nagarajan, S.M.; Muthukumaran, V.; Murugesan, R.; Joseph, R.B.; Meram, M.; Prathik, A. Innovative feature selection and classification model for heart disease prediction. *J. Reliab. Intell. Environ.* **2022** .
3. Garg, A.; Mago, V. Role of machine learning in medical research: A survey. *Comput. Sci. Rev.* **2021**,
4. Qureshi, K.N.; Din, S.; Jeon, G.; Piccialli, F. An accurate and dynamic predictive model for a smart M-Health system using machine learning. *Inf. Sci.* **2020**.
5. Sidey-Gibbons, J.A.; Sidey-Gibbons, C.J. Machine learning in medicine: A practical introduction. *BMC Med. Res. Methodol.* **2019**.
6. Palacio-Niño, J.O.; Berzal, F. Evaluation metrics for unsupervised learning algorithms. *arXiv* **2019**.
7. El Mrabet, M.A.; El Makkaoui, K.; Faize, A. Supervised machine learning: A survey. In Proceedings of the 2021 4th International Conference on Advanced Communication Technologies and Networking (CommNet), Rabat, Morocco, 3–5 December 2021.
8. Muhammad, L.; Algehyne, E.A.; Usman, S.S.; Ahmad, A.; Chakraborty, C.; Mohammed, I.A. Supervised machine learning models for prediction of COVID-19 infection using epidemiology dataset. *SN Comput. Sci.* **2021**.

9. A. Haleem, M. Javaid, I.H. Khan, Current status and applications of Artificial Intelligence (AI) in medical field: an overview, Current Medicine Research and Practice 9 (6) (2019) 231–237.
10. S.S. Waghade, A.M. Karandikar, A comprehensive study of healthcare fraud detection based on machine learning, Int. J. Appl. Eng. Res. 13 (6) (2018).
11. Subasi, K. Khateeb, T. Brahimi, A. Sarirete, Human activity recognition using machine learning methods in a smart healthcare environment, in: Innovation in Health Informatics, Academic Press, 2020.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi crossref

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details