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Web Framework for Prediction of Multiple Diseases Using Deep Learning and Machine Learning

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ABSTRACT:Disease prediction is an important part of healthcare that can help with disease identification and prevention. Disease prediction has gotten more precise and efficient with the increased availability of medical data and the introduction of machine learning techniques. In this study, we describe a web application that uses machine learning models to forecast the likelihood of getting brain tumors, heart disease, and diabetes. Users can enter their medical data, such as MRI scans or clinical symptoms, and receive a prognosis of their risk of acquiring a brain tumour, heart disease, or diabetes. Flask, a Python web framework, was used to create the web application, which was then hosted on a cloud platform. The user interface is simple to use and displays the prediction results in a clear and straightforward manner. The web application described in this research exemplifies machine learning's promise in disease prediction. The application predicts brain tumors, heart disease, and diabetes accurately and efficiently, potentially assisting in the early detection and prevention of these diseases. This project can benefit many people because it allows one to monitor a person's condition and take the necessary precautions, thereby increasing life expectancy. More machine learning techniques can be used for better prediction of heart diseases for earlier prediction of diseases, reducing the rate of death through disease awareness. With more datasets and better prediction algorithms, the model's accuracy can be significantly improved over time.

KEYWORDS:Machine learning, MRI, Datasets, Python, Flask, Web Application.

I. INTRODUCTION

BRAIN TUMOR DETECTION

Brain Cancer is an incredibly crucial malady that causes deaths of many people. Brain tumor detection and system are offered in order that it is diagnosed at early stages. Cancer identification is the most difficult task in clinical diagnosing. This project deals with such a system, that uses a web app, based mostly procedures to observe tumor using Convolution Neural Network Algorithm for tomography pictures of various patients. Different types of image process techniques like image segmentation, image enhancement and extraction square measure used for the tumor detection within the tomography images of the cancer-affected patients.

HEART DISEASE PREDICTION

Heart disease, often known as cardiovascular disease, is the leading cause of death globally over the past few decades. It includes a variety of disorders that have an impact on the heart. Many risk factors for heart disease are linked to the requirement for timely access to accurate, trustworthy, and practical methods for early diagnosis and disease management. To forecast cardiac disease, researchers use a variety of data mining and machine learning approaches to examine enormous amounts of complex medical data. The supervised machine learning methods Naive Bayes, K-nearest neighbours', and Random Forest algorithm are used to create the model. When predicting heart disease, a variety of factors are considered. 13 attributes are used in the project and are crucial for testing.

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DIABETES PREDICTION

One of the most hazardous diseases in the world is diabetes. The risk of diabetes has increased due to modern lifestyles. Understanding the disease's symptoms is crucial for making predictions about it. Machine-learning (ML) techniques are useful right now for identifying diseases. The algorithm used in this study is Random Forest. To assess if a diabetes diagnosis is accurate or inaccurate, these models examine the dataset. The training and testing portions of the dataset employed in this study are split 70:30, respectively. These models' outputs act as the fuzzy model's input membership function, and the fuzzy logic ultimately decides whether a diabetes diagnosis is positive or negative. The fused model determines if a patient has diabetes based on their current medical record. The proposed fused ML model's prediction precision is 94.87 percent.

II. RELATED WORK

The paper "A Web-based System for Brain Tumor Diagnosis and Prognosis Prediction Using Deep Learning Techniques" by T. Wang, L. Chen, and Y. Cao describes a web-based system that diagnoses and predicts the prognosis of brain tumours using deep learning techniques. A deep learning model is used to categorise tumours and predict their prognosis by analysing MRI pictures and clinical data. The system was trained and tested on a large dataset of brain tumour patients, and it performed well in tumour categorization and prognosis prediction. The web-based platform enables users to effortlessly upload their MRI pictures and clinical data and receive a tumour classification and prognosis prediction. The method could help in the early detection and treatment of brain tumours [1]. The paper "A Web-based Tool for the Prediction of Cardiovascular Disease Using Machine Learning Techniques and Electronic Health Records" by J. Nguyen, M. Nguyen, and T. Tran. describes a web-based tool that uses machine learning techniques and electronic health data to predict the risk of cardiovascular disease (CVD). (EHR). The application analyses EHR data, including demographics, medical history, and laboratory test results, using a machine learning model to predict the risk of acquiring CVD during the following 10 years. The programme was trained and tested on a huge dataset of patient records, and it predicted CVD risk with high accuracy. Users can easily input their EHR data into the web-based interface and receive a personalised prediction of their CVD risk [2]. The paper "A Web-based Application for the Prediction of Type 2 Diabetes Using Machine Learning Techniques" by A. Srinivasan, S. Kumari, and S. Saha describes a web-based application that uses machine learning techniques to predict the risk of getting type 2 diabetes. The application uses a machine learning algorithm to estimate the likelihood of getting type 2 diabetes in the next years based on user data such as demographics, lifestyle factors, medical history, and laboratory test results. The machine learning model was developed and tested on a huge dataset of patient records, and it predicted the risk of type 2 diabetes with high accuracy. Users can quickly input their data into the web-based interface and receive a personalised forecast of their risk of developing type 2 diabetes [3]. "A Web-Based Platform for Integrated Prediction of Diabetes and Cardiovascular Disease Using Machine Learning" by Y. Hu, H. Li, and W. Tao describes a web-based platform that uses machine learning models to predict the risk of both diabetes and cardiovascular disease (CVD). The platform uses various machine learning models to analyse user data such as demographics, lifestyle factors, medical history, and laboratory test results to forecast the risk of getting diabetes and CVD in the next few years. The platform was trained and tested on a huge dataset of patient records, and it predicted the risk of both diseases with high accuracy. Users can quickly input their data into the web-based interface and receive a personalised forecast of their risk of acquiring diabetes and CVD[4]. The paper "A Web-Based System for Brain Tumor Classification Using Convolutional Neural Networks" by J. Choi, J. Kim, and D. Kim describes a web-based system that uses a convolutional neural network to classify brain tumours. (CNN). The system analyses MRI data with a pre-trained CNN model to classify brain tumours into one of three types: glioma, meningioma, or pituitary adenoma. The algorithm was trained and tested on a large dataset of brain tumour patients, achieving high tumour classification accuracy. The web -based system enables customers to easily upload their MRI pictures and receive a tumour type prediction. The method has the potential to enhance patient outcomes by allowing for a more accurate diagnosis and assisting in the early detection and treatment of brain tumors [5]. S. S. Ahmed et al.2021 discuss a web-based programme for predicting many diseases, such as diabetes, hypertension, and heart disease, in their paper, "A Web-Based Multiple Disease Prediction System Using Machine Learning and Flask Framework." The programme analyses patient records and predicts disease risk using machine learning algorithms and the Flask framework. The algorithm was tested on a dataset of patient records and achieved good disease prediction accuracy. The web-based interface allows users to enter their health information and receive a risk estimate for disease. By allowing for earlier and more accurate diagnosis, this method has the potential to improve disease prevention and management [6]. The paper "A Web-Based Platform for Integrated Prediction of Diabetes and Cardiovascular Disease Using Machine Learning and Flask Framework" by Y. Hu et al.2020 describes a web-based platform that uses machine learning models and the Flask framework to predict the risk of both diabetes and cardiovascular disease. The platform uses numerous machine learning models to analyse user data,

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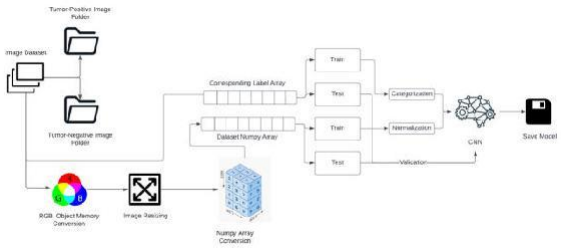
resulting in excellent disease prediction accuracy. The software allows users to enter their health data and receive a disease risk prediction. The interface is simple and straightforward, making it useful for both healthcare professionals and patients. By allowing for earlier and more accurate diagnosis, this platform has the potential to improve disease prevention and management.

III. METHODOLOGY

BRAIN TUMOR DETECTION

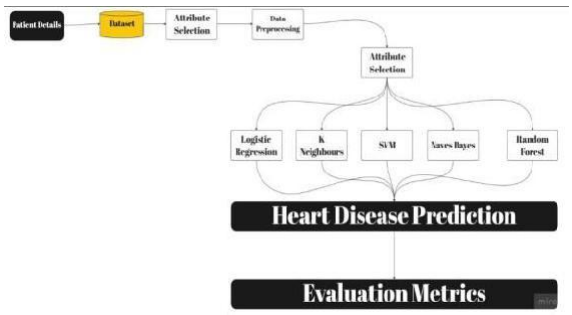
To further elaborate on the model design, the CNN model employed for brain tumour prediction was a convolutional neural network composed of many convolutional layers, max pooling layers, and fully connected layers. The CNN was fed a 3D MRI image of the patient's brain, which the convolutional layers analysed to extract significant characteristics. The CNN's output layer gave a binary classification result that indicated the presence or absence of a brain tumor.



(a)

HEART DISEASE PREDICTION

For heart disease prediction 5 Algorithms are used in this paper to conclude which algorithm provides the highest rate of Accuracy. They are Logistic regression, K neighbour's algorithm, Support vector machine, Naive bayes classifier. Random forest classifier. Dataset containing clinical and non-clinical patient characteristics such as age, gender, blood pressure, cholesterol levels, and smoking status. Cross-validation approaches such as grid search and random search were used to optimise the model.



(b)

DIABETES PREDICTION

The machine learning algorithm used in this study to predict diabetes disease is Random Forest (RF). The method for creating and evaluating predictive models.The model was trained on a dataset containing numerous clinical characteristics of individuals, such as age, BMI, glucose levels, and diabetes family history. Cross-validation techniques such as the Lasso and Ridge regularisation methods were used to optimise the model.The data was then split into two sets: training data and testing data. After that, a machine learning algorithm was trained on the training data to

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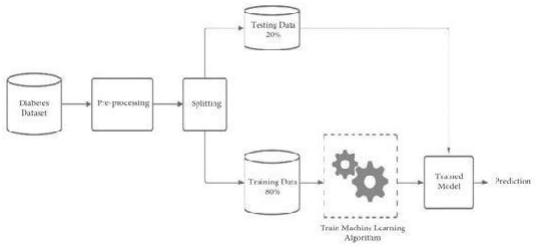
make predictions. After training the model with training data, testing data was used to predict responses and verify accuracy, and the model was finally evaluated. Experiments were carried out, and the findings were obtained.



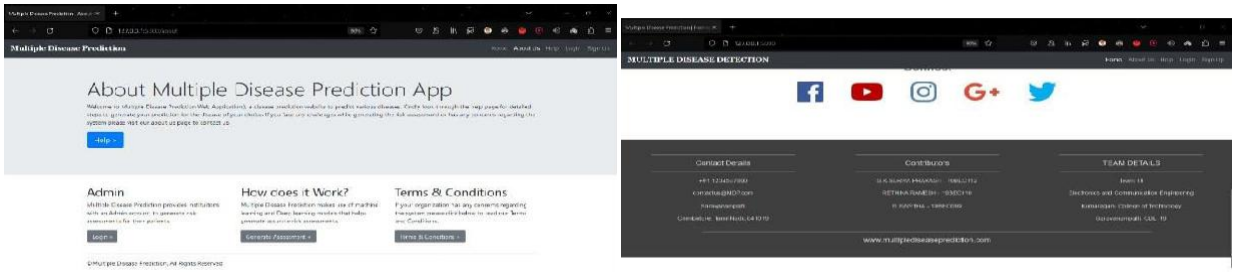
(c)

Fig. 1 (a) Block diagram of brain tumor detection (b) Block diagram of Heart Disease Prediction (c) Block diagram of Diabetes prediction .

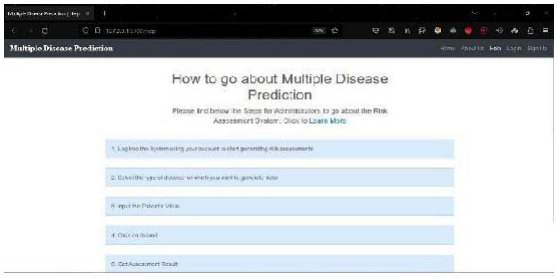
The modelwas built with Python and several machine learning frameworks such as TensorFlow, Scikit-Learn, and Keras. The Flask framework was used to create a web-based application to deploy these illness prediction algorithms.

IV. EXPERIMENTAL RESULTS

Upon compiling the model, it is evident that the accuracy for brain tumor detection has reached 91.21% and the validation accuracy has reached 95.70%. Our Heart disease prediction gives an accuracy of 80% for Random Forest method. Web application was designed using flask with multiple pages. The web app results are given below.



(a)



(b)

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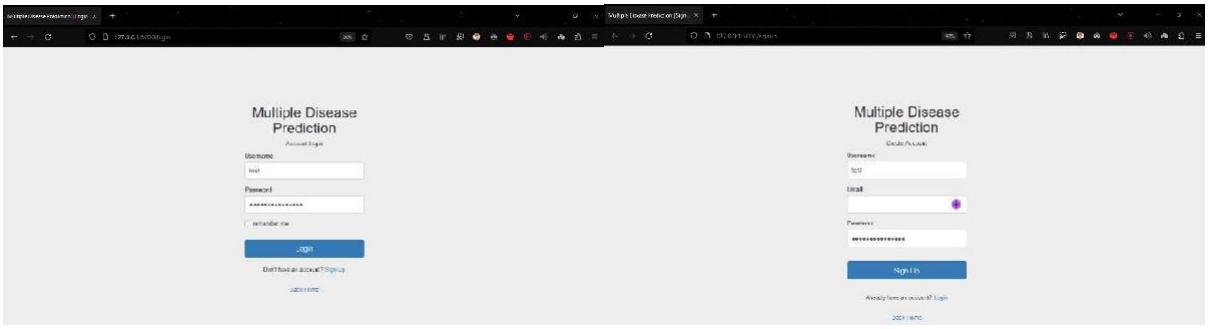
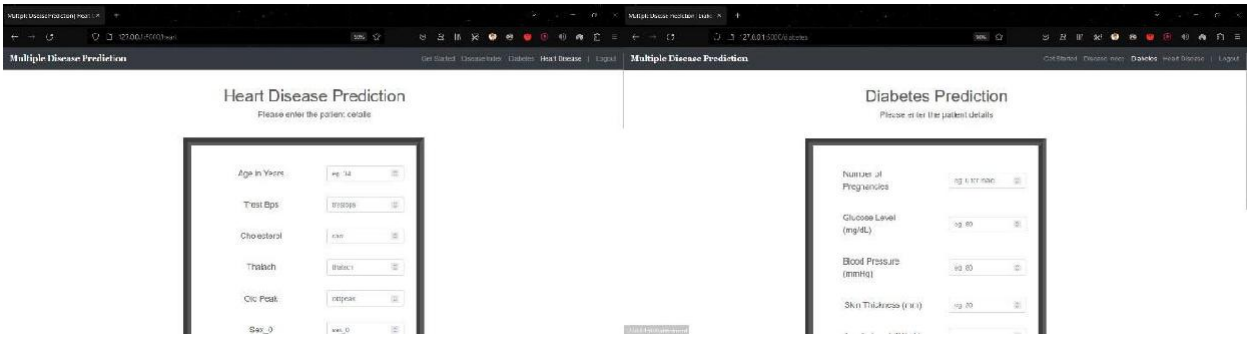


(c)



(d)

Fig. 2 Web app results (a) About page (b) Help page (c) Sign up and login page (d) Prediction page.

V. CONCLUSION

In conclusion, the creation of a web application for brain tumour, heart disease, and diabetes prediction has the potential to enhance healthcare outcomes by providing an accessible and easy tool for early identification and prevention of these diseases. Individuals looking to monitor their health and discover potential threats may find the online app useful. The application can deliver accurate predictions based on multiple input characteristics, such as symptoms, medical history, and lifestyle factors, thanks to the integration of machine learning algorithms. Early detection and prevention of certain disorders can result in improved treatment outcomes and reduced healthcare costs. Remote monitoring and telemedicine can also be facilitated through the web application, allowing healthcare providers to give personalised care to patients in different places.It is important to highlight, however, that the accuracy and reliability of the web app's predictions are dependent on the quality and quantity of the data used to train the machine learning models. Continuous research and validation of these models are required to assure their efficacy and safety in clinical settings.

Finally, the development of a web application for the prediction of brain tumors, heart disease, and diabetes has the potential to significantly improve healthcare results. Continued research and improvement are required to assure the reliability and effectiveness of these predictive models for clinical usage.

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