A

PROJECT REPORT

ON

"PERSONALIZED MEDICINE RECOMMENDATION SYSTEM"

SUBMITTED TO

SHIVAJI UNIVERSITY, KOLHAPUR

IN THE PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE BACHELOR OF TECHNOLOGY IN COMPUTER SCIENCE AND ENGINEERING

SUBMITTED BY

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UNDER THE GUIDANCE OF

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE ENGINEERING

DKTE SOCIETY'S TEXTILE AND ENGINEERING INSTITUTE, ICHALKARANJI

(AN EMPOWERED AUTONOUMOUS INSTITUTE)

2024-2025

D.K.T.E. SOCIETY'S

TEXTILE AND ENGINEERING INSTITUTE, ICHALKARANJI
(AN EMPOWERED AUTONOUMOUS INSTITUTE)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE ENGINEERING

CERTIFICATE

This is to certify that, project work entitled

"PERSONALIZED MEDICINE RECOMMENDATION SYSTEM"

is a bonafide record of project work carried out in this college by

MISS. SAKSHI ARAGE 22UAD003

is in the partial fulfillment of award of degree Bachelor of Technology in Artificial Intelligence and Data Science Engineering prescribed by Shivaji University, Kolhapur for the academic year 2024-2025.

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DECLARATION

We hereby declare that, the project work report entitled "PERSONALIZED MEDICINE RECOMMENDATION SYSTEM" which is being submitted to D.K.T.E. Society's Textile and Engineering Institute Ichalkaranji, affiliated to Shivaji University, Kolhapur is in partial fulfillment of degree B.Tech.(AI & DS). It is a bonafide report of the work carried out by us. The material contained in this report has not been submitted to any university or institution for the award of any degree. Further, we declare that we have not violated any of the provisions under Copyright and Piracy / Cyber / IPR Act amended from time to time.

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Thank you,

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ABSTRACT

In recent years, the demand for accessible and intelligent healthcare support systems has increased significantly. This project introduces a Personalized Medicine Prediction System that leverages machine learning techniques to predict probable diseases based on user-reported symptoms. In addition to disease prediction, the system provides comprehensive health guidance by recommending suitable medicines, preventive measures, workout routines, and diet plans tailored to the individual's condition.

The primary objective is to assist users in making informed health decisions and promoting wellness through personalized suggestions. This system is not intended to replace professional medical consultation but serves as an initial point of reference for users seeking timely and relevant health advice. The integration of disease prediction with lifestyle recommendations enhances the usability and scope of the system, offering a holistic approach to personal health management.

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1. Introduction

Problem Definition

Many people experience symptoms but are unsure of the cause or the right treatment. Relying on self-medication or online advice often leads to wrong decisions or delayed care. There's a need for a reliable, personalized system that predicts diseases based on symptoms and suggests suitable medicines, preventive steps, workouts, and diets.

Aim and Objective:

- Data Collection & Preprocessing – Use a dataset of symptoms, diseases, and treatments.
- Disease Prediction – Predict possible diseases using ML models.
- Medicine Recommendation – Suggest medicines based on predicted disease.
- Preventive Measures – Recommend ways to prevent worsening or recurrence.
- Workout & Diet Plans – Provide personalized health plans to support recovery.

Scope and Limitations

Scope:

- Disease predictions
- Recommended medicines
- Preventive advice
- Diet and workout plans

Limitations:

User Input Accuracy – Wrong or incomplete symptoms may affect results.

No Full Medical History – Doesn't consider chronic conditions or allergies.

Not a Medical Replacement – It's a supportive tool, not a substitute for a doctor.

Data Limitations – Predictions depend on the quality and range of training data.

2. Background study and literature overview

Literature Overview

Recent advancements in healthcare technology have led to tools like WebMD and Mayo Clinic symptom checkers that predict diseases based on user input. However, these tools lack personalized suggestions like diet, workout, and prevention plans.

Machine learning has also been widely used for disease prediction (e.g., heart disease, diabetes), offering improved accuracy over traditional methods. But most ML-based systems focus only on prediction, not complete health management

.Investigation of Current Project and Related Work

1. Symptom Checkers – Tools like Isabel and Symptomate predict diseases but don't offer medicine suggestions, diet, or lifestyle advice.

2. ML for Disease Prediction – Models using Random Forest, SVM, etc., predict diseases effectively but rarely include personalized recommendations.

3. Personalized Health Systems – Apps like HealthifyMe and Ada provide diets and workouts or symptom-based predictions, but not both together.that includes medications or preventive health measures.

PMRS is Different from Existing Systems

- **Modular & Scalable**: Unlike hospital-scale systems (e.g., IBM Watson), PMRS is lightweight and suitable for clinics, telemedicine, and small hospitals.

- **Deep Personalization**: Uses patient-specific data like demographics, symptoms, history, and genetic markers for tailored drug recommendations.

- **Hybrid Recommendation Engine**: Combines collaborative filtering and content-based filtering for more accurate suggestions.

- **Lightweight Tech Stack**: Built using Python, Flask, and SQLite—easy to deploy, unlike complex enterprise systems.

- **Adaptive Learning**: Designed to improve over time by learning from new patient data and feedback (future feedback loop).

- **User-Friendly & Deployable**: Includes UI, API integration, and deployment features—ready for real-world use.

3. Requirement analysis

a.Requirement Gathering

User Needs Analysis: Understanding what users expect—simple symptom input, clear disease prediction, and helpful health advice.

Research Review: Studying existing systems (e.g., WebMD, symptom checkers) to find what features are missing or can be improved.

Consulting Academic Sources: Referring to medical datasets and ML techniques used in health applications.

Functionality Expectations: Users want quick responses, easy-to-use interfaces, and reliable suggestions.

Based on this, the project requires:

- A symptom input system
- Disease prediction engine using machine learning
- Medicine recommendation based on disease
- Diet, workout, and prevention tips generator

b.Requirement Specification

1. Functional Requirements:

- These are the features the system must perform:
- Symptom Input Module: Users can enter one or more symptoms through a form or text input.
- Disease Prediction Module: The system uses a machine learning model (e.g., Random Forest or Naive Bayes) to predict possible diseases based on symptoms.
- Medicine Suggestion Module: Based on the predicted disease, the system suggests commonly used medicines (OTC or prescription-based).
- Preventive Measures Module: Recommends actions to prevent the condition from worsening (e.g., rest, hydration, hygiene tips).
- Workout Plan Module: Suggests light exercises or stretches suitable for the condition (or advises rest if needed).
- Diet Recommendation Module :Provides food and nutrition advice based on the predicted illness.
- User Interface (UI):Simple and clean interface where users can interact with all the above features.

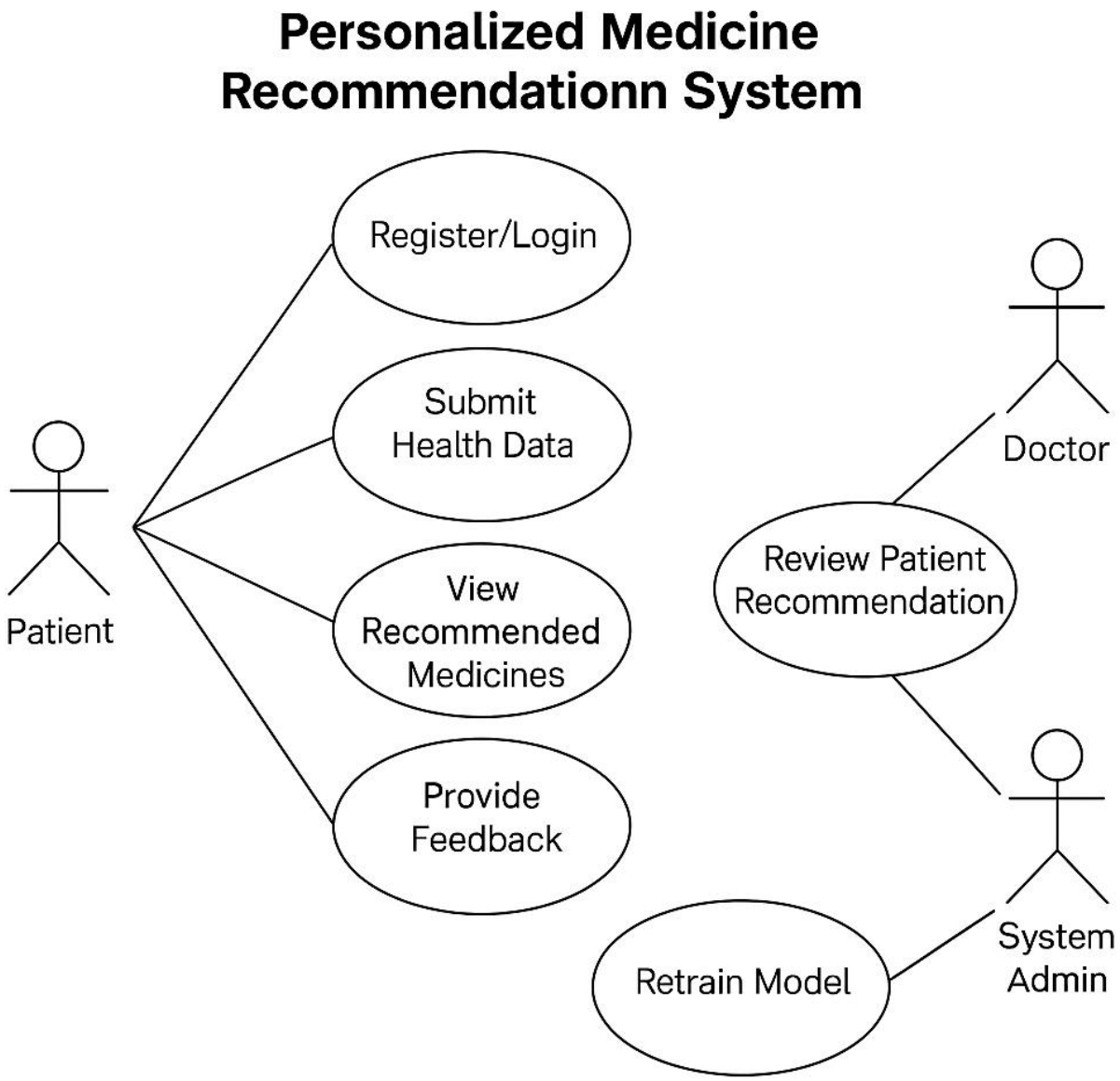
2. Non-Functional Requirements:

These describe how the system should perform:

- Accuracy: Predictions must be as accurate as possible using a well-trained ML model.

- Usability: Easy-to-use design, accessible to non-technical users.
- Performance: Quick response time even when handling multiple symptoms.
- Scalability: The system should support adding new diseases, symptoms, and recommendations over time.
- Security & Privacy: User inputs should be handled securely and kept private.
- Portability: Can run as a web or mobile application.

c. Use case Diagram:



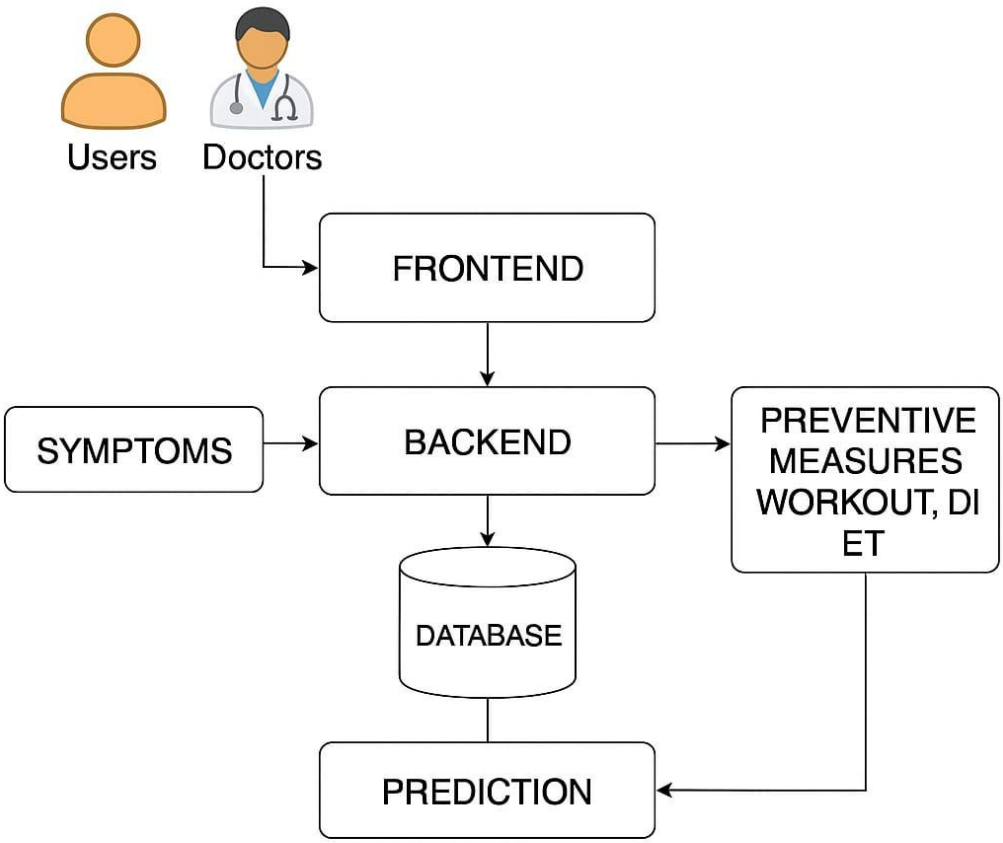
4. System design

Architectural Design

The system follows a layered architecture:

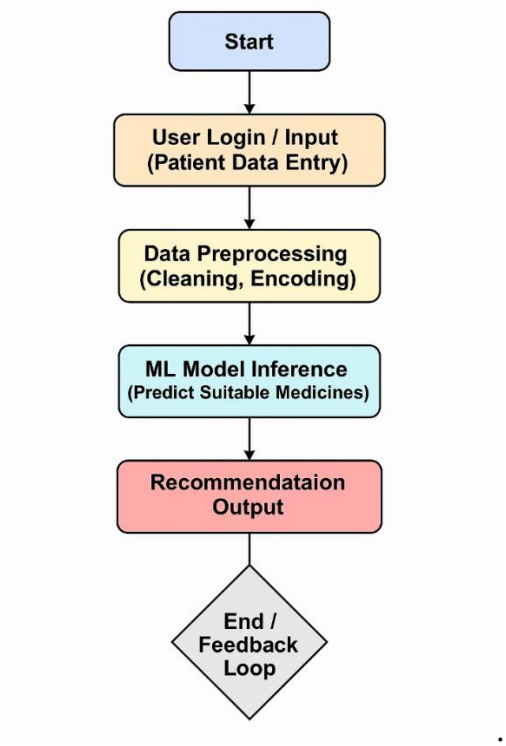
1. **Presentation Layer:** Frontend user interface for patients and doctors.
2. **Application Layer:** Flask-based backend handling input validation and ML model execution.
3. **Data Layer:** Storage of patient records and system logs.

Optional enhancements include API endpoints for EHR integration and cloud-hosted databases for scalability



PERSONALIZED MEDICINE PREDICTION SYSTEM

Flow Chart



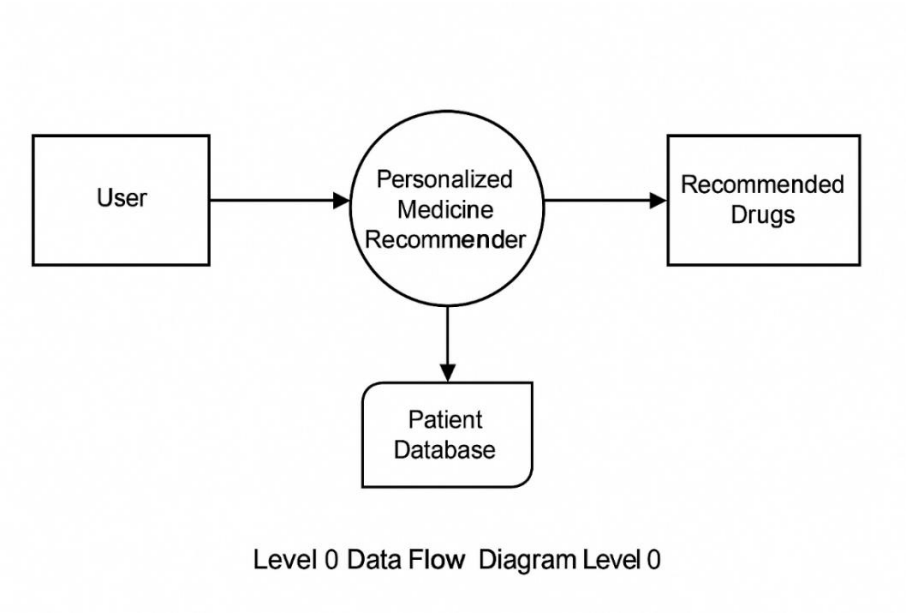
System Modeling

The system is modeled using a modular design:

- Data Preprocessing Module
- Prediction Engine
- Recommendation Display Module

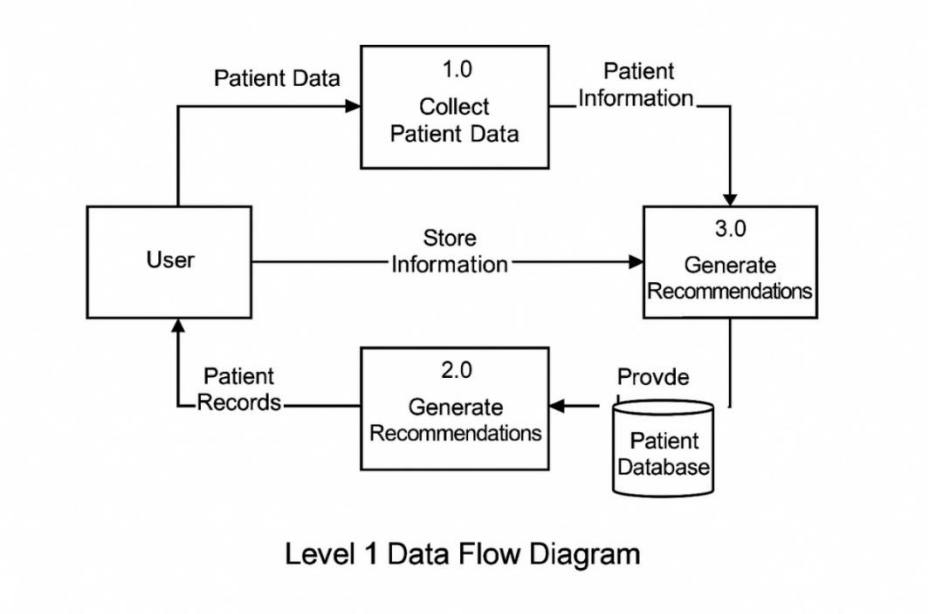
Dataflow Diagram

Level 0 DFD: User input → System processing → Recommendation



Level 0 Data Flow Diagram Level 0

Level 1 DFD: Breaks down data collection, preprocessing, model inference, and result gen



Level 1 Data Flow Diagram

5. Implementation

Agile Methodologies

The project followed agile methodology through:

- Weekly sprints
- Trello-based task management
- Continuous integration (CI) through GitHub
- Regular code reviews and testing checkpoints

Development Model

1. Requirement Analysis
-Identify functional and non-functional requirements.
-Understand user needs like symptom input, disease prediction, preventive suggestions, etc.

2. Data Collection
-Gather datasets related to symptoms, diseases, diets, workouts, and preventive measures.
-Use reliable medical datasets (e.g., Kaggle, WHO, or UCI repositories).

3. Data Preprocessing
-Handle missing values, normalize data.
-Use label encoding or one-hot encoding for categorical data.

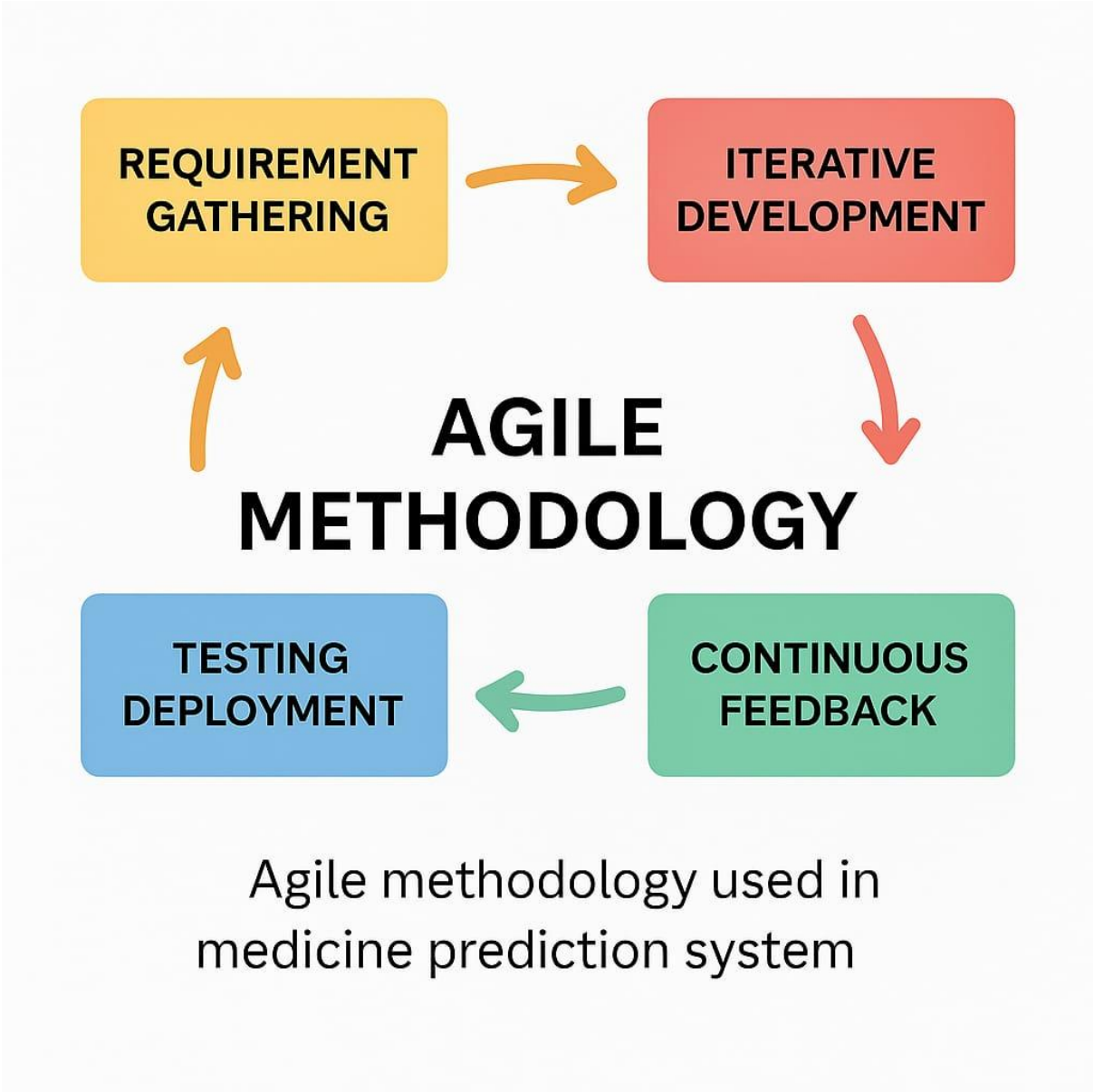
4. Machine Learning Model Selection
-Choose classification algorithms like Random Forest, Decision Tree, Naive Bayes, or Logistic Regression.
-Compare models based on accuracy, precision, recall, and F1-score.

6. Prediction System Design
-Design a user interface for inputting symptoms.
-Integrate the trained model to predict disease and suggest preventive measures.

7. Diet & Workout Recommendation Module
-Use condition-specific mappings (e.g., diabetes → low-sugar diet).
-Rule-based or AI-based suggestion engines.

8. Deployment
-Deploy using Flask or Django (for web apps).
-Host on cloud (e.g., Heroku, AWS, or PythonAnywhere).

9. Documentation & Reporting
-Prepare user manual, technical documentation, and final report



Agile methodology used in medicine prediction system

6. Future Scope

- Integration with Health Monitoring Devices: The system could be integrated with wearables like smartwatches or fitness trackers to collect real-time health data (e.g., heart rate, temperature, physical activity). This would allow the system to offer even more personalized recommendations based on actual health metrics, not just symptoms.

- Expansion of Disease and Symptom Database: Currently, the system might be limited to predicting common diseases. In the future, the database can be expanded to include rare diseases, making the system more comprehensive. As the model is exposed to more data, its predictions can become more accurate over time.

- AI and NLP Enhancements: Incorporating Natural Language Processing (NLP) can help the system understand user descriptions in free text, rather than just selecting symptoms from predefined lists. This would make it more user-friendly, as users could describe their symptoms in their own words.

- Personalized Health Reports: The system could generate detailed health reports based on predictions, including progress tracking, suggested next steps, and health tips. These reports could help users track their health over time and improve preventive care.

- Collaboration with Medical Professionals: The system could be improved by working closely with doctors and health experts. This collaboration could help in refining the disease prediction models and ensuring that recommendations are both accurate and safe.

- Mobile App Development: While the system can be web-based, there's great potential for a mobile version, making it accessible to a broader audience. Mobile integration would allow users to easily input symptoms, get predictions, and receive real-time health recommendations while on the go.

- Multi-Language Support: The system could be developed in multiple languages to serve people from different regions and cultures, making it more globally accessible. This would be particularly helpful in countries where access to medical advice is limited.

- Collaboration with Health Insurance Companies :The system could be used by health insurance companies to assist in preventive care and early detection, potentially leading to cost reductions in healthcare. It could be used to help policyholders stay healthy by providing personalized health guidance.

7. References (public repository GitHub source code links)

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