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Liver Disease Prediction Using Machine Learning based on ANN

Mohanapriya T[1], Priyadharshini M[2], Sirajudeen H[3], Dr. Angayarkanni N[4]
Electronics and Communication Engineernig
Paavai Engineering College (Anna university Affliated), Salem, India
1mohanapriyathangavelz@gmail.com
2priyadharshini3388@gmail.com
3sirajdeen304@gmail.com
4angaiece18@gmail.com

***Abstract*— This project presents a ground- breaking approach to liver disease detection by utilizing deep machine learning techniques. Liver disease is a prevalent global health issue that requires early detection for effective management and prevention of complications. Our proposed solution involves leveraging an Artificial Neural Network (ANN) algorithm, which utilizes a comprehensive dataset containing essential clinical and biochemical parameters such as age, gender, total bilirubin, direct bilirubin, alkaline phosphatase, and more. This approach shows promising potential for accurate prediction of liver disease.**

Keywords—ESP8266, ANN, Arduino Uno, Python Software, GSM/GPS module.

I. Introduction

The liver is the most imperative structure in a human build. Insulin is broken down by the liver. The liver breaks bilirubin with glucuronidation, which further helps its defecation into bile. It is also accountable for the breaking down and excretion of many unwanted product. Diagnosis of liver diseases can be divided into three stages i.e., the first stage is liver inflammation, the second is liver scarring (cirrhosis), and the final stage is liver cancer or failure. Since these scenarios are present in liver disease, early prediction is significant to provide better health . Liver disease is a significant health issue affecting millions of people globally. Early detection and accurate classification of liver diseases can lead to better patient outcomes and reduce the burden on the healthcare system. One-third of adults and an increasing proportion of youngsters in affluent nations suffer from non-alcoholic fatty liver disease (NAFLD), a growing health issue. Several diseases states can disturb the liver. Some of the diseases are Wilson's disease, hepatitis (an inflammation of the liver), liver cancer, and cirrhosis (a chronic inflammation that progresses ultimately to organ failure).

Liver diseases can be categorized into three stages: firstly, liver inflammation; secondly, liver scarring (cirrhosis); and finally, liver cancer or failure. These conditions are commonly observed in cases of liver sick

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In this paper, his paper examines the techniques that indicate liver diseases at an acceptable level of accuracy and determines the methods that produce the best accuracy. This study selects a single data set of liver patients with five supervised learning techniques that are applied to that data set in R.

Moreover, our model showcases a remarkable performance in terms of accuracy, dice similarity coefficient, and specificity parameters when compared to established algorithms. Additionally, it exhibits exceptional adaptability across various datasets.

II. Literature Review

The Prediction of the disease in the human being is the very long and difficult process in early days. Now a days, computer aided diagnosis is the important role in the medical industry for predicting, analyzing and storing medical information. In this paper will discuss and classify the liver patients with the help of the liver patient dataset with the help of the machine learning algorithms. WEKA is the software used here for implement the some of the classification algorithms with the data selected from the liver disease dataset. After the successful implementation of the all the algorithms, the best algorithms selected from the output of the all the algorithms execution

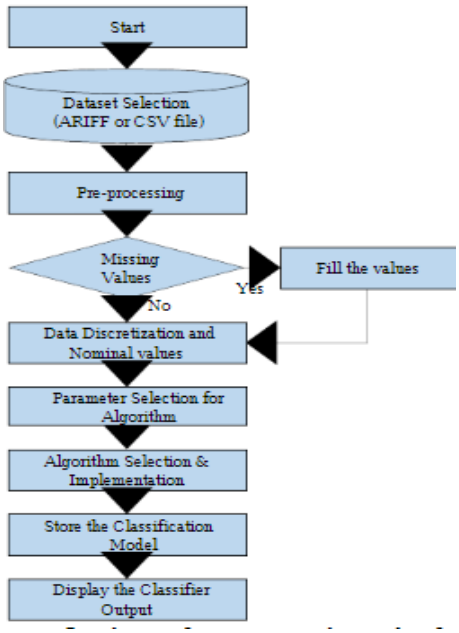

Figure 1. Flow Chart of Liver Dataset

According to a review of the literature, general practitioners (GPs) rarely investigate any anomalies in liver function tests to the level indicated by national standards. The authors have used data pre-processing in this work. The collection has 30691 records with 11 attributes. The classification model is utilized to construct an effective prediction system to aid general practitioners in identifying a liver patient using data mining.

The incorporation of liver tumor diagnosis ideas was achieved by the researchers through the utilization of convolutional neural networks and various other deep learning systems. It is worth noting that both supervised and unsupervised classification methods were employed. In the supervised system, the feature sets were organized into predefined groups, whereas in the unsupervised method, they were assigned to undefined classes.

Classification algorithms are frequently employed in the prediction of liver disease, as they enable the assessment of whether a patient possesses the ailment or not by analyzing specific features or characteristics.

According to the available solutions, it has been determined that the F-Tree algorithm demonstrates the highest level of accuracy compared to the other algorithms that were tested. This makes it an appropriate option for predicting liver disease. The combination of feature selection and the fuzzy K-means classification methods is widely utilized in the classification of liver diseases.

The performance of these cutting-edge algorithms was assessed in the study, utilizing metrics such as data accuracy, data effectiveness, and correction rate, and subsequently comparing the outcomes.

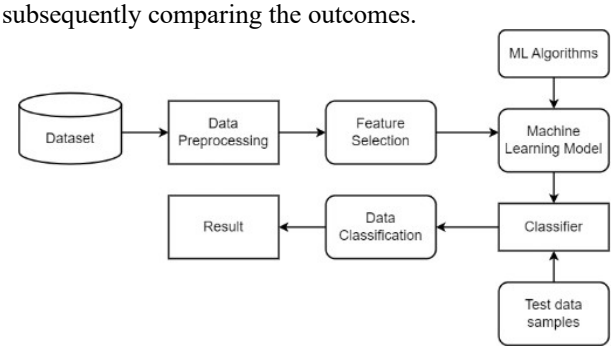

Figure 2. Processing of Ml Algorithm

The training dataset is developed by collecting data from UCI repository consists of 345 instances with 7 different attributes. This paper deals with results in the field of data classification obtained with Naïve Bayes algorithms .FT tree algorithms, and KStar algorithms and on the whole performance made know FT Tree algorithm when tested on liver disease datasets, time taken to run the data for result is fast when compare to other algorithm with accuracy of 97.10%Based on the experimental results the classification accuracy is found to be better using FT Tree algorithm compare to other algorithms.

The algorithms used in this work are Naïve Bayes and support vector machine (SVM Comparisons of these algorithms are done and it is based on the performance factors classification accuracy and execution time. From the results, this work concludes the SVM classifier is considered as a best classification algorithm because of its highest classification accuracy values.

III. Proposed Methodology

The configuration of the proposed system is to used to predict the disease and other odd factors using algorithms such as classification and clustering. The Deep Learning is also a machine learning technique yet works such better than the later. The clustering algorithms aids in the grouping of the data based on their common properties but the classification algorithms categories the data according to a specific predefined class Prediction of liver Disease using ANN Algorithms" proposed the conventional text-classification deep learning algorithm, ANN has demonstrated significant superiority over genetic and KNN learning algorithms. Therefore, this research focuses on implementing a deep learning algorithm instead of traditional machine learning algorithms. Python's elegant syntax, dynamic typing, and interpreted nature make it an ideal language for scripting and rapid application development across various platforms. The input design aims to control the required input amount, minimize errors, eliminate delays, reduce unnecessary steps, and maintain a simple process.

A Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning

In our proposed system, an alert is triggered through a buzzer and the condition is displayed on an LCD when the disease reaches a critical stage. Additionally, an app suggests hospitals and specialist doctors' names.

The hardware components utilized in this project include the Arduino UNO, which acts as the system's brain, managing control and communication. The ESP8266 is used as an access point, hosting a webserver or connecting to the internet to retrieve or upload data.

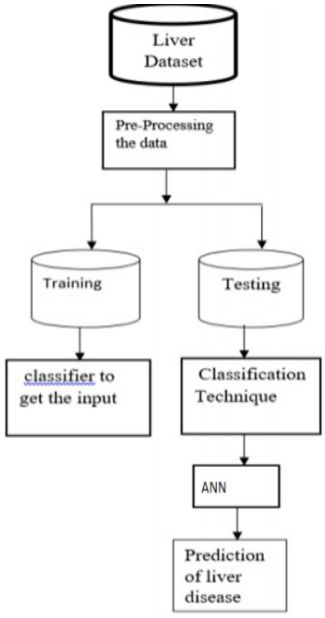

Figure 3. Block diagram of our proposed model

As we compile the dataset from the liver patient's record of all 625 liver patients ". That includes the person's Age, Gender, Direct_bilirubin, Alkaline phosphatase, Alanine_Aminotransferase, Aspartate_Aminotransferase, Total_Proteins, Albumin, Albumin_and_Globulin_Ratio

	A	B	C	D	E	F	G	H	I	J	K
1	Age	Gender	Total_Bilir	Direct_Bili	Alkaline_P	Alamine_A	Aspartate_	Total_Prot	Albumin	Albumin_a	Dataset
2	65	Female	0.7	0.1	187	16	18	6.8	3.3	0.9	1
3	62	Male	10.9	5.5	699	64	100	7.5	3.2	0.74	1
4	62	Male	7.3	4.1	490	60	68	7	3.3	0.89	1
5	58	Male	1	0.4	182	14	20	6.8	3.4	1	1
6	72	Male	3.9	2	195	27	59	7.3	2.4	0.4	1
7	46	Male	1.8	0.7	208	19	14	7.6	4.4	1.3	1
8	26	Female	0.9	0.2	154	16	12	7	3.5	1	1
9	29	Female	0.9	0.3	202	14	11	6.7	3.6	1.1	1

A. Esp8266

The ESP8266 is a wifi SOC (system on a chip) manufactured by Espressif Systems. This highly integrated chip is specifically designed to offer complete internet connectivity in a compact form. On the other hand, the NodeMCU is a microcontroller development board that comes with wifi capability. It utilizes the ESP8266 microcontroller chip.

It has the capability to function as an access point and/or station, serve as a host for a webserver, or establish a connection to the internet for retrieving or uploading data. Additionally, it is a programmable WiFi module with Arduino-like (software defined) hardware IO. It can be programmed using either the user-friendly and robust Lua programming language or the Arduino IDE.

The Node MCU board generally functions within the voltage range of 3.3V to 5V. It is equipped with WiFi and Bluetooth capabilities, as well as onboard CP2102 and keys. The ESP8266EX microcontroller incorporates a Tensilica L106 32-bit RISC processor, which ensures minimal power consumption and can reach a maximum clock speed of 160 MHz

B. Arduino UNO

The Arduino Uno, released in 2010, is a microcontroller board developed by Arduino.cc. It is based on the Microchip ATmega328P microcontroller and operates on an open-source platform.

With its user-friendly hardware and software, Arduino enables easy interaction with external devices by reading inputs such as light on a sensor. The Arduino Uno can be powered either through a USB connection or an external power supply, with the power source being automatically selected.

C. Buzzer

The buzzer is an electronic device that makes an audible sound when an external voltage is applied. When the condition of the liver exceeds a normal liver conditon, then it will be indicating through the sound of the buzzer.

D. IOT app

The "iot app" sends a sms about liver status and identifies the patient's location.The Internet of Things (IOT) describes the network of physical objects –"things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and system over the internet.

Python Software

A Python compiler plays a vital role in the Python programming ecosystem as it converts Python source code, which is readable by humans, into machine code or bytecode at a lower level. Unlike Python interpreters that execute code line by line, compilers produce a compiled code version that has the potential to improve performance.

A compiler is a software application that transforms high-level programming language into a lower-level language that can be comprehended by the assembly and interpreted as logical inputs. Despite being commonly categorized as an interpreted language, Python encompasses various implementation versions such as C Python and Iron Python. C Python, being the standard version, converts code into bytecode, which often leads to the misconception that Python is interpreted.

Nevertheless, the CPU unit cannot comprehend these interpreted codes and thus necessitates an interpreter. Subsequently, the Python Virtual Machine proceeds to transform the bytecode into machine code.

Result

The deep ANN-based and atlas-based techniques demonstrated satisfactory performance for the Liver (with average values of 0.87 < DSC < 0.95, 1.8 mm < MSD < 3.8 mm, and 7.9 mm < 95% HD < 11 mm).The app sends an SMS containing information about the patient's liver condition, as well as the name of the doctor and the location of the hospital.

The accuracy of every model is achieved through training the model using the dataset values and evaluating it by predicting the dataset value. The accuracy is determined by the number of accurate predictions made by the model.

IV. CONCLUSION

The implementation of prediction and ANN algorithms using the liver patient data set has effectively alleviated the burden on doctors. Our recommendation is to utilize machine learning techniques for a comprehensive evaluation of the patient's overall liver health.

Hence, the results obtained from the suggested classification model demonstrate a high level of accuracy in forecasting the outcome. Our research focuses on utilizing deep learning methods to anticipate liver disease. To enhance the precision of liver disease prediction and classification models, future endeavors involve incorporating a wider range of data sources. Additionally, combining various machine learning techniques can further enhance the accuracy of liver disease prediction and classification. By training machine learning models with individuals' distinctive attributes, it becomes possible to predict the probability of liver disease occurrence.

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