

Predicting Liver Disease Through Machine Learning Techniques

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Abstract: The incidence of disease caused to the liver has increased rapidly due to excessive alcohol consumption, inhalation of polluted air, having contaminated food so a medical professional program should support the doctor to predict the disease automatically. By the recursive development of technology in artificial intelligence, prior diagnosis of liver disease could be done, so people could diagnose easily fatal disease in early stages. This would greatly help the health care community, and a specialist diagnosis system can be used in a remote location. The liver has a vital role in human health and helps in the removal of unwanted chemicals and toxins from the human body. Therefore, prior detection has a major role in diagnosis and recovery. Various types of machine learning methods that are used to diagnose liver disease are KNN, NB, DNN, SVM, K-Mean and DT, etc. Which provides each individual accuracy and sensitivity. The objective of this paper is to present a survey and analysis of all diagnostic techniques for liver diseases diagnosis in the medical field, which are already being used for predicting liver disease by different experts and the analysis will be based on accuracy, sensitivity, and clarity.

Keywords: Machine Learning, LR-Logistic Regression, KNN- K Nearest Neighbor, DT-Decision Tree, NB- Naïve Bayes, RF- Random Forest, ANN-Artificial Neural Network, SVM- Super Vector Machine, EL-Ensemble Learning.

I. INTRODUCTION

According to the WHO, about 46% of the world's diseases and 59% of deaths from chronic illnesses, and about 35 million people worldwide die from chronic diseases. globally, 2 lakh people have the liver disease by 2020 and by 2021 they have increased to 5 lakhs. The liver is an important internal organ in the human body. The liver can be classified into two parts, left and right. The liver can weigh up to 3 pounds, brown to red. The function of the liver is to remove toxins from the blood, before spreading to various organs of the human body.

Liver disease is considered a dangerous and deadly disease faced by people in the whole world. If the liver fails 100% there is no recovery option, the only solution for the liver is liver transplantation. The disease can be recovered faster if it is detected in the early stages. The below figure 1 represents the liver diseases damages.

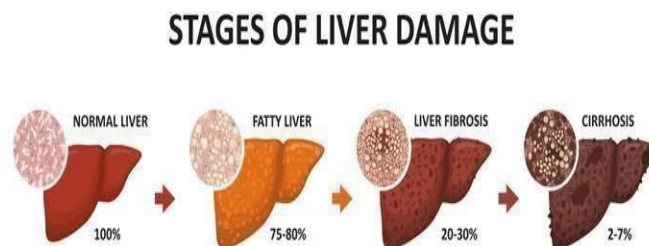


Figure 1: Stages of Liver Disease Damages

Liver Disease is hard to pinpoint in the beginning stages, even if the liver tissues are slightly affected, for maximum cases the system of medical professionals is difficult to diagnose. This leads to failure in treatment. To avoid this, it is important to provide appropriate treatment and save the patient's life. There are various symptoms of chronic liver disease digestive problems like dry mouth, abdominal pain, internal bleeding and constipation, skin problems such as pale skin colour, vascular-like membranes, redness of the feet, and abnormal brain and nerves such as memory problems, numbness, and

fainting. Therefore, the safest measures to prevent liver disease are regular doctor visits, immunizations, regular exercise, weight loss, and minimal use of soda and alcohol. According to the present system of medical professionals, the diagnosis of liver disease is helpful to the public, in addition to the easy diagnosis and prediction of the disease can be easily done through a specialist program. With the repeated development of the ingenuity of making various methods of learning algorithms are developed to help and improve the accuracy and quality of liver disease diagnosis. Hence early detection of liver disease is necessary as it helps with early treatment as well curing of chronic diseases. Disease Detection with better accuracy in the early stages is difficult.

II. LITERATURE REVIEW

- K. M. Sazzadur Rahman [1] describes that Liver Disease diagnoses are highly-priced and complicated hence reducing the high-cost expenditure of chronic liver disease diagnosis using ML algorithms LR, DT, SVM, NB with accuracy 75%, 74%, 69%, 64%, 62% and 53% for LR, RF, DT, SVM, KNN, and NB.
- Mehtaj Banu H [2] illustrates machine learning calculations accessible for the detection and determination of liver illness by using SVM and KNN with accuracy up to 80%.
- Muktevi Srivenkatesh [3] propose a method that can create Classification Association Rules (CARs) productively using NB, LR, SVM, KNN, RF for the examination Logistic regression indicators had the lowest qualities (MAE = 0.23) (RMSE = 0.48, RAE = 60.02%, RRSE = 38.83) trailed by different calculations.
- Thirunavrasu K, Ajay S Singh, M. D. Irfan [4] predicts liver disease using different classification algorithms, and the proposed techniques are used to match classification accuracy of K-nearest Neighbor, Logistic Regression, and Support Vector Machine with accuracy LR=KNN=73.97% and SVM is 71%.
- Engy A. El-Shafeiy [5] uses machine learning- based classifiers for big datasets in areas of the liver to Predict and therapeutic discovery using SVM, Boosted C5.0, and NB., Datamining Techniques evaluated with accuracy, sensitivity, specificity.
- G. Shobanna, K. Umamaheswari [6] propose a method of feature reduction using Recursive Feature Elimination and applying the Machine learning boosting algorithms to enhance the prediction accuracy by using Boosting algorithms like CatBoost, LGBM Classifier, XGBoost, and Gradient Boost were applied to the dataset. The technique effectively optimized the prediction accuracy of the Gradient Boosting algorithms to 94%.
- Kanza Hamid Amina Asif, Wajid Arshad. Abbasi [7] presents a novel approach for the detection of liver abnormalities in an automated manner using ultrasound images. Results clearly show that the proposed system is very useful in a practical setting and can help both patients and medical doctors by saving their time, money, and the inconvenience of undergoing painful or expensive tests.
- Maria Alex Kuzhippallil; Carolyn Joseph; A. Kannan [8] compares different visualization techniques and classification models used to predict liver disease with attribute selection. The results of different classifiers are obtained by using aselection algorithm. The experiments and analysis, increase the classification accuracy and also lead to areduction in classification time and hence aids in the prediction of the disease more efficiently.
- Burair Hassan Al Telaq; Nabil Hewahi [9] predicts liver disease using different learning models applied on Indian Liver Patient Dataset (ILPD) using SVM, KNN, RF, ANN, EL with an accuracy of 88% for KNN, RF, and SVM. 99% True Positive Rate (TPR) on negative cases obtained using KNN with RF.
- Vyshali J Gogi [10] describes Liver disease which leads to an abrupt state of health that precisely controls the functioning of the liver and the intern affecting other organs of the body. Data classification techniques such as logistic regression, decision tree, and fine Gaussian SVM algorithms are applied. with better accuracy of SVM and DT gave 82.7% and LR with high accuracy with 95.8% and ROC is 0.93%.
- Vasan Durai et al [11] describe three methods like NB, SVM & J48 dataset for liver disease detection and find that the J48 algorithm has best performance than other classifiers with an accuracy of 95%.
- Mrigank Srivastava, Rakshith D B, Ashwani Kumar, Gururaj S P [12] describes the prediction of liver disease based on blood test reports results of the person and predicted using ML algorithms such as SVM, ANN, KNN, NB with an accuracy of 100%, 99%, 70%, 55.56% respectively.

TABLE I: ACCURACY TABLE

Methods	Accuracy
DT	73.97
Bayesian Network	73.97
KNN	70
SVM	100
ANN	99.99

The above table shows the accuracy of various Machine Learning techniques used in liver disease prediction.

III. METHODOLOGY

MACHINE LEARNING

Machine Learning is a subfield of Expert Systems, this helps a system to think like humans to make its own decisions without the involvement of humans. The rapid growth of Artificial Intelligence and machine learning has many advances in the diagnosis of different types of diseases. In addition, the machine learning algorithm provides performance and accurate predictions. Machine Learning is widely categorized into various types as shown in below Figure 2.

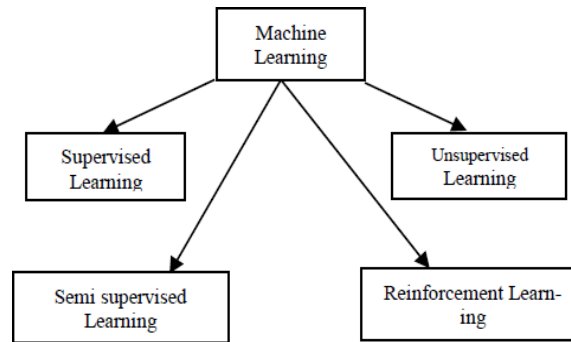


Figure 2: Types of Machine Learning Techniques

A. SUPERVISED LEARNING

It is a method of creating artificial intelligence, in which an algorithm is trained for input data with an output label. The model is trained until it can detect the basic patterns and relationships between input data and output labels, enabling it to produce accurate labelling results when presented with unprecedented data. Some of the various supervised learning are KNN, NB, SVM, DT, RF.

B. UNSUPERVISED LEARNING

Unsupervised learning machine training uses information that is not segmented or labelled and this allows the algorithm to work on the information without supervision. Here the function of the machine is to collect unfiltered information according to similarities, patterns, and differences without prior data training.

C. SEMI SUPERVISED LEARNING

Semi-Supervised is a type of machine learning that uses a combination of a small amount of labelled data and a large amount of non-label data to train models. This machine learning approach is a combination of supervised machine learning, using labelled training data, and unsupervised learning, using non-labelled training data.

D. REINFORCEMENT LEARNING

This type of intelligence is based on agent, execution, status, benefits, and location. A software agent and machine that automatically defines behaviour in a specific relationship based on their reward response.

IV. CONCLUSION

This paper provides us with a basic overview of the previously published papers on the diagnosis of liver disease based on various types of machine learning algorithms. Through the survey, it was discovered and recognized that algorithms of machine learning like DT, KNN, NB, ANN, and SVM provides the best accuracy in detection of chronic liver disease and prediction based on various conditions, here important are data set and attribute selections are required for best predictable results. This paper displays an analysis of discrete methods of machine learning strategies utilized by different authors and learning methods that have both positive and negative effects depending on data sets and selection of features etc. Through the survey, it was found accuracy and performance could be improvised, from various combinations and hybrid methods of machine learning. Further work can be improvised by an additional attribute that can provide better results so we propose implementation of DNN algorithm and hybrid algorithm for prediction of liver chronic diseases.

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