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# Recent Trends in Machine Learning for Health Care Sector

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**Abstract-** *Nowadays computer-aided disease diagnosis from medical data through deep learning methods has become a wide area of research. Disease prediction from healthcare data which substantiates useful information in large quantity related to patients with various diseases is a problem related to the medical domain. Predicting disease risk entails probability prediction of disease and establish a preventive measure for either decreasing disease risk effect upon the patients in a particular way or preventing the risk of the disease altogether. Disease prediction has many benefits such as early-stage disease diagnosis, limit morbidity, and prevent mortality. In this paper, we mentioned the machine learning techniques for the health care sector to predict the disease detection ratio.*

**Keywords:-** Information and Communication Technology, Artificial Intelligence, Machine Learning, Health Care.

## INTRODUCTION

In healthcare systems, Information and Communication Technology (ICT) takes part in offering an opportunity in developing not only the value and adeptness of the healthcare systems but also improves the quality of health services. Healthcare around the world has its significance in general progressing of the physical condition and the welfare of human beings. Sometimes the healthcare data are found hard to classify because of the uncertainty and nature of medical data which are supposed to have increased dimensionality. Healthcare data have details such as patient-centric facts, reports about treatments and, resource management information. These statistics are huge and filled with information. In healthcare data mining methods can be probably used in finding hidden relationships and trends in data.

To provide good and on-time healthcare services is the primary goal of any government or any agencies, the process of disease diagnosis is a challenging area for medical science. There are various tools we used for the medical disease diagnosis in current. The diagnosis system depends on any penitent's treatment, history, huge medical data etc., The healthcare industry is the especially fastest-growing part of the economy of many countries in modern society. There are various diseases to diagnose such as heart, cancer, diabetes, and liver etc. Heart disease prediction and classification is a major issue in the current lifestyle and diagnosis system. For the prediction and classification used various clustering, classification algorithm are used such as support vector machines, neural networks, and using other optimization technique. Optimal selection of cluster and classifier value used to improve the results of classifier and optimization techniques. So far, numerous works have contributed to finding consensus clustering. Compared classification accuracy on the same datasets between conventional and proposed algorithms.

Artificial intelligence (AI) is a broader term that refers to technologies or systems being able to demonstrate human-like intelligence. Machine learning (ML) is a subset of AI that refers to the ability of machines to learn from data, improve at tasks with experience, and make predictions. AI and ML have been applied to a variety of industries. In healthcare, there is an expanding body of literature on ML-based algorithms and their potential clinical utility. Deep neural networks have become the state-of-the-art for a range of tasks such as image classification, speech recognition, natural language processing, and based on complex data such as electronic health records (EHR), imaging, bio-sensors, omics, and text [5].

Deep Learning has been quickly adapted to many application domains for data-driven discoveries. Different from both Big Data processing systems such as Hadoop and Spark and statistical analysis tools such as R, deep learning is a relatively new methodology that emerged from Data Mining that is used to derive insights from data. However, successful application of deep learning to a practical problem requires significant knowledge about the data, the algorithm, programing efforts and computational resources. Usually, the developments of these techniques require exhaustive computing making the development, and scalability of machine learning models impractical [8].

Machine learning is a subfield of Artificial Intelligence that allows a computer system to learn from the environment, through re-iterative processes and improve itself from experience. Machine learning algorithms organize the data, learn from it, gather insights and make predictions based on the information it analyzed without the need for additional explicit programming. Training a model with data and after that using the model to predict any new data is the concern of machine learning. Machine learning algorithms are widely composed of supervised, unsupervised, semi-supervised, and reinforcement learning [11]. The development of machine learning has proven to better describe data as a result of providing both engineering solutions and an important benchmark.

Machine learning algorithms were developed with numerous features such as effective performance on healthcare-related data that includes text, images, X-rays, blood samples etc. The choice of the algorithm to be used depends on the type of dataset, be it large or small. Sometimes the noise in a dataset can be a drawback to some machine learning algorithms. Sometimes, after viewing a dataset, interpreting the pattern and extracting meaningful information becomes difficult, hence the need for machine learning. At a regularization point where a model quality is highest, variance and bias problems are compromised, and that is where Random Forest (RF) model is used. Random Forest has the capability of building numerous numbers of decision trees using random samples with a replacement to overcome the shortcomings of the Decision tree algorithm.

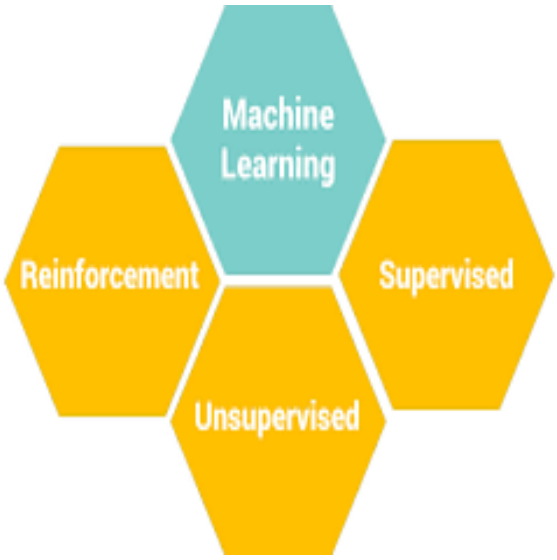


**Fig 1:** Components of machine learning.

## II MACHINE LEARNING

There are various tools and technology for the prediction and classification available machine

learning is most popular tools among them. Machine learning is popular programming tools for the prediction and classification of a large or huge amount of data, the classification is also a method of data mining which primary object is to a grouping of the same data or the same pattern of the data in a single group. Machine learning is differs from the traditional programming language.

As we know that the machine learning tools provide the concept of pattern analysis or behavioral analysis for a large amount of data, basically it is categorized the data according to their properties or behavior such as their shape, size, used places, their attributes etc., classification is also challenging task for the dynamic nature or regularly updated data there is some classification are supervised classification, up-supervised classification, semi-supervised classification. In the classification category, there are two types of dataset test dataset and train dataset. This special classes data are also called labeled data or known data. These types of classification are known as supervised classification.

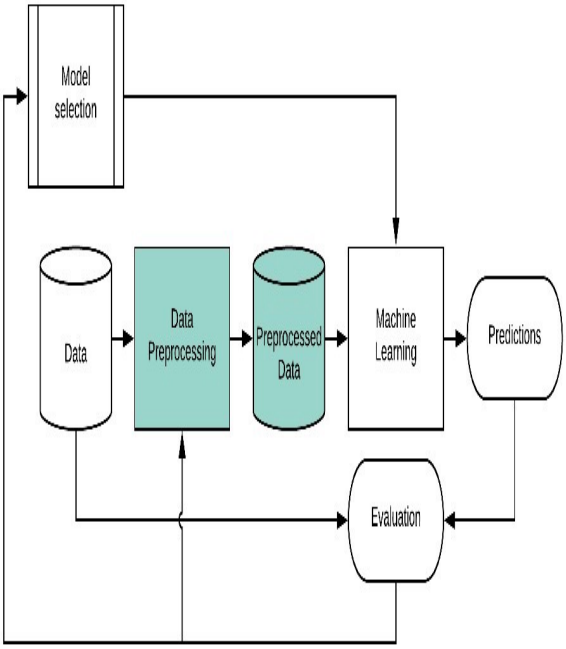


**Fig 2:** Machine learning work flow.

Another form of classification is also known as unsupervised classification where no class data or known data, here we work with the unknown data and there is no already created class data or we can say that there is no target object or an output. The unsupervised classification is also provides the grouping of data but without target output, it is also known as clustering of the data.

## III RELATED WORK

Here we discuss the health care sector for various diseases over machine learning and other techniques, in the real world there are various diseases such as heart diseases, liver diseases, cancer, tumor diseases, and diabetes etc., here we discuss only the heart diseases, the brief study of some good examples are stated as follows:

[1] In this work, a fuzzy hybridized convolutional neural network (FCNN) model is stated to guess the class of healthcare data. This model collects the information from the data set and builds the decision table based on the collected features from data sets. The unrelated attributes are deleted by using the principal component analysis algorithm. The decision of normal and cardiac disease is described by using the FCNN classifier. Using the data sets from the UCI (University of California Irvine) repository the estimation of the presented model is carried on. The performance of the authors' classification technique is measured by various metrics such as accuracy, F-measure, G-mean, precision, and recall. The experimental results while compared with some of the existing machine learning methods such as probabilistic neural network, support vector machine, and neural network, show the higher performance of FCNN. This model presented in this work acts as a decision support pattern in healthcare for therapeutic specialists.

[2] In healthcare, it is necessary to predict diverse situations accurately. Accordingly to care for mental health, it is necessary to recognize individuals' situations and continue to manage them. In the area of mental diseases and treatment, research has been conducted to find a patient's

state with the use of big data and to monitor the worst situation. Mental illnesses typically have depression. Research on Mental healthcare using artificial intelligence does conduct on prediction based on patients' voice, word choice, and conversation length. However, there is not much research on situation prediction to prevent depression. Therefore, this study proposes the context-DNN model for predicting depression risk using multiple-regression. The context of the proposed context-DNN consists of the information to predict situations and environments influencing depression in consideration of context information.

[3] Here author presents deep-learning techniques for healthcare, centering our discussion on deep learning in computer vision, natural language processing, reinforcement learning, and generalized methods. They describe how these computational techniques can impact a few key areas of medicine and explore how to build end-to-end systems. Their discussion of computer vision focuses largely on medical imaging, and we describe the application of natural language processing to domains such as electronic health record data. Similarly, reinforcement learning is discussed in the context of robotic-assisted surgery, and generalized deep-learning methods for genomics are reviewed.

[5] Distributed machine learning-based solutions can provide great benefit to the medical field by enhancing seamless collaboration across entities. Split learning has shown benefits compared to alternative distributed learning methods. They have applied split learning in the medical field for the first time and it worked great compared to conventional single and multi-institution setups. Their results show that teaming up, in general, can give a great performance boost. Their results show that teaming up in a distributed learning setting, in general, can give a great performance boost in comparison to non-collaboration. In the futures we will also compare federated learning and LS-SGD within the medical setup.

[6] This work presents an experimental analysis of four classifiers by collecting Cleveland Heart disease data from the UCI repository. Initially, data preprocessing was done through the filters in Weka. Based on the subset of attributes chosen by the feature selection filter, the input data is provided to the classifier for classification. The Accuracy measure of the four classifiers is given higher priority to judge the best classifier. Based on the experimental results, Deep Neural Network with three hidden layers fully interconnected from input to output layers has a better accuracy of 85.478% when compared to other classifiers. In the future, author focus on improving the accuracy of our Deep Neural Network by increasing more number of features to the input dataset by adopting other feature selection techniques, implementing more than one activation function i.e., sigmoid function, hyperbolic tangent function at each hidden layer rather than same activation function at each hidden layer, making use of population based evolutionary techniques for optimizing neural network parameters.

[7] This review article provides an overview of artificial intelligence (AI) and machine learning (ML) as it relates to cardiovascular healthcare. AI is a broader term referring to the ability of machines to perform intelligent tasks, and ML is a subset of AI that refers to the ability of machines to learn independently and make accurate predictions. An expanding body of literature has been published using ML in cardiovascular healthcare. Moreover, ML has been applied in the settings of automated imaging interpretation, natural language processing and data extraction from electronic health records, and predictive analytics. Examples include automated interpretation of chest X-rays, electrocardiograms, echocardiograms, and angiography, identification of patients with early heart failure using clinical notes evaluated by ML, and predicting mortality or complications following percutaneous or surgical cardiovascular procedures.

[8] In this paper, they utilize distributed and parallel computation techniques to efficiently

analyze healthcare data using Deep Learning techniques. They demonstrate the scalability and computational benefits of this approach with a case study of longitudinal assessment of approximately 150,000 types 2 diabetic patients. Diabetes Mellitus (T2DM) is the fourth case of mortality worldwide with rising prevalence. T2DM leads to adverse events such as acute myocardial infarction, major amputations and avoidable hospitalizations. This study aims to establish a relation between laboratory and medical assessment variables with the occurrence of the aforementioned adverse events and its prediction using Machine Learning Techniques. They use a raw database provided by Basque Health Service, Spain to conduct this study. This database contains 150,156 patients diagnosed with Type 2 diabetes mellitus, from whom 321 laboratory and medical assessment variables recorded over four years are available.

## IV CONCLUSION

Machine Learning (ML) is distinct from other types of computer programming in that it transforms the inputs of an algorithm into outputs using statistical, data-driven rules that are automatically derived from a large set of examples, rather than being explicitly specified by humans. Historically, constructing a an ML system required domain expertise and human engineering to design feature extractors that transformed raw data into suitable representations from which a learning algorithm could detect patterns. Here we present the machine learning techniques study for the health care sector to predict the disease at an early stage and improve the performance of prediction and detection ratio.

## REFERENCES:

[1] Balamurugan Ramasamy, Abdul Zubar Hameed, “Classification of healthcare data using hybridised fuzzy and convolutional neural network”, Healthcare Technology Letters, 2019, pp. 59–63.

[2] Ji-Won Baek, Kyungyong Chung, “Context Deep Neural Network Model for Predicting Depression Risk Using Multiple Regression”, IEEE Access, 2020, pp. 18171-18181.

[3] Andre Esteva, Alexandre Robicquet, Bharath Ramsundar, Volodymyr Kuleshov, Mark DePristo, Katherine Chou, Claire Cui, Greg Corrado, Sebastian Thrun, Jeff Dean, “A guide to deep learning in healthcare”, Nat ure Medicine, JANUARY 2019, pp. 24–29.

[4] Muhammad Aurangzeb Ahmad, Carly Eckert, Ankur Teredesai, Greg McKelvey, “Interpretable Machine Learning in Healthcare”, IEEE Intelligent Informatics Bulletin, 2018, pp. 1-7.

[5] Maarten G.Poirot, Praneeth Vepakomma, Ken Chang, Jayashree Kalpathy-Cramer, Rajiv Gupta, Ramesh Raskar, “Split Learning for collaborative deep learning in Healthcare”, IEEE 2019, pp. 1-8.

[6] Chittem Leela Krishna, Poli Venkata Subba Reddy, “An Efficient Deep Neural Network Multilayer Perceptron Based Classifier in Healthcare System”, Third International Conference On Computing And Communication Technologies, IEEE 2019, pp. 1-6.

[7] Arman Kilic, “Artificial Intelligence and Machine Learning in Cardiovascular Healthcare”, The Annals of Thoracic Surgery, 2019, pp. 1-29.

[8] Daniel Sierra-Sosa, Begonya Garcia-Zapirain, Cristian Castillo, Ibon Oleagordia, Roberto Nuno-Solinis, Maider Urtaran-Laresgoiti, Adel Elmaghraby, “Scalable Healthcare Assessment for Diabetic Patients using Deep Learning on Multiple GPUs”, IEEE 2019, pp 1-8.

[9] Mohd Usama, Belal Ahmad, Wenjing Xiao, M. Shamim Hossain, Ghulam Muhammad, “Self-attention based recurrent convolutional neural network for disease prediction using healthcare data”, Computer Methods and Programs in Biomedicine, 2019, pp.1-32.

[10] Jenna Wiens, Suchi Saria, Mark Sendak, Marzyeh Ghassemi, Vincent X. Liu, Finale Doshi-

Velez, Kenneth Jung, Katherine Heller, David Kale, Mohammed Saeed, Pilar N. Ossorio, Sonoo Thadaney-Israni, Anna Goldenberg, "Do no harm: a roadmap for responsible machine learning for health care", Nature Medicine, 2019, PP. 1-4.

[11] Khan Muhammad, Salman Khan, Javier Del Ser, Victor Hugo C. de Albuquerque, "Deep Learning for Multigrade Brain Tumor Classification in Smart Healthcare Systems: A Prospective Survey", IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS, 2020, pp. 1-16.

[12] Deepak Kumar Rathore, Dr. Praveen Kumar Mannepalli, "A Review of Machine Learning Techniques and Applications for Health Care ", International Conference on Advances in Technology, Management & Education, 2021, IEEE proceeding, 978-1-7281-8586-6/21.

[13] Moloud Abdar, Wojciech Ksiazek , U Rajendra Acharya, Ru-San Tan, Vladimir Makarenkov, PawełPławiak, "A new machine learning technique for an accurate diagnosis of coronary artery disease", Computer Methods and Programs in Biomedicine, 2019, pp. 1-12.

[14] Senthilkumar Mohan, Chandrasegar Thirumalai, Gautam Srivastava, "Effective Heart Disease Prediction Using Hybrid Machine Learning Techniques', IEEE Access 2019, pp. 81542-81554.