



A Study On Applications of Machine Learning Techniques in Healthcare Sector

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ABSTRACT

The necessity of medical diagnosis is apparent because it helps save human lives and therefore is a very intricate task that needs to be executed accurately and efficiently. Consequently, a proper and precise computerized based supportive decision network will reduce the clinical tests cost. The Machine learning (ML) technique predicts the results based on healthcare data precisely through various statistical methods and advanced algorithms. Therefore, applying the computer-based decision support system can assume a significant job incorrect diagnosis and financially savvy treatment. The aim of machine learning is to create progressively positive result accompanies progressively exact forecasts. The paper gives a short insight into the classification of the diseases through machine learning techniques. It analyzes the variety of data information the different machine learning algorithms use, such as supervised, unsupervised, and reinforced algorithms, to improve expectations that can be broken down utilizing different execution parameters.

Keywords: Machine Learning, Healthcare, Classification, Disease, Treatment.

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INTRODUCTION

Computer utilization and information technology are progressively executed in the healthcare sector to help specialists in their everyday decision-making exercises. It helps the specialists and doctors supervise diseases, prescriptions, tests, and detection of symptoms and the relationship between medical and treatment in formation by utilizing machine learning techniques. Over the previous decade, an Indian healthcare service has been recognized as a swiftly growing industry. The Healthcare sector is taking care of different illnesses, including cancer, strokes, diabetes, etc., by utilizing machine learning techniques[1]. Nowadays, the healthcare sector produces much multifarious information regarding patients concerning clinical assessment and examination, hospital records, medicine, electronic patient records, and so on, which has achieved unwieldy to sort out appropriately.

The nature of the decision is getting exaggerated in any organization for assessing data information which is getting inappropriate information because these expansions of data size need a mechanism by which information may be processed efficiently and extracted. The perfect treatment of hazardous ailments, for example, cancer, liver ailment, heart illness, and so on, is a vital task in healthcare. Computers and humans can be incorporated mutually to accomplish the most significant outcomes for the proper finding of illnesses through adjusting information on specialist allied spaces with the tremendous capability of systems [2]. This sort of trouble could be settled with the assistance of machine learning techniques. An application of the computer-based decision support system will assume a significant job incorrect diagnosis and financially savvy treatment [3].

MACHINE LEARNING(ML)

Machine learning had been introduced by Samuel in the year 1950 to play the most prominent game, i.e., chess, and it is a component of making machines adapt naturally, sans being expressly programming [4]. The main focal point for machine learning is making and building a computer programming that can easily access data-based information and use the information for learning. It succinctly aids specialists in the process of making a perfect diagnosis. It is the capacity of the machine to utilize statistical methods and propelled algorithms for the sake of, all the more remarkable, forecast which builds the information-operated rule-based framework [5]. The principal part of machine learning information is the focal point for any model, and thus the more applicable information, the more exact forecasts will be obtained. After

data information, we have to choose the algorithms to depend on the issue for progressively exact expectations. Applications of machine learning can be used in the accurate diagnosis, prescribing medicines, and different sorts of pathological tests and the early symptom of diseases and, at a later stage, the right kinds of opinion-making. Medical diagnosis is a significant aspect of things as it decides the line of treatment in a better way. That is why the utilization of techniques through machine learning is widely being used. Thus, machine learning is very crucial for the fast and accurate line of treatments. An application of the computer-based decision support system can assume a significant job incorrect diagnosis and financially savvy treatments[6]. The aim of machine learning is to create progressively positive results for accurate forecasts and it seems that machine learning is very effective in the classification of disease in a better way. Applications of machine learning can be seen in numerous fields, such as healthcare, social data, social media, retail, traffic control, self-driving car, speech recognition, image recognition, medical diagnosis, etc.

CLASSIFICATION OF ML TECHNIQUES

Machine learning is an area of Artificial Intelligence (AI) that includes the development of algorithms to consequently study through the performance of algorithm and experience to get enhanced with every understanding. The algorithm recognizes some prototypes in input information and structure-based models dependent on input information to build exact forecasts for new information [7]. A machine learning technique intensely depends on processing power. Building algorithms fit for doing this utilizes the binary 'yes' and 'no' are the logic of the computers and is the establishment of machine learning. Machine learning can be utilized for various reasons. The various kinds of machine learning algorithms and their techniques are shown in figure 1.

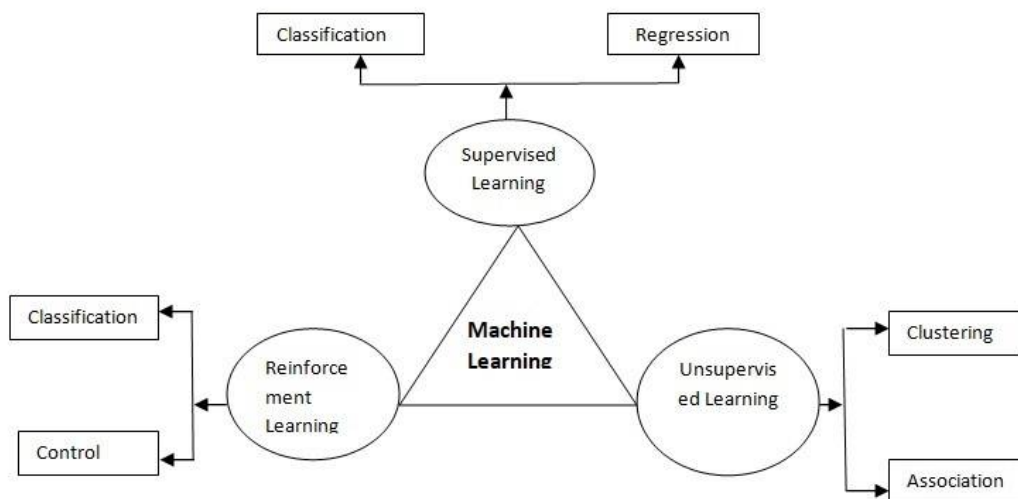


Figure 1: Classification of Machine Learning Techniques

The machine learning techniques depend on distinguishing designs and patterns from the huge data collections that offer help for expectations and assessment process for diagnosis and plan for treatment. Machine learning predicts precisely the output of healthcare data by applying various algorithms such as supervised, unsupervised and reinforcement, etc., for analysis. The classifications of machine learning techniques are as follows:

Supervised Learning Techniques:

It includes the training set on the labeled data information and utilizes it to make expectations on the new information. It includes splitting of data information into two sets, including training set and testing set. First, the set is trained on the training set, and after a while, the exhibition is tried on the testing set. The presentation of the set can be classified utilizing regression measurements. A marked assessment of supervised learning can be broadly divided into classified or regression problems. However, on the other hand, the sets are utilized to foresee the result, which depends on numerical data information in regression of supervised learning [8].

While classifying the primary information data, initially the data is chosen, subsequently afterward before processing is acted and all missing values (NA) are evacuated. At that point, data is standardized utilizing min-max standardization or z-score. Then, the standardization is applied to choose the best highlights,

which is performed including choice strategy. Once the highlight is chosen, a few supervised machine learning algorithms incorporate like K-nearest neighbor, statistical techniques, support vector machines, decision trees, soft computing techniques; neural network and naïve bays classifier is utilized for classification of raw data information as mentioned below:

Decision Tree

Decision Tree is similar to tree-like structure for predictive model and its applications spreading over various fields. It is built utilizing an algorithm methodology that distinguishes approaches to divide the information support on different situations. The tree is one of the most broadly utilized and down-to-earth strategies for supervised technique learning. It is a non-parametric supervised technique utilized in the regression and classification assignments [9]. The goal is to construct a structure that forecasts the estimation of a target variable by taking in essential decision policy gathered from the information highlighted. For example, the breast cancer treatments used as a decision tree by the method of the classifier as shown in figure 2:

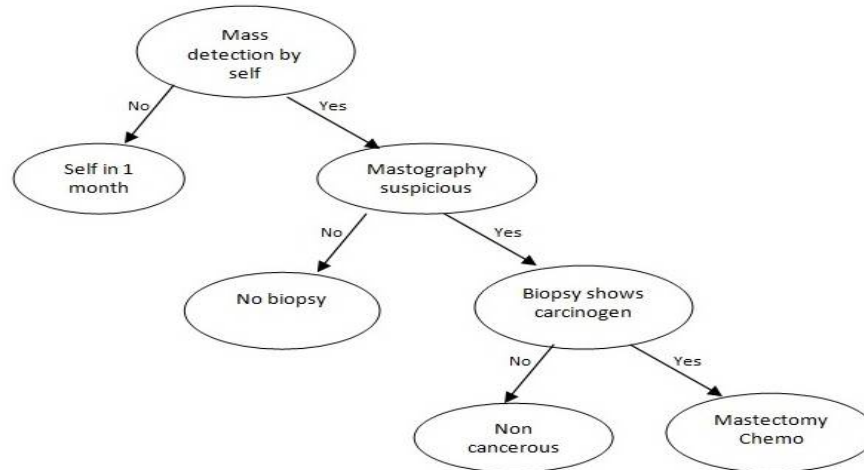


Figure 2: Example of the Decision Tree for breast cancer

Soft Computing Techniques

It is the combination of systems, for example, fuzzy algorithms, genetic algorithms, and artificial neural networks, which is intended to structure and enable answers for the actual global issues that are complicated to express in the mathematical model [10]. The neural network is a distributed data processing and parallel structure comprising considerable quantities for handling components known as nodes interconnected through a rectilinear sign channel called connection. Every component has only one output link, divided into several links, and has a similar sign—for example, Back Propagation Network and Multilayer Perceptron Neural Network.

Statistical Techniques

This technique depends on a hypothesis that explains a specific sampling and has a place with a specific set showing the probability significance P , which is $0 \leq P \leq 1$, e.g., Naïve Bayes and Bayesian networks classifier [11].

Support Vector Machines (SVM)

SVM is the latest supervised ML technique by Vapnik in the year 1995 [12]. It reduces experimental inaccuracy arrangement and amplifies the geometrical edge among these classes. The radial basis function part of SVM may be utilized to arrange high dimension information, including few arithmetic challenges. The data sets are classified into training and test set, which can be utilized to evaluate the SVM classifier structure set performance made via training set. The test's data set accuracy may be avoided possible unfairness of the presentation, approximate owing to training data set.

Hybrid approach

The word hybrid intends to combine two or more approaches or techniques to construct another model.

Unsupervised Learning Techniques

If there should arise an occurrence of unsupervised machine learning, the algorithm gathers a mapping capacity to discover pattern examples and the connection between them from the unlabelled input dataset. Information dataset involves models; every model is information with no unequivocal output significance. We can discover association by grouping the data information because there is a lack of

advice or instructor accessible for improvement, e.g., a need to find an affectionate gathering of the group in Facebook. For example, hierarchical clustering, K-means clustering algorithm.

Reinforcement learning

It is an iterative procedure that builds up a framework that rectifies and improves the presentation by taking opinions from the environment and finding a way to improve them. It is a demonstration of learning from the condition by communicating with no assistance from the people.

APPLICATION OF MACHINE LEARNING TECHNIQUES IN THE MEDICAL AND ALLIED FIELDS

Medical and healthcare services are the driving businesses with humanitarian objectives. Brilliant uses of machine learning are nowadays involved in several fields such as record-keeping, billing, insurance, patient care, staff arrangements, etc. Over the past years, innovative gadgets have changed significantly. The volume of data information and its difficulties, the different savvy gadgets utilized, and algorithms explicit to the healthcare domain [13]. Machine learning techniques are better outcomes in the medical services area. Because of the fastest decision-making, improved proficiency in clinical preliminaries and advanced development [14]. There are different uses of ML in medical and allied fields. They are comprehensively arranged into the following:

Diagnosis on a worldwide level:

Machine learning applications and algorithms achieved in sickness treatment, giving straightforward finding and online diagnosis in provincial regions, identify patterns in the illness movement challenging to distinguish and make a worldwide storehouse of investigation to assist good healthcare section [15]. A few portions of malignancy recognition, hereditary symptoms, and challenging to treat. For example, hemophilia, diabetes, color blindness, and so on, giving remedies and anticipating conditions like depression, stress, etc.

MRI and Scans Diagnosis:

Machine learning and Deep Learning have been answerable to improve highly developed imaging gadgets like magnetic resonance imaging, computer-aided tomography scans, ultrasound scans, or non-invasive Doppler [16]. The improvements exemplify machine learning training, treatment of enormous data levels, and machine learning capacity to predict accurately for the advancement of tumors and aneurysms.

New drugs discovery & manufacturing:

Investigation Discovery and utilization of the most recent medications are significant today as we find other illnesses and nervous tension that are regular medication safe. Machine learning permits the learning in an unsupervised manner and grows the latest medications through ideal doses customized for carcinogenic (cancer-causing substance) patients.

Behavior therapy modification:

Anticipation being better than fix, a couple of startup firms are approaching with gesture control-based treatment applications, suggestive examination, early carcinogenic caution, and relevant applications, sleep trackers, and such conduct detecting applications that can help even with foreseeing the powerlessness to hereditary diseases. For example, Sheryl Crow experienced mastectomy dependent on such prediction of carcinogenic.

App-based remedial:

Presently clinical expectations apply bio-sensors, accurate data, hereditary information, and symptoms to break down disorders which will, in general, have relatively current treatment strategies. However, the moment is not away from where machine learning may offer all-encompassing customized cure alternatives which could facilitate quicker recuperation through distinguishing fundamental reason, counts calories, ideal medication measurements, and recuperation ways in a second. Indeed, even the very procedure of looking for a specialist's recommendation has all the earmarks of going on the web to connect stretch out into province areas and the individual healthcare sector.

Epidemic Prediction:

Deep learning, machine learning, and artificial intelligence have prevailed within aiding healthcare and precisely and through unsupervised learning foresee and gauge pestilence flare-ups which would then be able to be stopped from really developing.

Smart storage and insurance claim:

Enhance the support of records and is the trouble-free cashless admission and treatment in the hospital. Machine learning is captivating exceptionally enormous steps through brilliant applications to empower savvy well-being reports progressively; improved report categorization in the case of smart settlement in deficient documents for an insurance claim.

Research & development and medical trial:

ML has a high perspective in the research & development and medical trial areas of clinical consideration in which it plays a vital role in improvement and development.

Data crowd sourcing:

The intelligent applications controlled through smart machine learning permit specialists universally to crowd sourcing their data information assets felicitate immediate finding, treatment, and good healthcare services. Nowadays, complex delivery and operation can be conveyance effectively and securely.

Medical and radiotherapy imaging:

Radiology, pathology, laser medications, cosmetology, gastroenterology, and many branches of medicine are by and large imaginatively modernized with a brilliant algorithm-based ML to construct a model of the single case, which individually helpful making it more straightforward to treat effectively.

CONCLUSION

This paper gives a holistic approach to the classification of diseases through machine learning techniques. The accuracy of classification relies upon the specific measurements for utilizing and shows the varying features that have been used. Therefore, the classifier's function is significant in the healthcare sector with the goal that the outcomes can be utilized to decide the treatment for finding effective and precise frameworks. By analyzing the different types of data information, the different machine learning algorithms are used, like supervised, unsupervised, and reinforced algorithms, to improve more expectations that can be extracted by utilizing different execution parameters like precision, specificity, affectability, particularity, accuracy, and so forth. In this paper, machine learning algorithms are characterized and utilized for examining various types of healthcare data information such as clinical, sensor data information, and omics. It can be summarized for analyzing various kinds of data information in the healthcare sector in different machine learning algorithms, and dimensionality reduction techniques are proposed by different researchers for endurance forecast of patient's disease.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

1. B. Nithya and V. Ilango (2017). Predictive analytics in health care using machine learning tools and techniques. *International Conference on Intelligent Computing and Control Systems (ICICCS)*; Madurai. 492-499.
2. Michalski, R.S., Carbonell, J.G. and Mitchell, T.M. eds. (2013). Machine learning: An artificial intelligence approach. *Springer Science & Business Media*.
3. Vanisree K, Jyothi Singaraju (2011). Decision Support System for Congenital Heart Disease Diagnosis based on Signs and Symptoms using Neural Networks. *International Journal of Computer Applications*; 19(6): 6-12.
4. Samuel, A. L. (1959). Some studies in machine learning using the game of checkers. *IBM Journal of research and development*; 3(3): 210-229.
5. Zheng T, Xie W, et al. (2017). A machine learning-based framework to identify type 2 diabetes through electronic health records. *Int J Med Inform*; 97:120-127.
6. Moustakis, V. and Charissis, G. (1999). Machine learning and medical decision making in book *Machine Learning and Its Applications: Advanced Lectures*, vol 2049. Springer, 300-307.
7. Zacharaki EI, Wang S, et al. (2009). Classification of brain tumor type and grade using MRI texture and shape in a machine learning scheme. *MagnReson Med.*; 62(6):1609-1618.
8. Osisanwo, F., J. Akinsola, et al. (2017). Supervised machine learning algorithms: classification and comparison. *International Journal of Computer Trends and Technology (IJCTT)*; 48(3): 128-138.
9. A. T. Azar and S. M. El-Metwally (2013). Decision tree classifiers for automated medical diagnosis. *Neural Comput Appl.*; vol. 23, no.7-8: 2387-2403.
10. D. R. Chowdhury, M. Chatterjee & R. K. Samanta (2011). An Artificial Neural Network Model for Neonatal Disease Diagnosis. *International Journal of Artificial Intelligence and Expert Systems (IJAE)*; vol. 2, no. 3, 96-106.
11. Rish, I. (2001). An empirical study of the naive Bayes classifier. *IJCAI 2001 workshop on empirical methods in artificial intelligence*.
12. Vapnik, V., I. Guyon and T. Hastie (1995). Support vector machines. *Mach. Learn*; 20(3): 273-297.
13. H. Dou (2019). Applications of Machine Learning in The Field of Medical Care," 34thYouth Academic Annual Conference of Chinese Association of Automation (YAC), Jinzhou, China. 176-179.
14. Raheja K, Dubey A, Chawda R. (2018). Data analysis and its importance in health care. *Int. Computer Trends and Technology*; J.48: 176-180.
15. Beam AL, Kohane IS. (2018). Big data and machine learning in health care. *JAMA*; Available on: +<http://dx.doi.org/10.1001/jama.2017.18391>.
16. Zacharaki EI, Wang S, et al. (2009). Classification of brain tumor type and grade using MRI texture and shape in a machine learning scheme; *MagnReson Med.*; 62(6):1609-1618.

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