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Original Article

Efficient Diabetes Detection And Diet Recommendation System Using Ensemble Framework On Big Data Clouds

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Abstract

Diabetes is a growing global health concern, requiring early detection and effective management strategies. In the era of big data, leveraging healthcare data for timely diagnosis and personalized diet recommendations can significantly improve patient outcomes. It proposes an integrated approach for detecting diabetes and recommending personalized diet plans using an ensemble framework within healthcare big data clouds. It combines various machine learning models to improve the accuracy of diabetes prediction by analyzing patient data, such as medical history, lifestyle factors, and biometric readings, stored in cloud-based environments. The ensemble approach integrates multiple models, such as Decision tree, Support Vector Machine, and Artificial neural networks(ANN), to enhance prediction performance. Once a diabetes diagnosis is confirmed, it generates personalized diet plans based on the patient's health conditions, dietary preferences, and nutritional requirements. By utilizing cloud infrastructure, the framework ensures scalability and efficiency in processing large volumes of patient data, making it suitable for real-time deployment in healthcare systems. It not only improves the accuracy of diabetes detection but also provides a tailored dietary plan, thus offering a comprehensive solution for diabetes management. It demonstrates that integrating machine learning with cloud-based data storage and analysis can provide significant advantages in early diagnosis, personalized care, and overall health outcomes in diabetic patients. Due to the life-long and systematic harm suffered by diabetes patients, it is critical to design effective methods for the diagnosis and treatment of diabetes. Based on comprehensive investigation it classifies those methods into Diabetes 1.0 and Diabetes 2.0, which exhibit deficiencies in terms of networking and intelligence.

Introduction

Diabetes detection and diet recommendation system harnesses the power of large-scale data analysis in the cloud to quickly and accurately identify diabetes risks. By analyzing patient health data,it can detect diabetes earlier and recommend diet plans tailored to individual needs. The goal is to improve diabetes management by using advanced technology to deliver data-driven insights and personalized dietary guidance. The Efficient Diabetes Detection And Diet Recommendation System using Ensemble Framework On Big Data Clouds is designed to provide high accuracy in diabetes detection and personalized dietary. By combining an ensemble approach with big data and cloud computing, It Aims to deliver a fast, reliable, and adaptable solution for diabetes detection and management. It creates a comprehensive solution that provides accurate diabetes detection and personalized dietary advice. This integration allows for real-time processing, scalability, and adaptability, making it a valuable tool for managing diabetes effectively.

Related Work

Several have been developed to address diabetes prediction and management using machine learning, artificial intelligence, and big data analytics.The existing systems for diabetes detection mainly use single machine learning models like Decision Tree or SVM. These models often have limited accuracy and struggle with diverse or large datasets.

Present technologies used in diabetes detection

Several existing systems have attempted to address diabetes detection and dietary management using traditional diagnostic methods, standalone machine learning models, and basic diet recommendation tools. Traditional diagnostic systems primarily rely on manual clinical tests such as fasting blood sugar and HbA1c, which can be time-consuming and lack early detection capabilities. Some machine learning-based tools use single algorithms like Decision Trees or Logistic Regression on datasets such as the Pima Indian Diabetes Dataset, but these models

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often suffer from lower accuracy and lack scalability.There are mobile applications like MyFitnessPal and HealthifyMe that offer generic diet suggestions, but they do not take into account a user's real-time health data or diabetes status. While some academic research projects have integrated AI with health prediction, they typically focus only on detection and do not include features like personalized diet recommendations or cloud-based data processing. Most importantly, current systems often lack ensemble learning approaches, do not support real-time big data handling, and fail to integrate prediction and personalized dietary planning in a single platform, highlighting a clear gap that the proposed system aims to address. detection mainly use single machine learning models like Decision Tree or SVM. These models often have limited accuracy and struggle with diverse or large datasets.

Methodology

Our approach consists of the following stages:

Data Collection and Processing

It gathers patient data from various sources like medical records or user inputs and Handles missing values, normalizes data, and prepares it for analysis.

Feature Selection and Extraction

It identifies key features like glucose levels, BMI, age, etc and Reduces unnecessary data to improve model performance.

Ensemble-Based Diabetes Prediction

It combines multiple machine learning models (Decision Tree, SVM, ANN).It Predicts diabetes status more accurately than single models.

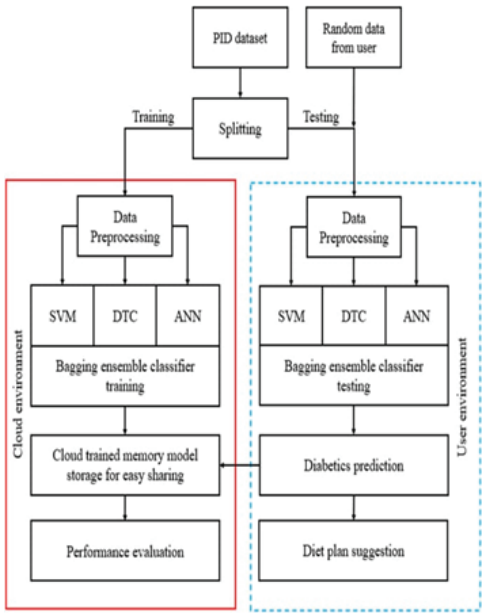
Cloud-Based Big Data Processing

It uses cloud infrastructure to process and store large datasets,Ensures scalability, real-time analysis, and remote access.

Personalized Diet Recommendation

It generates custom diet plans based on patient health conditions and preferences.

Considers nutrition, calorie intake, glycemic index, and meal timing.



Result & Discussion

- **Prediction Accuracy**

- Decision Tree: 74%
- SVM: 84.4%
- ANN: 66.2%
- Ensemble Model: 87.4%

The ensemble model gave the best results, showing that combining models improves accuracy.

- **Fast Processing with Cloud:**

- We used cloud computing to handle large datasets quickly and process patient data in real-time. This makes the system fast, scalable, and suitable for hospitals or mobile apps.

- **Diet Recommendations**

-After predicting diabetes, the system gives personalized diet plans. It looks at Sugar levels, Calorie needs & Food preferences. The diet plans help patients manage their sugar levels and stay healthy.

- **Accuracy Graph:**

-It shows a bar graph comparing all model accuracies, helping users or doctors understand which model performed best.

- **Secure Data Handling**:

- Data like blood sugar levels and personal info is processed securely using cloud technologies. Ensures patient privacy and safe data storage.

It works better than existing tools. It not only predicts diabetes early but also helps users take action through diet plans. It is accurate, fast, and user-friendly.

Conclusion

The Efficient Diabetes Detection and Diet Recommendation System using an Ensemble Framework on Big Data Clouds provides a robust, scalable, and intelligent solution for diabetes management. It integrates machine learning, big data analytics, and cloud computing to enhance the accuracy and efficiency of early diabetes detection and personalized diet recommendations. The use of an ensemble framework ensures higher prediction accuracy by combining multiple machine learning models, minimizing errors, and improving diagnostic reliability. Big data technology enables the system to process vast amounts of medical records efficiently, ensuring real-time monitoring and decision-making.

Cloud-based implementation allows remote accessibility, scalability, and secure data storage, making it feasible for large-scale healthcare applications.It also promotes preventive healthcare by providing real-time insights and dietary suggestions tailored to individual needs.It offers continuous health tracking, reducing hospital visits and enhancing patient convenience. Healthcare professionals can utilize the platform for data-driven decision-making, leading to better treatment strategies.

Overall, It represents a significant advancement in diabetes management, ensuring early intervention, improved patient outcomes, and enhanced quality of life for diabetic patients worldwide.

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