**VISVESVARAYA TECHNOLOGICAL UNIVERSITY**

"Jnana Sangama", Belagavi: 590 018



Digital Image Processing Mini Project report on

**“DIABETES PREDICTION”**

Submitted in partial fulfillment of the requirement for the award of Degree of

**BACHELOR OF ENGINEERING**

**IN**

**ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

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**DEPARTMENT OF ARTIFICIAL INTELLIGENCE & MACHINE LEARNING**

**ACHARYA INSTITUTE OF TECHNOLOGY**

(Affiliated to Visvesvaraya Technological University, Belagavi)

**2022-2023**

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**Certificate**

Certified that the Digital Image Processing Laboratory with Mini Project entitled “**DIABETES PREDICTION”** is a bonafide work carried out by**ANIKETH HEBBAR (1AY20AI008) SHAHIL RASHEED (1AY20AI036) & SPOORTHI KL(1AY20AI043)** of Sixth semester in partial fulfillment for the award of degree of **Bachelor of Engineering in Artificial** **Intelligence & Machine Learning** of the **Visvesvaraya Technological University**, **Belagavi**, during the year **2022-2023.** It is certified that all corrections/ suggestions indicated for internal assessments have been incorporated in the Report deposited in the departmental library. The Mini Project report has been approved as it satisfies the academic requirements in respect of Mini Project work prescribed for the **Bachelor of Engineering Degree**.

**Signature of Faculty in Charge** **Signature of H.O.D**

**Name of the examiners** **Signature with date**

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**ABSTRACT**

Diabetes is a common chronic disease affecting many people worldwide, with significant impact on their health and quality of life. Early detection and risk assessment are important for preventing and managing diabetes. We introduce a cutting-edge system for real-time prediction of diabetes risk, featuring a user-friendly interface. This system allows users to input their health data and receive personalized risk predictions instantly. By providing immediate access to diabetes risk assessment and integrating with healthcare systems, our system has the potential to transform diabetes prevention and management. It empowers users to adopt healthier lifestyles and enables healthcare professionals to intervene in a timely manner for those at risk.

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**CHAPTER 1**

**INTRODUCTION**

* 1. **DEF**

Diabetes mellitus is a widespread and chronic metabolic disorder characterized by elevated blood glucose levels, leading to a range of health complications. Early detection and proactive management of diabetes are essential to mitigate the risk of complications such as cardiovascular disease, kidney failure, and vision impairment. With the advancements in machine learning and healthcare informatics, predictive modelling for diabetes risk assessment has become an invaluable tool in identifying individuals at high risk. Predictive analytics leverages historical health data, lifestyle information, and clinical measurements to develop models capable of forecasting the likelihood of an individual developing diabetes. These models aid healthcare professionals in making informed decisions about preventive interventions, personalized treatment plans, and lifestyle modifications. Moreover, they empower individuals with insights into their own health, fostering a proactive approach to diabetes prevention.

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**CHAPTER 2**

**PROBLEM DEFINITION**

**2.1. DEF:**

In today's healthcare landscape, diabetes continues to pose a significant public health challenge. However, several critical barriers impede effective diabetes risk assessment and early intervention efforts: Limited Accessibility, Complexity of Risk Factors, Delay in Diagnosis, Healthcare Overload, Style of Living. Addressing these challenges is paramount to improving diabetes risk assessment and early intervention, thereby reducing the burden of diabetes on individuals and healthcare systems alike. We propose the solution to bridge accessibility gaps, tackle the complexity of risk factors, enable early diagnosis, alleviate healthcare overload, and prioritize data privacy and security.

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**CHAPTER 3**

**LITERATURE SURVEY**

**3.1. LITERATURE REVIEW**

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|  |  |  | **TECHNICAL** |  |  |
|  |  |  | **IDEAS /** | **SHORTFALLS/DISADV** |  |
|  |  |  | **ALGORITHM** |  |
|  |  |  | **ANTAGES &** |  |
| **S.** | **PAPER TITTLE &** | **NAME OF THE** | **S USED IN** |  |
| **SOLUTION PROVIDED** |  |
| **N** | **PUBLICATION DETAILS** | **AUTHORS** | **THE PAPER** |  |
| **BY THE PROPOSED** |  |
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|  |  |  | **SYSTEM** |  |
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| 1 | Detection from an image in | Chowdhury, Mushfika | OpenCv and | and unfocused image |  |
| Business System. | Sharmin Rahman, | Zbar | caused problems while |  |
|  |  |
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**3.2 PROPOSED SOLUTION :**

# Diabetes risk prediction is a complex task due to the multifaceted nature of contributing factors. Traditional machine learning models, such as decision trees, may be susceptible to overfitting, especially in datasets with noise and intricate relationships. In this proposed solution, we advocate for the use of Logistic Regression as a robust alternative, emphasizing its ability to handle noise and maintain generalizability.

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**CHAPTER 4**

**REQUIREMENTS SPECIFICATION**

Requirements specification is a specification of software requirements and hardware requirements required to do the project.

**4.1 Hardware Requirements Specification**

Hardware Requirements are the hardware resources that are need to do the project work. These resources are a computer resource provides functions and services to do the project. Hardware resources required for our project are shown below.

* Processor: Intel Core i5 or above
* RAM: >=8GB
* Hard disk: Minimum 10 GB

**4.2 Software Requirements Specification**

Software Requirements are the software resources that are need to do the project work. These resources are installed on a computer in order to provide functions, services, hardware accessing capabilities to do the project.

In our project we used the following software resources.

**4.3 FUNCTIONAL REQUIREMENTS:**

Functional requirements specify a function that system or a system component must be able to perform. It can be documented in various ways.

* The system should be able to collect relevant health data for predicting diabetes risk.
* Ensure the accuracy and quality of input data through validation and preprocessing steps.

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* Accuracy Level. Our system aims to provide high level of Accuracy and certainly better, such that people could predict their diabetes.
* High Speed/Getting results quickly. We applied linear regression as this model will suitably be the fastest to give results with good accuracy.

**4.4 NON-FUNCTIONAL REQUIREMENTS:**

* Reliability: This system can enhance its reliability, providing accurate and actionable information for healthcare professionals and individuals involved in diabetes risk assessment and management.
* Availability: This system can achieve high availability, providing healthcare professionals and individuals with reliable and timely predictions for effective diabetes risk assessment and management.
* Security: We have implemented a lot of security mechanism to avoid to hack the system by outer world.
* Maintainability: It is very easy to maintain the system. Any people with the appropriate dataset can easily maintain the system.

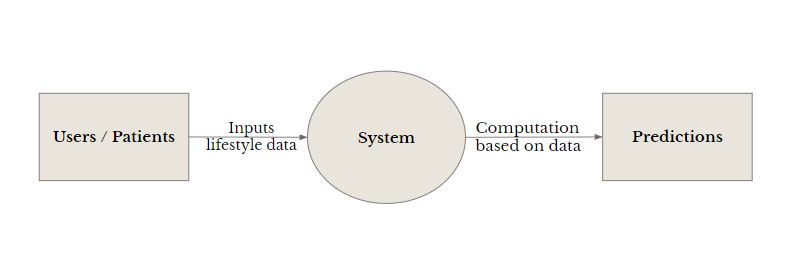
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**CHAPTER 5**

**SYSTEM DESIGN**

**5.1 Data Flow Diagram**

A Data Flow Diagram (DFD) is a graphical representation that illustrates the flow of data within a system or process. It shows how data moves from external sources, through processes, and eventually reaches its destination. DFDs provide a visual representation of the system's data flow, highlighting inputs, outputs, processes, and data stores.

**Fig 5.1 Data Flow Diagram**

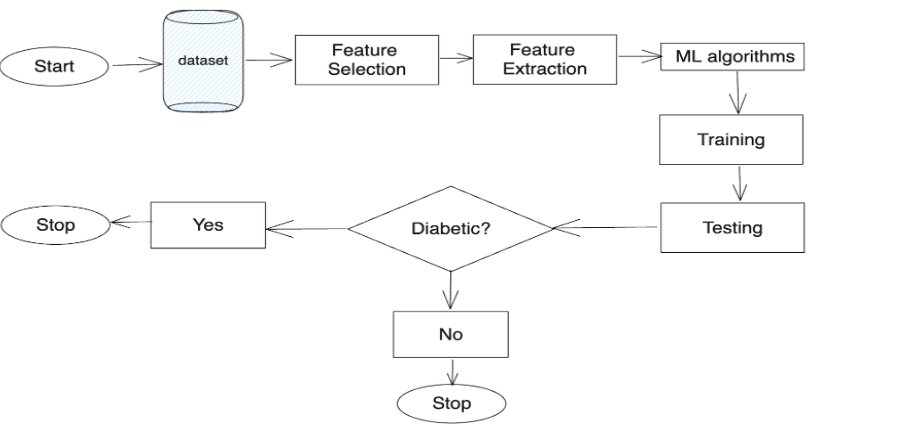
Data Flow Diagrams are valuable tools for understanding the flow of data within a system, analysing dependencies, and identifying areas for improvement or optimization. They can aid in system design, requirements analysis, and communication among stakeholders involved in system development or improvement projects.

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**5.2 Flow Chart diagram:**

A flowchart is a graphical representation of a process or a system, using symbols connected by lines to show the flow of steps or activities. It is a visual tool commonly used in various fields to describe and analyze processes.



**Fig 5.2 Flow Chart Diagram**

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**5.3 Module Description :**

A module description provides an overview and details of a specific module within a software system or project. It outlines the purpose, functionality, and scope of the module, as well as its interactions with other modules and components within the system. The module description serves as a reference document for developers, designers, and stakeholders involved in the development or maintenance of the software system.

* **User Module :-** In this module the user opens the interface and fills the interface with the required data.
* **Prediction Module :-** In this module the model evaluates with the given datas by the user and predicts whether the user contains diabetes.
* **Diet recommendation :-** In this module they recommends the diet pattern that the user has to follow.

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**CHAPTER 6**

**IMPLEMENTATION**

**6.1 Tools and Technologies Used**

* **Visual Studio Code:** Visual Studio Code (VS Code) is a free and open-source code editor developed by Microsoft. It has gained immense popularity among developers for its simplicity, versatility, and a rich set of features. VS Code's intuitive user interface boasts a clean design with a sidebar for easy file navigation, an integrated terminal, and a customizable status bar. Its strength lies in the extensive support for extensions, available through the marketplace, allowing developers to tailor the editor to their specific needs.
* **Flask:** Flask is a lightweight and widely used web framework for Python that simplifies the process of building web applications. Developed with simplicity and flexibility in mind, Flask empowers developers to create robust and scalable web solutions with minimal boilerplate code. Its modular design allows users to choose the components they need while providing the essential tools for routing, templating, and handling HTTP requests. Flask is known for its ease of learning and quick setup, making it an excellent choice for both beginners and experienced developers. Despite its minimalistic nature, Flask is highly extensible, allowing the integration of various extensions for tasks such as authentication, database management, and API development.
* **HTML:** HTML, or Hypertext Markup Language, is the foundational language of the World Wide Web and a cornerstone of web development. Developed to structure content on web pages, HTML uses a system of tags to define and organize elements such as headings, paragraphs, images, links, and more. These tags, enclosed in angle brackets, provide a structural hierarchy that browsers use to render and display content. HTML is a markup language that facilitates the creation of structured documents by assigning specific roles and attributes to different elements within a page.

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**CSS:** Cascading Style Sheets (CSS) is a fundamental technology in web development that plays a crucial role in styling and designing web pages. As a style sheet language, CSS enables developers to control the presentation and layout of HTML elements, defining how content should be displayed on different devices and screen sizes. CSS allows for the separation of content and presentation, making it easier to maintain and update web pages. It provides a wide range of styling options, including setting colors, fonts, margins, padding, and positioning elements on a page.

Pandas: Pandas is a powerful and widely used open-source data manipulation and analysis library for the Python programming language. Developed to handle structured data seamlessly, Pandas provides easy-to-use data structures like DataFrame and Series, which enable efficient manipulation, cleaning, and analysis of diverse datasets. With a syntax inspired by the R programming language, Pandas simplifies complex data operations into concise and expressive code. It excels in handling missing data, merging and joining datasets, and performing time-series analysis.

**Numpy:** NumPy is a fundamental library for numerical computing in Python, providing support for large, multi-dimensional arrays and matrices, along with a collection of mathematical functions to operate on these data structures. Developed to address the limitations of Python's built-in data structures, NumPy offers efficient and high-performance operations for numerical tasks. Its core feature is the ndarray, a versatile array object that enables the manipulation of large datasets with ease.

**Seaborn:** Seaborn is a powerful data visualization library in Python built on top of Matplotlib. Designed to create aesthetically pleasing and informative statistical graphics, Seaborn simplifies the process of generating complex visualizations with concise and expressive code. It provides a high-level interface for creating attractive and informative statistical graphics, including heatmaps, pair plots, violin plots, and more.

**Scikit-learn:**

**6.2 Algorithms / Methodologies Used**

**Logistic Regression:** Logistic Regression is a widely used classification algorithm, particularly suitable for binary classification problems, where the outcome variable has two classes (e.g., diabetic or non-diabetic). In the context of diabetes prediction, Logistic Regression can be applied to model the probability of an individual having diabetes based on various features**.**

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**CHAPTER 7**

**SYSTEM TESTING**

System testing is an essential part of developing a barcode detection system using OpenCV and Pyzbar. It involves thoroughly testing the system to ensure its functionality, performance, and accuracy. Here are some key aspects to consider for system testing:

1. **Input Image and Video Testing**: Test the system with a variety of input images and videos containing different barcode types, orientations, lighting conditions, and image qualities. Ensure that the system can accurately detect and decode barcodes from these inputs.
2. **Barcode Detection Testing**: Test the accuracy and robustness of the barcode detection algorithm by providing images or video frames with barcodes at different positions, angles, and scales. Verify that the system can consistently and reliably locate barcodes within the input.
3. **Barcode Decoding Testing**: Test the decoding functionality using various barcode types, including 1D barcodes like UPC and EAN, as well as 2D barcodes like QR codes. Evaluate the accuracy and efficiency of the decoding process, especially with damaged, partially obscured, or incomplete barcodes.
4. **Real-time Performance Testing**: Test the system with a live video stream to ensure it can perform barcode detection and decoding in real-time. Measure the processing speed and verify that the system can meet the required performance standards.
5. **Robustness Testing**: Test the system with challenging scenarios, such as images or video frames with low lighting, glare, or noise. Evaluate the system's ability to handle these variations and provide accurate barcode detection and decoding results.
6. **Performance Testing**: Measure the system's performance metrics, such as processing time, memory usage, and resource utilization. Analyze the results to identify any bottlenecks or potential areas for optimization.
7. **Documentation and User Manual Testing**: Assess the completeness and accuracy of the system's documentation, including installation instructions, configuration guidelines, and troubleshooting steps. Also, verify the clarity and effectiveness of the user manual or help documentation.

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**CHAPTER 8**

**CONCLUSION AND FUTURE SCOPE**

**CONCLUSION:**

The diabetes prediction using machine learning holds significant promise for improving public health, individual well-being, and healthcare efficiency. By leveraging advanced algorithms and the wealth of healthcare data available, machine learning models offer the ability to identify individuals at risk of diabetes before symptoms manifest. This early detection can lead to proactive interventions, personalized healthcare, and better outcomes for patients.

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**FUTURE SCOPE:**

The future scope of diabetes prediction involves ongoing advancements in technology, data science, and healthcare to enhance the accuracy, accessibility, and effectiveness of predictive models. Several areas hold significant potential for the evolution and improvement of diabetes prediction:

**1.Integration of Wearable Devices and IoT**:- Incorporating data from wearable devices, continuous glucose monitors, and other Internet of Things (IoT) devices can provide real-time health information. This integration allows for more dynamic and personalized predictions based on current health status and lifestyle factors.

**2.Advanced Machine Learning Techniques**: - Continued research into advanced machine learning and artificial intelligence techniques, such as deep learning, ensemble methods, and hybrid models, may uncover more intricate patterns in data. These techniques can potentially improve prediction accuracy, especially in cases with complex and non-linear relationships.

**3.Personalized Medicine and Genomic:** - Integrating genetic information and personalized medicine approaches into diabetes prediction models can enhance their precision. Understanding the genetic predisposition to diabetes and tailoring predictions based on individual genomic profiles may contribute to more targeted preventive strategies.

**4.Big Data Analytics and Population Health Management: -** Leveraging big data analytics for population health management can provide insights into broader trends and risk factors for diabetes at a community or population level. This information can inform public health interventions and resource allocation.

**5.Continuous Model Improvement**: - Implementing systems for continuous model improvement based on feedback from healthcare professionals and users is essential. Regular updates to models can account for evolving medical knowledge, changes in risk factors, and improvements in predictive techniques.

As technology continues to advance and our understanding of diabetes deepens, the future of diabetes prediction holds great promise for improving preventive strategies, personalized healthcare, and overall public health outcomes. However, it is crucial to address ethical considerations, validate models rigorously, and ensure that these technological advancements are accessible and beneficial to diverse populations.

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**CHAPTER 9**

**APPENDICES**

A. **SAMPLE CODE:**

Importing packages:

**Fig 9.1 Importing package**

Methods:

**Fig 9.2 Methods Used**

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Authorization:

**Fig 9.3 Authorization**

Un-Authorized:

**Fig 9.4 Un-Authorization**

Barcode Info:

**Fig 9.5 Barcode Information**

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Displaying Output:

**Fig 9.6 Displaying Output**

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**B. SNAPSHOTS**

Gray Scale version of the real time image:

**Fig 9.7 Grayscale Image**

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Barcode detection:

**Fig 9.8 Un-Authorized Barcode Image**

**Fig 9.9 Authorized Barcode Image**

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