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FINGERPRINT BASED DIABETES PREDICTION USING AI & ML

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Abstract - -- *Diabetes mellitus is a health issue that is getting worse. We need to find out if someone has Diabetes mellitus on so they do not get really sick. The old methods of finding out if someone has Diabetes mellitus are not simple. They cost a lot of money. Usually involve getting a blood test.This paper is about a way to find out if someone has Diabetes mellitus that is easy to use. We can do this by looking at the patterns on a persons fingerprints and using computers to help us. The things we look at on a fingerprint include how dense it is, the lines and points on it and the texture. We use computer programs to look at the fingerprint. First we get a picture of the fingerprint. Then we make the picture better so the computer can understand it. After that we find the things, about the fingerprint. Finally we use the computer to look at the fingerprint and figure out if someone might have Diabetes mellitus. This new way is easy to use. Does not cost a lot of money. We can use it to help people, people who live in the country where it is hard to get to a doctor. When we tried this way we found out that it is possible to predict if someone might have Diabetes mellitus by looking at their fingerprints.*

Key Words*: *Diabetes mellitus Prediction, Fingerprint Analysis, Artificial Intelligence, Machine Learning,CNN.

I. INTRODUCTION

Diabetes is a problem that is getting worse everywhere in the world and it is really bad in India. This happens when our body cannot control the sugar in our blood either because it does not make insulin or because it does not use insulin properly. If we do not find out we have diabetes it can cause a lot of problems like heart issues, kidney damage, nerve problems and blindness. So it is very important to find out if we have diabetes early so we can take care of diabetes. The ways we can find out if we have diabetes now like getting our blood tested when we have not eaten need us to give blood. These methods are good.

They are not nice we might not want to do them all the time. In some places like in the country or where people do not have a lot of money people do not like to get tested because it hurts, costs money or they do not have a doctor. This means we need a way to find out if we have diabetes that does not hurt and is easy to do. Our fingerprints are special diabetes is a problem we want to solve. Nobody else has the fingerprints like us they have patterns on them that are made when we are growing inside our mother. Some studies say that the patterns on our fingerprints might be different if we have diabetes. This means that maybe we can use our fingerprints to see if we might have diabetes and that would be a help in fighting diabetes.

Computers are getting better at looking at pictures and finding patterns, which can help us with diabetes. We can use this to look at our fingerprints and find things like how close together the linesre which way they go and what they look like. Then we can use this information to teach a computer to find patterns and make predictions about diabetes.

In this study we want to see if we can use fingerprints to predict if someone has diabetes. We will use a computer to look at the fingerprint find the things about it and then use that to say if someone has diabetes or not. This way is better than the ways because it does not hurt it is cheap and it is easy to do. This makes it a good way to use for a lot of people it can help us fight diabetes.

We want to help people find out if they have diabetes early so they can take care of themselves and manage diabetes. This can be especially helpful in places where people do not have doctors more people can get the help they need and be healthier. Diabetes is a problem using fingerprints to predict diabetes can be a tool. Diabetes can cause a lot of problems like heart issues and kidney damage. If we can find out about diabetes early we can do something about it that is the goal of our study, on diabetes

II. LITERATURE REVIEW

The field of diabetes prediction has seen a lot of growth in the few years. This is because Artificial Intelligence and Machine Learning techniques have been used. Researchers have tried different approaches. They have looked at data and made models that can predict things.

One of the studies was done by Jha et al. They looked at the relationship between fingerprint patterns and Type II diabetes. They found that certain features of fingerprints like the patterns of the ridges are different in people with diabetes and

people without diabetes. This study showed a connection. It did not have automation and could not make predictions.
Some other researchers, like Mohamed and Khalaf made a system that can predict glucose levels in time. Their system was good at making predictions. Could adapt to new patients. However it needed a device to constantly monitor glucose levels, which's not very convenient.

Wu et al. Used Machine Learning techniques like Support Vector Machines and Artificial Neural Networks to predict blood glucose levels. Their models were very good. They needed clinical data, which limits their use.
Dhoble et al. Showed that methods like Random Forest and Logistic Regression can be used to classify conditions. Their work was very accurate. Showed that Artificial Intelligence can be used in healthcare. However their approach neededprameters like glucose levels and body mass index, which makes it hard to use on a large scale.Recently researchers have started looking at using data like fingerprints to predict diabetes.

Suresh et al. Used Convolutional Neural Networks to analyze fingerprint images. They found that these models can capture features of fingerprints and can be used to classify diabetic conditions. This is a step towards making non-invasive diagnostic systems.

With all this progress most of the current approaches have some problems. They need invasive clinical data or only useone method. There are also issues with the datasets, scalability and deploying the systems, in the world. These problems show that we need a practical solution. The proposed work is trying to make a system that can predict diabetes using fingerprints. It will combine image processing and Machine Learning techniques to make a -invasive, efficient and scalable healthcare solution. This system will use.

III. METHODOLOGY

This Fingerprint-Based Diabetic Prediction System employs the client–server architectural design whereby biometrics are collected, processed into images, and analyzed via machine learning algorithms for prediction of diabetes non-invasively. This model of interaction enables easy and efficient communication between the user interface and the backend unit in terms of analysis and prediction.

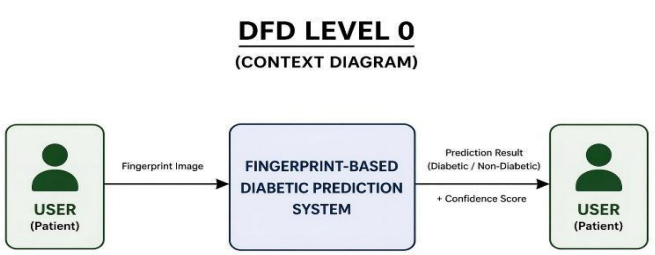
A. Architecture Overview

This system has the frontend for users' interactions and the backend processing unit where all data will be preprocessed, extracted, and classified. The frontend interface permits users to upload fingerprint images via an online interface. The backend processes this information utilizing various image processing and machine learning algorithms. Cloud database is employed for the storage of user information and prediction history. Real-time prediction is facilitated by the application.

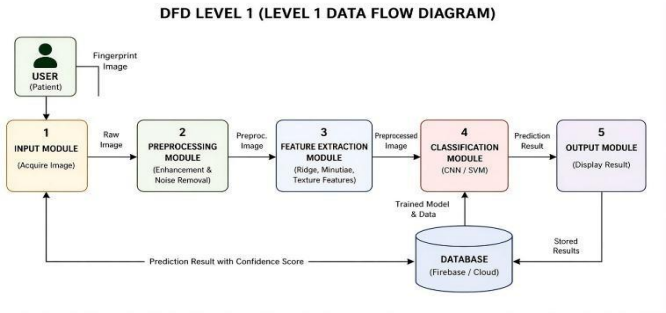
B. Important Components

1) Client Interface:
An website made with Streamlit technology that lets customers upload pictures of their fingerprints and get predictions.
2) Server for processing:
This includes preprocessing, feature extraction, and using machine learning models like CNN on the images that were uploaded.
3) Model for Machine Learning:
Uses supervised learning techniques to sort the fingerprints into two groups: those that belong to people with diabetes and those that don't.
4) The Database Layer:
A cloud computing platform (like Firebase) that keeps track of users' fingerprints, the results of predictions, and other important information.
5) Layer for Deployment:
This step is about putting all the parts together into one system.

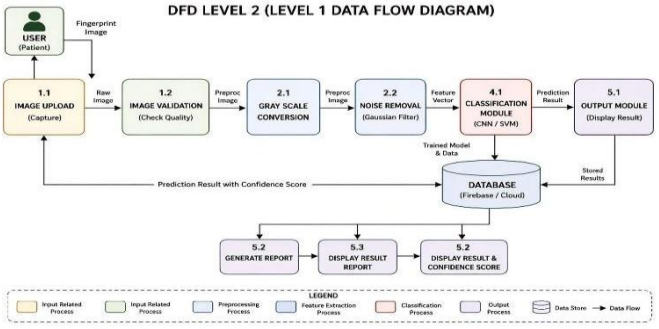
IV. DATA FLOW DIAGRAM : DFD 0 :



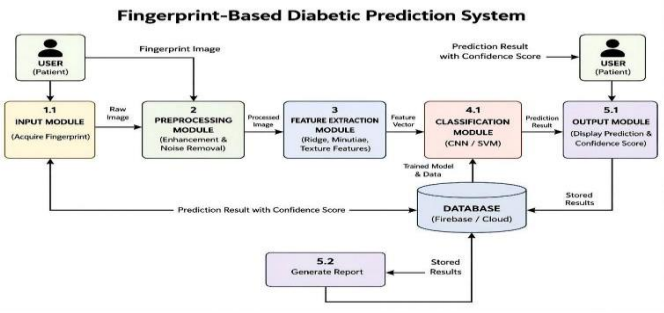
DFD 1 :



DFD 2:



V. SYSTEM ARCHITECTURE :



In order to achieve better predictions for diabetes through secure data and convenient Artificial Intelligence (AI) back end components, the multi-tier architecture was utilized to design the Fingerprint Based Diabetes Prediction System. Multi-layer architecture of Fingerprint Based Diabetes Prediction System contains four tiers where some or all parts of

Fingerprint Based Diabetes Prediction System can be found. Overall architecture of the Fingerprint Based Diabetes Prediction System consists of User Interface Tier, Application Logic Tier (Processing Logic), Data Management Tier, and External Integration Tier.

1. User Interface Layer :
In terms of the user interface layer (frontend), the applicationoffersa simplified,intuitive,and responsive user interface that is built with Streamlit and mobile compatibility. The users will be able to upload or capture their fingerprints' pictures, after which the diabetic prediction results will be available immediately.

2. Back-end Processing Layer (Application Logic Layer) :
The back-end processing layer is where the bulk of the processing for the whole system takes place. The bulk of the processing that enables the user interface as well as the AI application program interface (API) interaction is executed at this layer, including: processing captured images/screenshots; extracting all necessary features from the capturedimages/screenshots; classifying features of images/screenshots using CNNs; producing outputs from the processed images/screenshots; validating input data; and processing the workflow to ensure accuracy and reliability of the entire system.

3. Data Management Layer (Database) :
Firebase Cloud Database serves as the core component for storing and managing the data of the system. The user profile details, fingerprints, predictions, and system logs are stored in this cloud- based database in a secure manner.

4. External Integration Layer (Third Party Systems)
The integration of third-party systems such as fingerprint scanner devices, cloud systems, and other future integration systems in healthcare is done through this layer. The integration enhances the usability of the system and allows the solution to be applicable in a real-life situation.

VI. CONCLUSION:

"Fingerprint-Based Diabetic Prediction using Artificial Intelligence and Machine Learning" proposed in this work is a novel method that utilizes fingerprints along with machine learning to diagnose patients' risk of developing diabetes. This method avoids invasive and cumbersome blood sample tests and replaces them with convenient, less stressful, and more accessible tests based on fingerprints.

Using image processing and advanced machine learning techniques, including the CNN algorithm, this proposed system is capable of analyzing fingerprints' ridge characteristics, their minutiae, and texture and predicting diabetes from the data collected. Preprocessing, feature extraction, and classification make this process systematic and efficient.
Moreover, this innovative combination of machine learning with biometric information is very cost- effective and useful in remote and underdeveloped regions that cannot afford the services of specialists and expensive medical equipment. Using the web- based interface allows users to receive their predicted results immediately.
Summing up, this project represents the contribution to the development of intelligent preventive healthcare solutions that provide means of early detection of health problems, sucas diabetes. The further optimization of this solution may include the expansion of the current database of samples and enhancement of the system's accuracy.

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