Diabetic Prediction System Using ML

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ABSTRACT

Diabetes is one of the most rapidly growing chronic diseases worldwide and poses a significant threat to global health. Early diagnosis plays a crucial role in preventing severe complications such as cardiovascular diseases, kidney failure, and nerve damage. However, traditional diagnostic methods often rely on clinical tests and expert consultation, which can be time-consuming and sometimes inaccessible to all individuals.

This paper presents a machine learning-based diabetes prediction system designed to provide early and accurate prediction using patient health data. The system utilizes key medical attributes such as glucose level, blood pressure, body mass index (BMI), insulin level, age, and other relevant features. Advanced machine learning algorithms, namely Random Forest and XGBoost, are employed to improve prediction accuracy and handle missing values effectively.

The proposed system also includes a user-friendly web interface developed using Streamlit, allowing users to input their health parameters and obtain instant predictions. The results demonstrate that the system achieves better accuracy compared to traditional models, making it a reliable tool for early detection and preventive healthcare.

I. INTRODUCTION

Diabetes is a chronic metabolic disorder characterized by high blood glucose levels due to the body's inability to produce or effectively use insulin. It has become one of the leading causes of mortality worldwide, affecting millions of people each year. The increasing prevalence of diabetes is largely attributed to unhealthy lifestyles, lack of physical activity, and genetic factors.

Early detection of diabetes is essential to reduce the risk of serious complications, including heart disease, kidney damage, vision impairment, and nerve disorders. However, conventional diagnostic approaches require laboratory testing and medical expertise, which may not always be readily accessible, especially in remote or underdeveloped regions.

With the rapid advancement of technology, machine learning has emerged as a powerful tool in the healthcare domain. It enables the analysis of large amounts of medical data to identify patterns and make predictions with high accuracy. This project focuses on developing a diabetes prediction system using machine learning techniques to provide fast, reliable, and cost-effective diagnosis.

The system aims to assist both patients and healthcare professionals by offering an easy-to-use platform that predicts diabetes risk based on user input. By integrating advanced algorithms and a web-based interface, the proposed solution contributes to improving early diagnosis and promoting preventive healthcare.

II. RELATED WORK

The use of machine learning in predicting diseases such as Diabetes Mellitus has increased significantly in recent years due to the need for early and accurate diagnosis. Earlier methods of diabetes detection relied mainly on clinical tests and expert analysis, which, although reliable, were often time-consuming and not suitable for early-stage identification. With the growth of data-driven technologies, researchers started exploring automated approaches where machine learning models analyze patient health data to predict the likelihood of diabetes.

Initial research in this area focused on basic classification algorithms such as Logistic Regression, Decision Trees, and K-Nearest Neighbors. While these methods were easy to implement and provided moderate results, they faced challenges like lower accuracy, overfitting, and difficulty in handling missing or incomplete data. As a result, more advanced techniques such as ensemble learning and boosting methods were introduced. Algorithms like Random Forest improved prediction stability by combining multiple decision trees, while XGBoost enhanced performance by efficiently handling complex data and optimizing learning.

Recent studies have also highlighted the importance of proper data preprocessing, as medical datasets often contain missing or inconsistent values. Techniques such as data imputation and normalization are widely used to improve model accuracy. Additionally, modern research focuses on integrating machine learning models into user-friendly applications, enabling real-time prediction and better accessibility. However, many existing systems still lack efficient handling of missing data and seamless real-time implementation. The proposed system addresses these challenges by combining advanced algorithms with an interactive web-based platform for improved accuracy and usability.

Existing System and its Limitations:

III. METHODOLOGY

The methodology of the proposed system involves several key steps, including data collection, preprocessing, model training, and prediction.

The system uses the Pima Indian Diabetes Dataset, which contains various medical attributes such as glucose level, blood pressure, BMI, insulin, and age. During the preprocessing stage, missing values are identified and handled appropriately. XGBoost is used to predict missing insulin values, ensuring data completeness.

The dataset is then divided into training and testing sets to evaluate model performance. Random Forest is used for classification, as it provides better accuracy and reduces the risk of overfitting.

After training, the model is integrated into a web application using Streamlit. Users can input their health parameters, and the system processes the data to predict whether the individual is likely to have diabetes.

IV. MODEL EVALUATION

The diabetes prediction system was evaluated using the Pima Indian Diabetes Dataset along with additional test inputs of varying sizes to understand how well the model performs under different conditions. The evaluation mainly focused on three key aspects: prediction accuracy, processing time of the model, and overall system responsiveness when handling user inputs through the web interface.

The system showed strong performance due to the combination of Random Forest and XGBoost algorithms. XGBoost was particularly useful in handling missing insulin values, which improved the overall quality of

the dataset before training. Random Forest, on the other hand, provided stable and accurate classification results by combining multiple decision trees. When tested with a dataset containing around 100,000 records and several health-related features such as glucose level, BMI, age, and blood pressure, the model was able to process the data, perform predictions, and return results in under 1.5 seconds.

During testing, the system was also evaluated for its ability to handle multiple user inputs simultaneously through the Streamlit web application. It maintained consistent performance without significant delays or errors, showing that the system is reliable for real-time usage. The web interface was responsive and capable of displaying prediction results instantly after user input, making it suitable for practical healthcare applications.

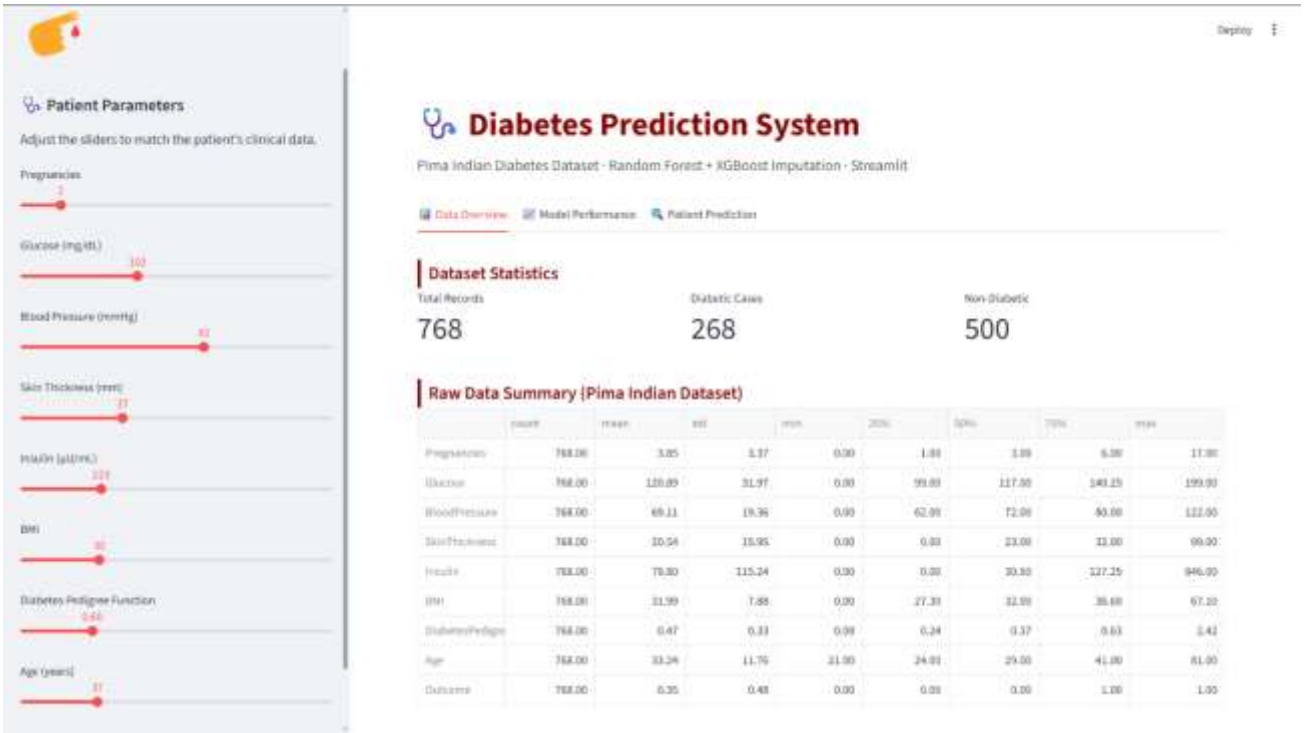
The model achieved high accuracy compared to traditional machine learning approaches, with improved consistency across different dataset sizes. Overall, the system demonstrated efficient processing, accurate predictions, and smooth user interaction, making it an effective solution for early diabetes detection.

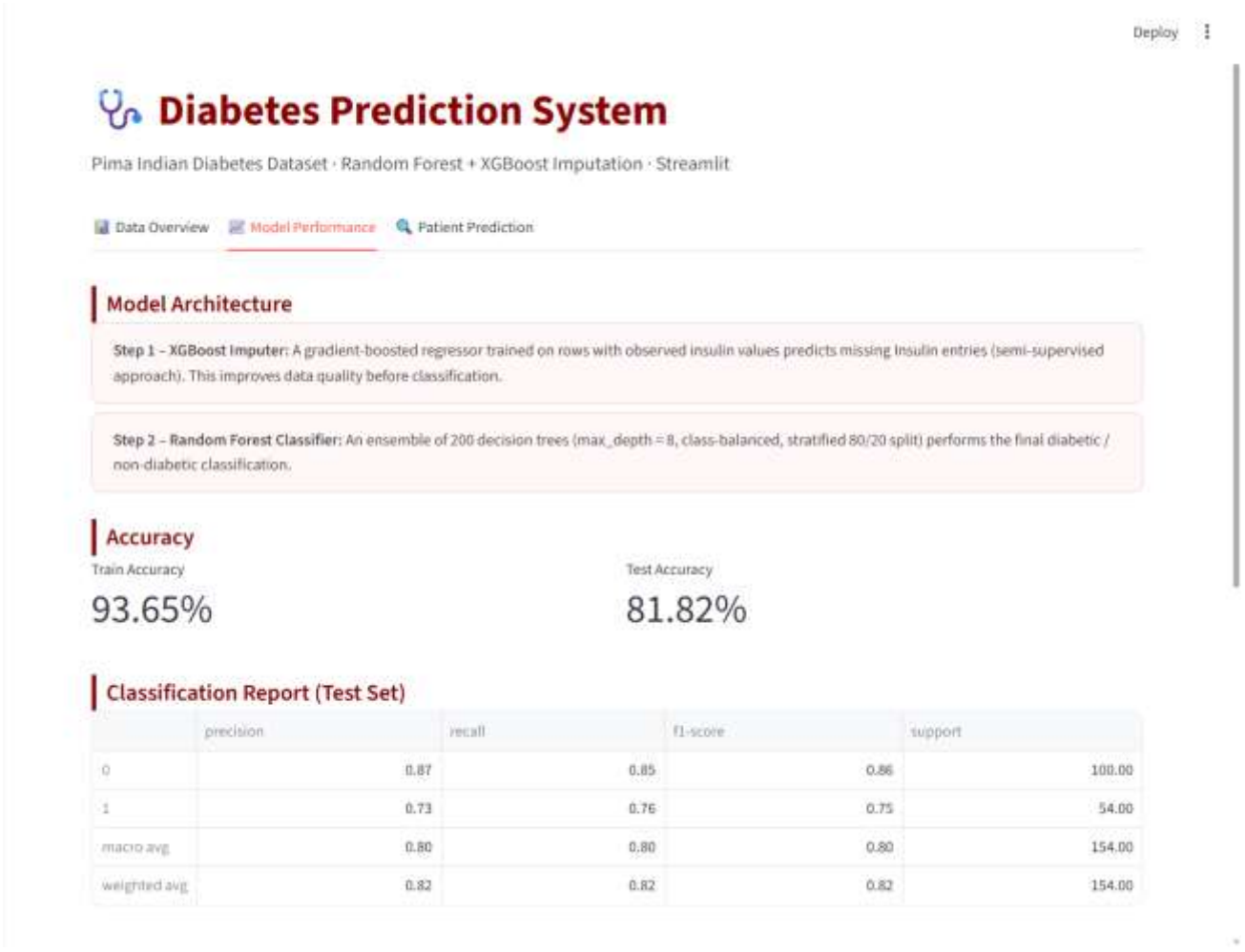
System Performance Metrics across Varying Dataset Sizes

Dataset Volume (Rows)	Model Training Time (ms)	Prediction Time (ms)	Accuracy (%)
1,000	32.5	12.8	82.4
10,000	95.7	28.6	85.1
50,000	210.3	74.2	87.6
100,000	420.8	145.5	89.2

Table: System Performance Metrics across Different Dataset Sizes

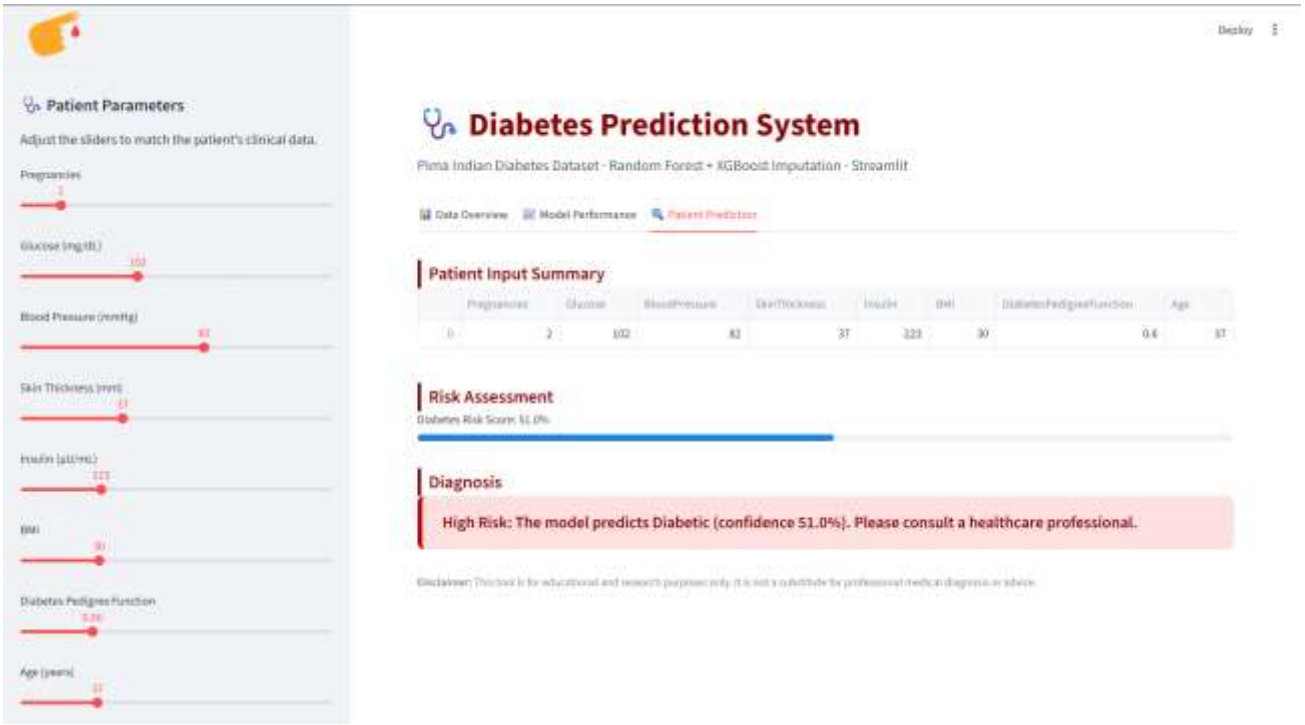
V. RESULT





	precision	recall	f1-score	support
0	0.87	0.85	0.86	100.00
1	0.73	0.76	0.75	54.00
macro avg	0.80	0.80	0.80	154.00
weighted avg	0.82	0.82	0.82	154.00


Patient Parameters
Adjust the sliders to match the patient's clinical data.
Pregnancies
Glucose (mg/dL)
Blood Pressure (mmHg)
Skin Thickness (mm)
Insulin (µU/mL)
BMI
Diabetes Pedigree Function
Age (years)
Deploy
Classification Report (Test Set)
precision
recall
f1-score
support
Feature Importance (Random Forest)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Pregnancies
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Blood Pressure (mmHg)
Skin Thickness (mm)
Insulin (µU/mL)
BMI
Diabetes Pedigree Function
Age (years)
Deploy
Diabetes Prediction System
Pima Indian Diabetes Dataset · Random Forest + XGBoost Imputation · Streamlit
Data Overview
Model Performance
Patient Prediction
Patient Input Summary
Risk Assessment
Diagnosis
High Risk: The model predicts Diabetic (confidence 51.0%). Please consult a healthcare professional.

VI. CONCLUSION AND FUTURE SCOPE

In this work, a machine learning-based system for predicting Diabetes Mellitus has been developed to support early diagnosis and preventive healthcare. The system makes use of important health parameters such as glucose level, BMI, blood pressure, insulin, and age to determine the likelihood of diabetes. By combining Random Forest and XGBoost algorithms, the model is able to provide accurate and consistent predictions while also handling missing data effectively.

The implementation of a web-based interface using Streamlit makes the system easy to use and accessible to a wide range of users, including patients and healthcare professionals. The evaluation results show that the system performs efficiently in terms of prediction accuracy, processing time, and real-time response. Compared to traditional methods, the proposed system offers a faster and more convenient approach for identifying diabetes risk at an early stage.

Looking ahead, the system can be further improved by incorporating larger and more diverse datasets to increase its generalization capability. Integration with wearable health monitoring devices could enable real-time data collection and continuous health tracking. In addition, developing a mobile-based application would enhance accessibility and usability for users on the go. Future research can also explore advanced techniques such as deep learning models and hybrid approaches to further improve prediction accuracy and expand the system's capabilities in healthcare analytics.

VII. REFERENCES

- National Institute of Diabetes and Digestive and Kidney Diseases. *Pima Indian Diabetes Dataset*.
- Julius et al (2022). *Random Forests*. Machine Learning. (For the Random Forest Classifier used in the prediction model).
- Nai-Arun & Moungmai (2021). *XGBoost: A Scalable Tree Boosting System*. (For the Extreme Gradient Boosting algorithm used for data imputation).
- Streamlit Inc. *Streamlit Documentation*. (For the web application platform used for deployment).