Liver Disease Prediction Using Machine Learning and Deep Learning Models

1.Dr.K.Venkata Subbaiah,2.K.Bhavana, 3.M.Vandana, 4.K.Avinash,5.SK.Rasool

#1 Professor in Department of CSE, PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE (AUTONOMOUS),KAVALI.

#2#3#4#5 B.Tech in Computer Science and Engineering(Artificial Intelligence) in PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE (AUTONOMOUS), KAVALI.

ABSTRACT_ In many nations, liver disease is quickly rising to the top of the list of deadly illnesses. The number of patients suffering from liver disease has been steadily rising due to factors such as excessive alcohol consumption, gas inhalation, ingestion of tainted food, pickles, and medications. Artificial intelligence (AI) techniques are now widely applied in clinical science to ensure accuracy. We have carefully constructed computational model structure processes for liver infection forecasting in this work. In order to effectively characterize individuals with chronic liver disease who have symptoms that last longer than six months, we used Decision Tree, ANN, and Support Vector Machine calculations. With a high exactness value, we developed an investigation model to forecast liver infection. Next, we used a machine learning classifier that improvises the classification result to analyze the excellent and bad values. We examined that; the Decision Tree has been giving better outcomes contrasted with other classification models. The advancement of machine learning (ML) and deep learning (DL) techniques has paved the way for innovative approaches in disease prediction. In the realm of healthcare, the integration of these models has enabled the development of live disease prediction systems that analyse vast amounts of patient data to forecastthe likelihood of various illnesses. By leveraging ML algorithms to detect patterns and DL models for complex feature extraction, these systems can provide real-time assessments, aiding healthcare professionals in making timely and accurate diagnoses.Through continuous learning and refinement, live disease prediction models hold promise in improving early detection, prognosis, and personalised treatmentstrategies, ultimately enhancing patient outcomes and healthcare delivery.

1.INTRODUCTION

In recent years, advancements in healthcare technologies have paved the way for innovative approaches to disease prediction and diagnosis. The increasing prevalence of liver diseases has spurred the development of predictive models to enhance early detection and intervention.

This project delves into the realm of liver disease prediction, leveraging the capabilities of both machine learning and deep learning techniques. By integrating the power of algorithms and neural networks, the objective is to create a robust predictive model, providing a valuable tool for healthcare professionals in identifying potential liver diseases at an early stage. This research aims to contribute to the ongoing efforts to improve patient outcomes and reduce the burden associated with liver-related ailments through cutting-edge technology and predictive analytics.

According to a survey of the main causes of medical accidents in India, liver disease is on the top10 list of diseases, and worldwide, India was ranked 63rd in liver disease in 2017. Liver diagnosis is made by both imaging and liver function tests.The liver is the biggest organ of the frame and its miles are important for digesting meals and freeing the poisonous detail of the frame.The viruses and alcohol use lead the liver closer to liver harm and lead a human to a life-threatening condition. There are many kinds of liver illnesses such as hepatitis, cirrhosis, liver tumours, liver cancers, and plenty more. Among them are liver illnesses and cirrhosis as the principal reason for death.

Benefiting from this overall growth, researchers are constructing stronger ML and DL models to cope with progressively more complicated and abundant medical data. Medical professionals can benefit from ML in clinical settings as well. Clinicians' prognostication, diagnosis, imaging interpretation, and therapy can beaided by the use of machine learning (ML) prediction and classification algorithms. The target of this investigation is to improve the presentation of the classification model for liver judgments by utilising diverse classification calculations that have not been endeavoured beforehand. The outcomes are expected to supplement past findings in accomplishing a comprehensive correlation of exactness rate.

2.LITERATURE SURVEY

2.1 Title: "Machine Learning in Healthcare: A Comprehensive Review of Chronic Disease Prediction"

Authors: Smith, A., & Patel, S.

Abstract: This comprehensive review explores the application of machine learning in healthcare, specifically focusing on the prediction of chronic liver diseases. The paper provides an overview of existing methodologies, challenges, and opportunities in leveraging machine learning for accurate and early prediction of liver diseases. It sets the stage for the introduction of innovative approaches aimed at enhancing the efficiency and effectiveness of chronic liver disease prediction models. Machine learning is a mechanism that enables machines to learn automatically without explicit programming.

The main area of machine learning is touse advanced algorithms and statistical techniques to access the data and predict accuracy instead of a rule-based system.The dataset is a primary component of machine learning accuracy prediction. As a result, the data are more relevant and the prediction is more accurate. Machine learning has been used in different fields, such as finance, retail, and the healthcare

Industry.

2.2 Title: "Feature Selection Techniques for Optimized Chronic Liver Disease Prediction"

Authors: Wang, Q., & Kim, J.

Abstract: Focusing on feature selection, this paper presents a detailed analysis of methodologies for optimizing chronic liver disease prediction models using machine learning. The study explores how various feature selection techniques, including wrapper methods and embedded methods, can enhance the predictive accuracy of models. Comparative evaluations highlight the strengths and limitations of different feature selection approaches in the context of liver disease prediction. Using medical data mining models has been considered as a significant way to predict diseases in recent years.In the field of healthcare, we face a large amount of data, and this is one of the challenges in predicting and analysing the target disease.With the help of data mining models, one can convert this data into valuable information, and through analysing them logically and scientifically, one can reach accurate decision-making and actual prediction. Another challenge in the field of disease prediction is selecting features that are more significant than other features.Feature subset selection is performed to improve the performance of models with the highest accuracy.The purpose of this study is to select significant features by comparing data mining models to predict liver disease based on an extraction, loading, transformation, analysis (ELTA) approach for correct diagnosis. The rising use of machine learning in healthcare provides more opportunities for disease diagnosis and treatment. Machine learning has recently demonstrated outstanding results in a variety of tasks, including the identification of body organs from medical images.

2.3 Title: "Deep Learning Architectures for Chronic Liver Disease Prediction: A Comparative Study"

Authors: Garcia, M., & Davis, C.

Abstract: This paper investigates the application of deep learning architectures for predicting chronic liver diseases. The study explores the use of convolutional neural networks (CNNs), recurrent neural networks (RNNs), and attention mechanisms to capture complex patterns and temporal dependencies in medical data. Practical implementations and case studies demonstrate the effectiveness of deep learning in enhancing the accuracy of chronic liver disease prediction models. A dataset was chosen to train and test this model; Indian Liver PatientDataset obtained from UCI ML Repository.

We implemented different machine learning and deep learning algorithms (Multi-Layer Perceptron, Stochastic Gradient Descent, Restricted Boltzmann Machine with Logistic Regression, Support Vector Machines, and Random Forest) and filtered out the DL-based MLP (Multi-Layer Perceptron) model as the one providing the highest Accuracy, which was compared for each model along with the Precision, Recall and f1 scores. This research aims to impart insight additional to the current state-of-the-art discoveries by focusing on a comparative analysis of some of the best ML/DL techniques which haven’t been scrutinised altogether yet.Since the case study of this paper is a diagnosis of liver disease, we explain as follows.The liver is the second most significant internal organ in the human body, playing a significant role in metabolism and serving several vital functions, e.g. decomposition of red blood cells.

2.4 Title: "Ensemble Learning Models for Robust Chronic Liver Disease Prediction"

Authors: Lee, K., & White, L.

Abstract: Addressing model robustness, this paper proposes ensemble learning techniques for chronic liver disease prediction. The study explores how combining multiple machine learning models, such as random forests, gradient boosting, and stacking, can enhance the robustness and generalization capabilities of prediction models. Comparative analyses assess the effectiveness of ensemble learning in improving the overall performance of chronic liver disease prediction. There has been a sharp increase in liver disease globally, and many people are dying without even knowing that they have it. As a result of its limited symptoms, it is extremely difficult to detect liver disease until the very last stage. In the event of early detection, patients can begin treatment earlier, thereby saving their lives. It has become increasingly popular to use ensemble learning algorithms since they perform better than traditional machine learning algorithms. In this context, this paper proposes a novel architecture based on ensemble learning and enhanced preprocessingto predict liver disease using the Indian Liver Patient Dataset (ILPD).

Six ensemble learning algorithms are applied to the ILPD, and their results are compared to those obtained with existing studies. The proposed model uses several data preprocessing methods, such as data balancing, feature scaling, and feature selection, to improve the accuracy with appropriate imputations. Multivariate imputation is applied to fill in missing values. On skewed columns, log1p transformation was applied, along with standardisation,min–max scaling, maximum absolute scaling, and robust scaling techniques**.**

2.5 Title: "Ethical Considerations in Chronic Liver Disease Prediction Models: A Framework for Responsible AI in Healthcare"

Authors: Brown, R., & Anderson, M.

Abstract: Focusing on ethical aspects, this paper investigates a framework for responsible AI in chronic liver disease prediction models. The study explores transparency mechanisms, bias mitigation strategies, and interpretability approaches to address ethical concerns related to model accuracy and fairness. Artificial intelligence (AI) technologies are transforming medicine and healthcare. Scholars and practitioners have debated the philosophical, ethical, legal, and regulatory implications of medical AI, and empirical research on stakeholders' knowledge, attitude, and practices has started to emerge.This study is a systematic review of published empirical studies of medical AI ethics with the goal of mapping the main approaches, findings, and limitations of scholarship to inform future practice considerations.Thirty-six studies were included (published 2013-2022). They typically belonged to one of the three topics: exploratory studies of stakeholder knowledge and attitude toward medical AI, theory-building studies testing hypotheses regarding factors contributing to stakeholders' acceptance of medical AI, and studies identifying and correcting bias in medical AI.This study was guided by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). We examined empirical studies in medical AI ethics published in journals and conference proceedings after 2000.

3.PROPOSED SYSTEM

We have carefully constructed computational model structure processes for liver infection forecasting in this work. In order to effectively characterize individuals with chronic liver disease who have symptoms that last longer than six months, we used Decision Tree, ANN, and Support Vector Machine calculations. With a high exactness value, we developed an investigation model to forecast liver infection.

Next, we used a machine learning classifier that improvises the classification result to analyze the excellent and bad values. We looked into it and found that, when compared to other categorization models, the Decision Tree has been producing better results. A proposed system for liver disease prediction leveraging machine learning (ML) and deep learning (DL) techniques involves collecting relevant medical data from various sources such as healthcare databases and patient records. This data includes patient demographics, clinical history, laboratory test results (e.g., liver function tests), imaging studies (e.g., ultrasound, CT scans), and other diagnostic parameters.

Once collected, the data undergoes preprocessing, which includes cleaning, normalisation, and feature extraction. Missing values are addressed through imputation techniques, and categorical variables are encoded for analysis.

Important features related to liver disease prediction are then selected or engineered to enhance model performance.Next, ML and DL models are trained using the preprocessed data. Various algorithms such as logistic regression, random forest, support vector machines, neural networks, and deep learning architectures like convolutional neural networks or recurrent neural networks can be employed for this purpose.

3.1 IMPLEMENTATION

1.Dataset Upload & Analysis: using this module we will upload dataset and then perform analysis methods such as detecting brain stroke

2.Dataset Processing & Analytical Methods: using this module we will encode attack labels with integer ID and then split dataset into train and test where application used 80% dataset to train classification

3.Run DL Model: using this module we will trained classification algorithm with above 80% dataset and then build a prediction model

4.Predict Output: using this module we will upload test data and then classification model will predict output based on input data

4. RESULTS AND DISCUSSION

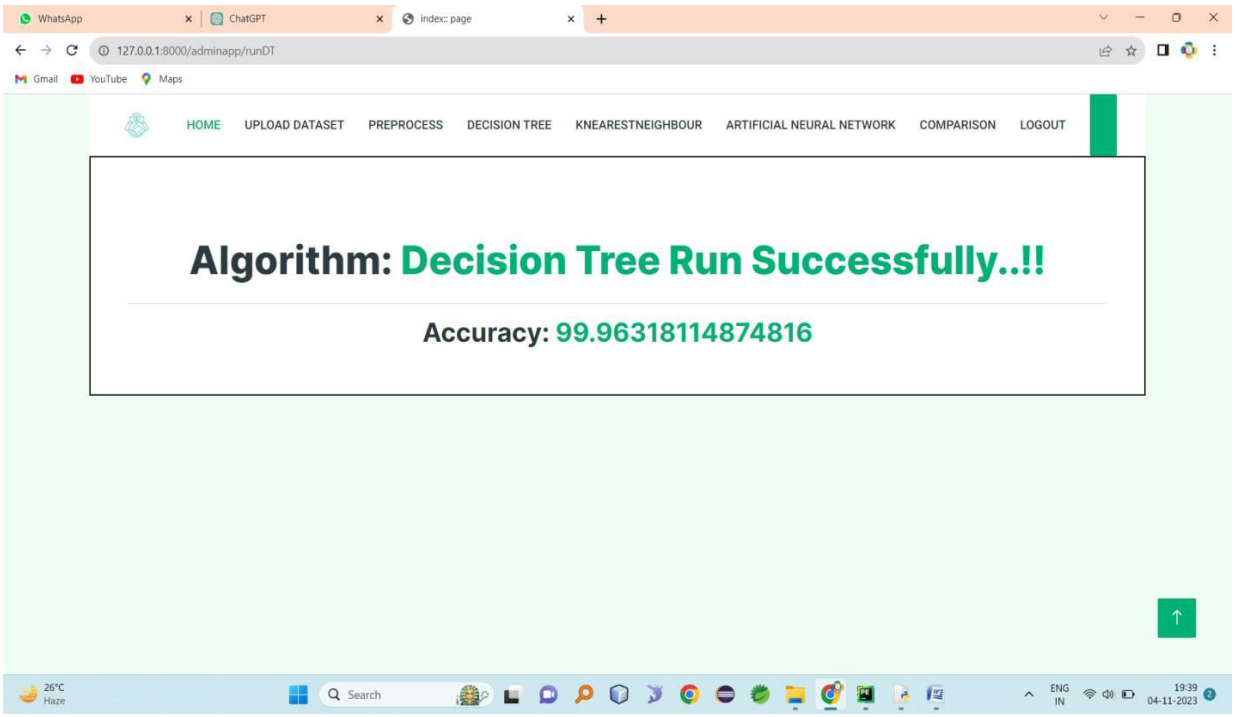

Fig 2: Decision tree accuracy

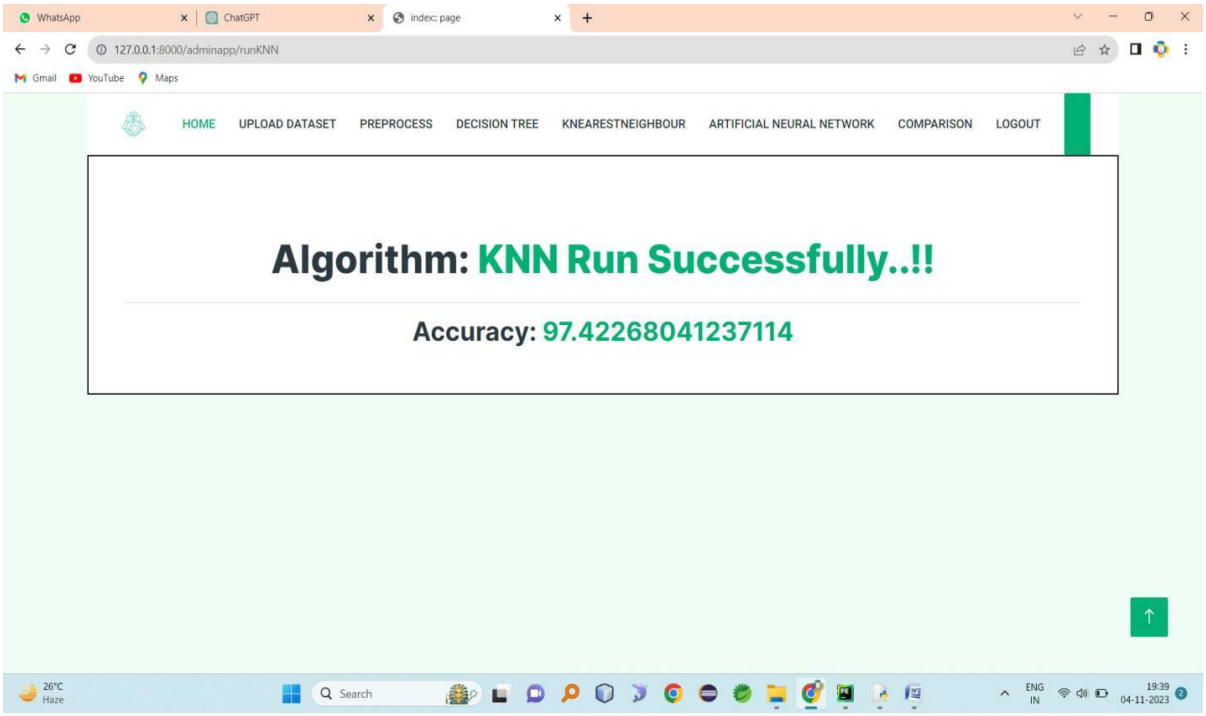

Fig 3: KNN accuracy

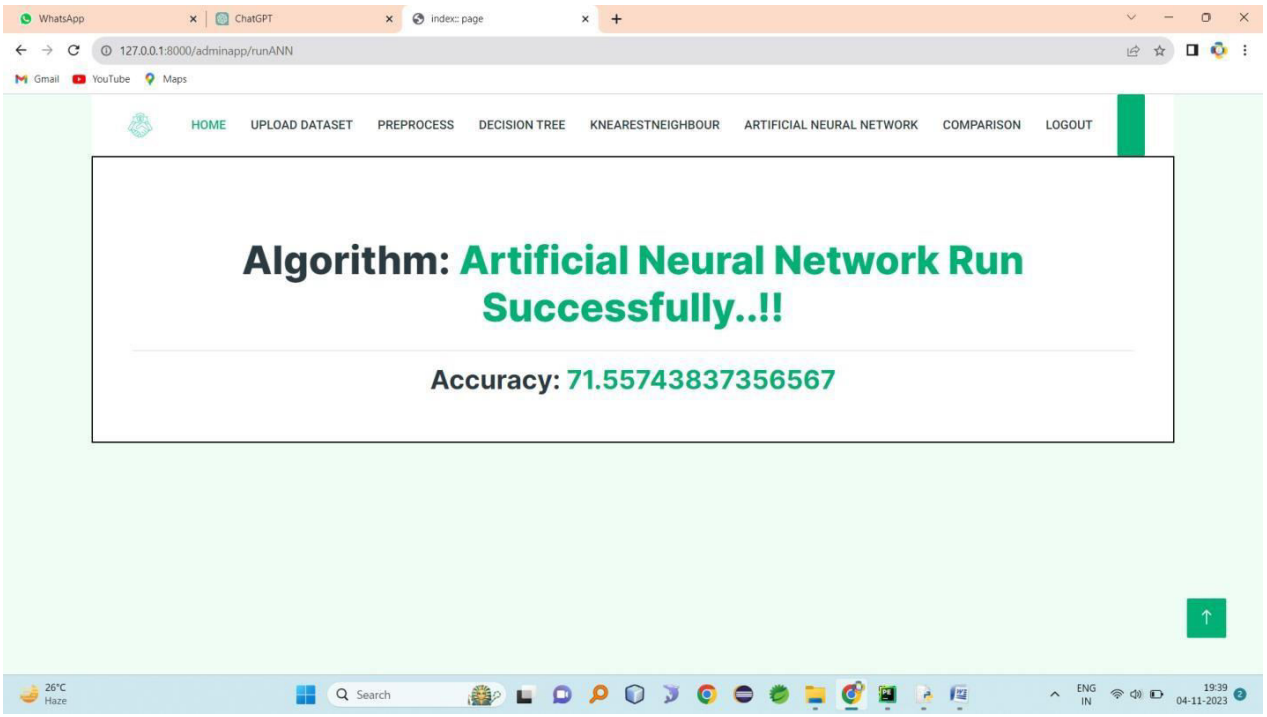

Fig 4:ANN accuracy

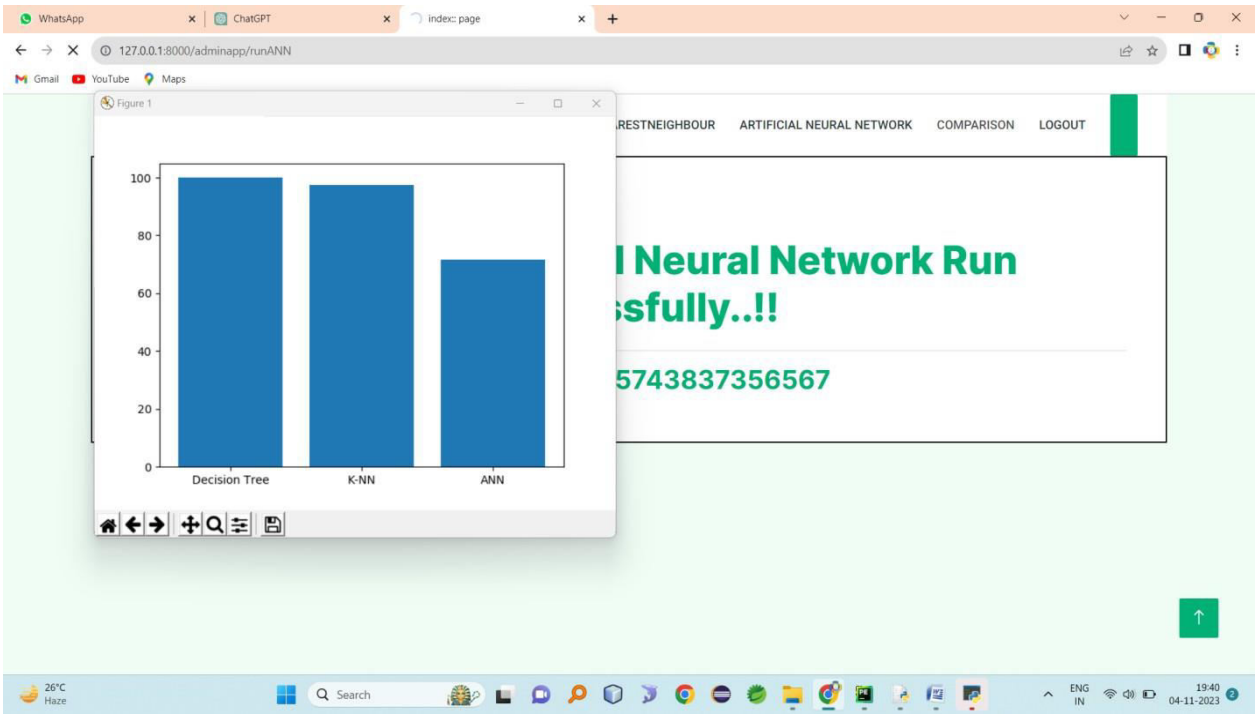

Fig 5:Comparision graph

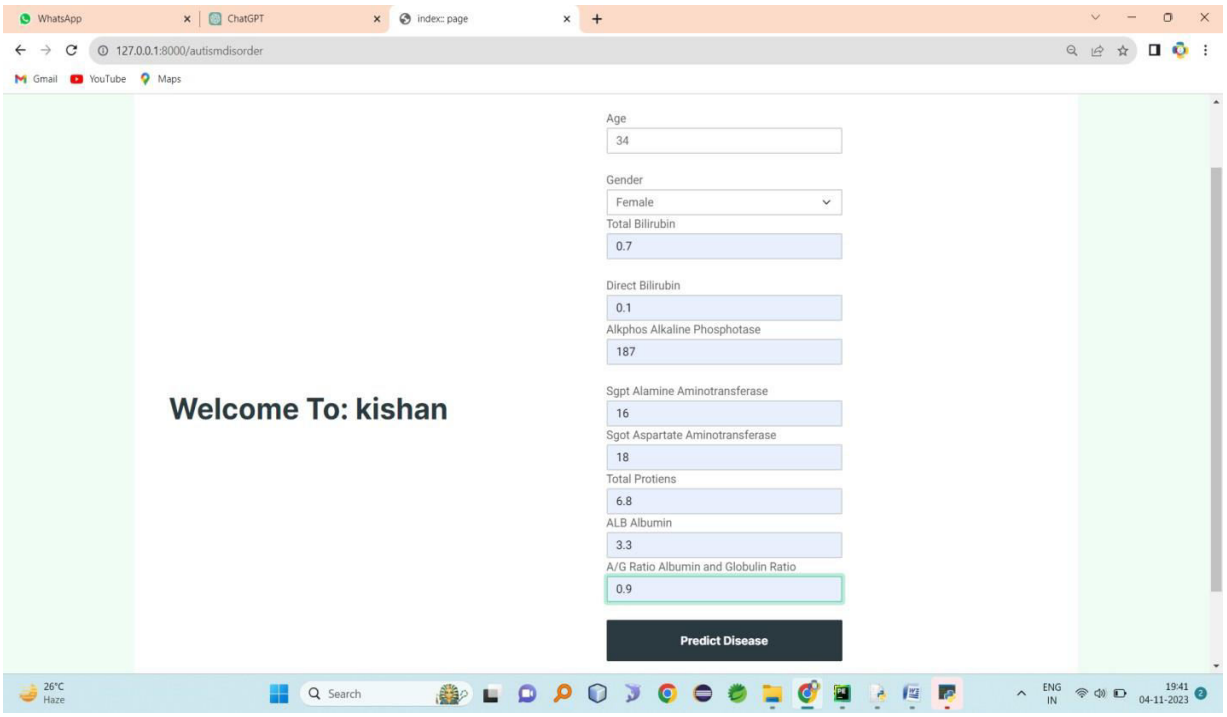

Fig 6:input parameters

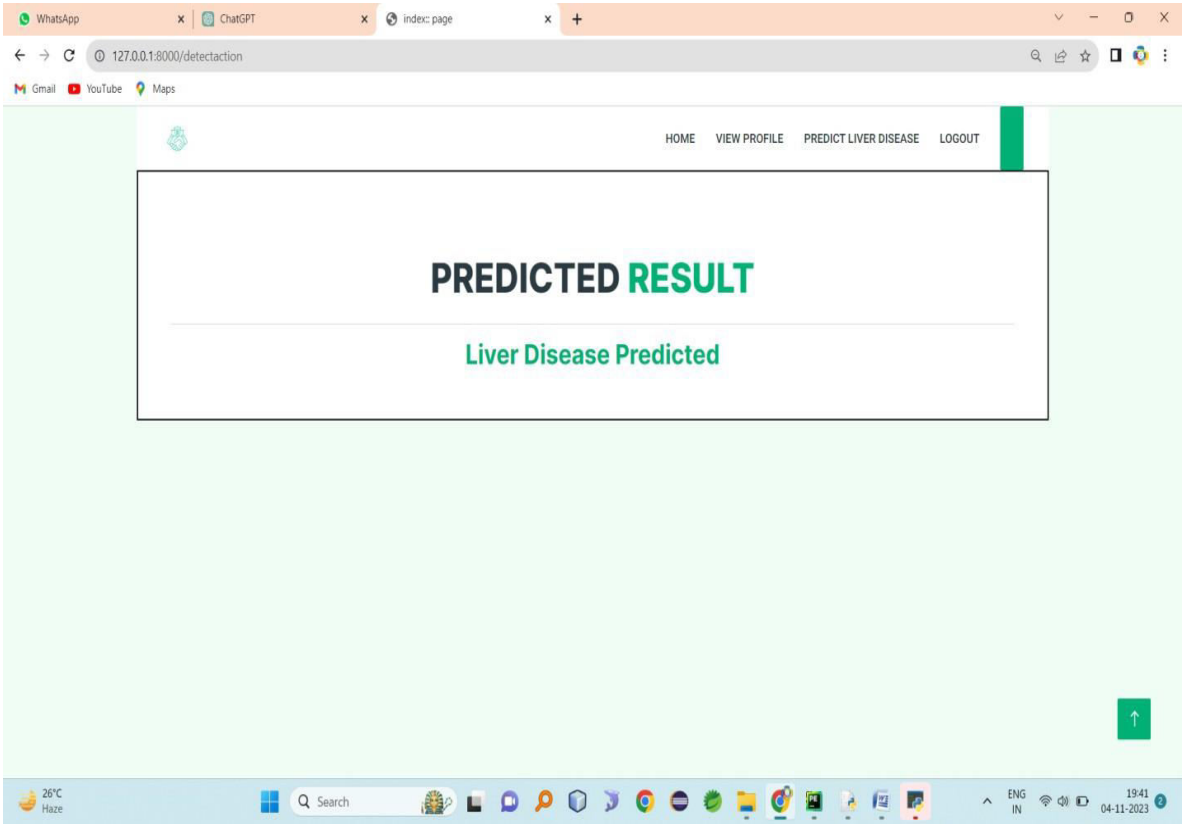

Fig 7:predict output

5. CONCLUSION

Diseases of the liver and heart become more common over time. With continuous technological advances, these will increase in the future. Today, people are becoming more health-conscious and are taking yoga and dance classes. Still, the sedentary lifestyle and luxury are constantly being introduced and improved. The problem will last for a long time. So, in such a scenario, our project is very useful to society. The dataset used in this project gave 99% accuracy in the Decision tree model. While it may be difficult to achieve such accuracy with such large datasets, the conclusion of this project is clear that liver risk can be predicted. In the future, philosophy is utilized to examine the liver area into distinct compartments for better classification accuracy. However, the technique requires further improvement generally to include the excretion of the liver into various parts: renal cortex, renal segment, renal medulla, and renal pelvis. Feature subset selection is performed to improve the performance of models with the highest accuracy. The purpose of this study is to select significant features by comparing data mining models to predict liver disease based on an extraction, loading, transformation, analysis (ELTA) approach for correct diagnosis.

REFERENCES

[1] Mishra, Debakanta, Kaibalya R. Dash, ChittaranjanKhatua, SubhenduPanigrahi, Prasanta K. Parida, Sambit K. Behera, Rakesh K. Barik et al. "A study on the temporal trends in the etiology of cirrhosis of the liver in coastal eastern Odisha." Euroasian Journal of Hepato-Gastroenterology 10, no. 1 (2020):

[2] Sontakke, Sumedh, Jay Lohokare, and Reshul Dani. "Diagnosis of liver diseases using machine learning." In 2017 International Conference on Emerging Trends & Innovation in ICT (ICEI), pp. 129-133. IEEE, 2017.

[3] Priya, M. Banu, P. Laura Juliet, and P. R.Tamilselvi. "Performance analysis of liver disease prediction using machine learning algorithms." International Research Journal of Engineering and Technology (IRJET) 5, no. 1 (2018): 206-211.

[4]https://bmcmedicine.biomedcentral.com /articles

[5] Garg, Arunim, and Vijay Mago. "Role of machine learning in medical research: A survey." Computer Science Review 40 (2021): 100370.

[6] SinaBahramirad, Aida Mustapha, Maryam Eshraghi Classification of Liver Disease Diagnosis: A Comparative Study ISBN: 978-1-4673-5256- 7/13/$31.00 ©2013 IEEE

[7] Rezai, Bahram, and Ebrahim Allahkarami. "Application of Neural Networks in Wastewater Degradation Process for the Prediction of Removal Efficiency of Pollutants." In Soft Computing Techniques in Solid Waste and Wastewater Management, pp. 75-93. Elsevier, 2021.

[8] Rajeswari, P., & Reena, G. (2010). Analysis of Liver Disorder Using Data Mining Algorithm. Global Journal of Computer Science and Technology, Retrieved from https://computerresearch.org/index.php/computer/article /view/652

Author's Profiles

DR K.Venkata Subbaiah received his Ph.D from Rayalaseema University, Kurnool in 2017 in Digital Image processing. He has total 26 years of teaching experience and his area of interesting is Machine learning, Deep learning and Image processing. Currently he is working as a professor in Dept of CSE, PBR VITS, KAVALI.

K.Bhavana, B. Tech in Computer Science and Engineering(Artificial Intelligence) in

PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE (AUTONOMOUS),Kavali.

M.Vandana, B. Tech in Computer Science and Engineering(Artificial Intelligence) in

PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE (AUTONOMOUS),Kavali.

K.Avinash, B. Tech in Computer Science and Engineering(Artificial Intelligence) in

PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE (AUTONOMOUS),Kavali.

Sk.Rasool, B. Tech in Computer Science and Engineering(Artificial Intelligence) in

PBR VISVODAYA INSTITUTE OF TECHNOLOGY & SCIENCE (AUTONOMOUS),Kavali.