

**PREDICTIVE AND RECOMMENDATION BASED HOLISTIC  
HEALTHCARE SYSTEM USING MACHINE LEARNING**

**Mrs.Suganya.S<sup>1</sup>**

<sup>1</sup> Department of Information Technology, Easwari Engineering College,

Bharathi Salai,Ramapuram,Chennai–600 089,India. e-

mail:suganyarajkumar1593@gmail.com

December 8, 2025

**Abstract**

The convergence of traditional and modern healthcare systems represents a transformative step toward achieving holistic and personalized medical care. In recent years, the rapid advancement of artificial intelligence (AI) and machine learning (ML) techniques has enabled the development of intelligent systems capable of predicting diseases and recommending suitable treatments. This study introduces a comprehensive disease prediction and healthcare remedy recommendation system that integrates multiple domains of medical knowledge, including Ayurveda, Siddha, traditional home remedies, and modern allopathic medicine, within a unified and user-friendly digital platform. The primary objective of this system is to provide users with

accurate disease predictions based on their symptoms and to recommend scientifically validated as well as traditionally recognized remedies, thereby bridging the gap between conventional and contemporary healthcare approaches. The proposed framework employs several machine learning algorithms—namely Decision Tree (DT), Random Forest (RF), Gradient Boosting Classifier (GBC), and Support Vector Machine (SVM)—to identify the most effective model for disease prediction. Analysis of these algorithms is performed to determine the most accurate and efficient predictive model. The selected algorithm is then integrated into the healthcare recommendation engine, which aligns the predicted disease with relevant treatments from various healthcare systems. This multi-domain recommendation strategy ensures that users receive holistic healthcare advice encompassing preventive, curative, and lifestyle-based remedies.

**Key Words and Phrases:**Disease Prediction, Gradient Boost Classifier, Healthcare, Recommendation.

**1 Introduction**

The growing intersection of traditional and modern healthcare systems highlights the need for integrated, technology-driven solutions. Medical systems such as Siddha and Ayurveda

have historically emphasized prevention, body balance, and herbal remedies, whereas Modern Medicine prioritizes empirical, evidence-based approaches to diagnosis and treatment. Despite differing methodologies, these systems share a common objective—improving health outcomes and overall well-being. The Healthcare Remedy Recommendation System (HRRS) bridges these domains through AI and ML. By analyzing symptoms entered by users, the system predicts potential diseases and recommends corresponding treatments from Siddha, Ayurveda, and Modern Medicine. This integration allows individuals to access diverse medical insights in one platform, promoting inclusive, accessible, and holistic healthcare.

The HRRS represents a significant advancement in the integration of traditional and modern medical practices through the application of artificial intelligence (AI) and machine learning (ML). The primary objective of this system is to unify treatment methodologies derived from Siddha, Ayurveda, and Modern Medicine within a single, intelligent, and accessible framework. Such integration not only enhances the reach of diverse healthcare knowledge systems but also promotes holistic, personalized, and evidence-informed treatment strategies for individuals. The system functions by analyzing symptoms provided by the user to predict potential diseases. For accurate and reliable disease prediction, the Gradient Boosting Classifier (GBC) algorithm is employed. GBC is a powerful ensemble learning technique that constructs multiple weak learners—typically decision trees—and combines them to form a robust predictive model. Each subsequent tree in the sequence aims to minimize the errors of its predecessors, thereby enhancing the model's precision and overall performance.

Its ability to model complex and non-linear relationships makes

it particularly well-suited for healthcare data, where symptoms often exhibit intricate and varied patterns across individuals. Upon disease prediction, the system recommends suitable remedies drawn from the three healthcare domains. Remedies from Ayurveda emphasize herbal formulations, detoxification therapies, and dietary modifications to restore internal balance. Siddha medicine, rooted

in ancient Tamil traditions, provides therapeutic preparations, lifestyle guidelines, and preventive measures. In contrast, Modern Medicine contributes clinically validated pharmacological and therapeutic treatments based on empirical research. By presenting these diverse treatment options collectively, the system enables users to make informed and personalized healthcare decisions based on their cultural preferences and medical needs.

The integration of predictive modeling with multi-domain remedy recommendations provides several advantages. It minimizes the time required for preliminary disease identification, encourages preventive healthcare practices, and bridges the gap between tra-

ditional and contemporary medical systems. Furthermore, the system functions as an intelligent virtual healthcare assistant, offering accessible, efficient, and user-centered

guidance without requiring direct medical consultation. The HRRS exemplifies the synergy between machine learning and integrative medicine. By leveraging the Gradient Boosting Classifier for disease prediction and unifying remedies from Siddha, Ayurveda, and Modern Medicine, the system delivers a comprehensive and technologically advanced healthcare solution. This innovation not only enhances diagnostic support and treatment accessibility but also contributes to the modernization of digital healthcare by harmonizing traditional healing wisdom with modern computational intelligence.

## **2 LITERATURE SURVEY**

C. Silpa, B. Sravani, et al.,[1] Drug Recommendation System in Medical Emergencies using Machine Learning (2023), the right amount of drug dosage for health severities is recommended using svm (support vector machine). Using SVM, a classification of drugs is performed based on various features such as age, temperature, blood pressure and symptoms. Rapid drug suggestion. Improved patient care by recommending right dosage.

Chinnasamy P, Wong WK, et al.,[2] Health Recommendation System using Deep Learning-based Collaborative Filtering(2023) Content-Based Filtering (CBF) for personalized recommendations based on patient medical history. Use Collaborative Filtering (CF) to suggest treatments based on similar patient cases. It incorporate Deep Learning Models (Autoencoders, RBM-CNN) for high-accuracy recommendations.

Park, Junseok & Park, Seongkuk, et al.,[3] CORUS: Blockchain-Based Trustworthy Evaluation System for Efficacy of Healthcare Remedies(2018), Blockchain data network (Hyperledger Fabric - HF) utilizes a permissioned blockchain to ensure immutability of data. Contribution-based incentives are cryptocurrency based reward systems where participants log healthcare remedy data through a web system, using pre-defined metrics.

Kaustubh Waghavkar et al.,[4] Healing Hands for Depressed People (D-HH) through Analysis of human body signals to predict the level of depression and recommendation of suitable remedy(2016), The system uses K-Means clustering to analyze the data and categorize the individual's depression level into low, mid, or high. The algorithm dynamically generates clusters based on real-time input, ensuring adaptability and accuracy.

Mahima Mohapatra, et al.,[5] A Machine Learning based Drug Recommendation System for Health Care(2022) The System works with Content-Based Filtering which uses Cosine Similarity to recommend drugs based on user-input conditions. It also uses Collaborative Filtering Builds a User-Item Interaction Matrix to compare conditions.

Percy Okae et al.,[6] A Disease Prediction and Medication Recommendation System Using Machine Learning Techniques(2024) the ML models such as Naïve Bayes, Random Forest, and Decision Tree are used for training both disease prediction and drug recommendation models. Each model was trained on the preprocessed dataset and evaluated for

accuracy, precision, recall, and F1-score. Chinmayi Chitnis et al.,[7] Improving Health-Care Systems by Disease Prediction(2018), A Neural Network Model is implemented using Keras, with multiple hidden layers and ReLU activation. The Adam optimizer is used for efficient weight adjustment, with binary cross-entropy as the loss function. The model is optimized through

hyperparameter tuning.

Taniksha Patil et al.,[8] Disease Prediction and Drug Recommendation using Machine Learning(2024) The system trains ML models such as Logistic Regression, Decision Trees, and Support Vector Machines (SVM) for disease prediction. Use patient symptoms and medical history as input to predict the likelihood of diseases. Implement feature selection techniques to improve model interpretability and performance. This system utilizes Collaborative Filtering and Content-Based Filtering to recommend personalized medications.

Mage Usha U, A. M. Arun Mohan,et al.[9]Predictive Modeling of Patient Outcomes Using Machine Learning Algorithms in Health Informatics(2025) Electronic health care system (EHRS) and available medical datasets include patient demographics, medical history, lab test results, imaging reports, and treatment records to find mandatory address missing values, inconsistencies, and imbalances in order to normalize and extract the numerical values.By using Multiple ML algorithms are evaluated to determine the most effective predictive model. These include: Logistic Regression (Baseline Model) , Random Forest (Ensemble Learning) ,Support Vector Machine (SVM) (Non-Linear Classifier) ,XGBoost (Gradient Boosting Model),Deep Neural Networks (DNN) (Advanced Feature Representation) identify the accuracy, precision, recall and F1-score and AUC-ROC metrics of dataset,XGBoost and Random Forest demonstrated the best discrimination abilities when predicting patient outcomes.

Akash Bhardwaj, Pawan Kumar et al.,[10] Medicine Recommendation System Using Effective Machine Learning Techniques & Predict(2025) The system integrates recommendations, medication, dietary plans, and exercise, to address the specific needs of patients to their personalized recommendations and accurate prediction ,actionable treatment strategies.This system uses Decision Tree,Random Forest,Support Vector Machine ,Multinomial naive bayes,KNN to compare their Accuracy level.Federated learning and explainable AI will also play a crucial role in addressing privacy concerns and improving trust in these systems.

## **3 METHODOLOGY**

### **3.1 Data Collection**

The system begins with a structured dataset comprising four key attributes: part of the body, symptoms, diseases, and remedies. The Part of the Body identifies the affected organ or

gion. Symptoms describe the signs experienced by the user. Disease links the symptoms to a possible diagnosis, and Remedies provide holistic and modern treatment options.

### **3.2 Data Preprocessing**

The collected data underwent a series of processing steps to reduce noise and import the quality of the input data that will be fed to the algorithm in later stages. The process included - label standardization, text cleaning, stop word removal and lemmatiza- tion.

### **3.3 Feature E xtraction**

Important features are selected from the dataset to form in- put for the model. Categorical values like symptoms and body parts are encoded into numbers. Label Encoding or OneHot Encoding or TF-IDF vectorizer are used to convert text into machine-readable formats.

### **3.4 Classification of Remedies Based on Disease Predicted**

Using the encoded features, the system predicts diseases based on user input. Once a disease is identified, it is matched with the correct remedy from the dataset. This mapping is learned during training using historical associations.

### **3.5 Apply Machine Learning Techniques**

This stage involves applying algorithms like Decision Trees, Random Forests, or Neural Networks. Models are chosen based on metrics such as accuracy and precision. They enable precise prediction of diseases and suitable remedy classification.

### **3.6 Model Selection**

To accurately predict disease across different symptoms and its produced recommendation system by the main difference between Gradient Boosting and other algorithms is its sequential learning approach, where each new model corrects the errors of the previous one using gradient descent. Unlike algorithms like Random Forest (which builds trees independently) or Logistic Regression (which assumes linear relationships), Gradient Boosting optimizes performance iteratively, making it more accurate and flexible for complex, non-linear problems.

### **3.7 Model Training**

ML Models were trained on preprocessed datasets. After symptoms are submitted, the system processes the input using TF- IDF vectorization, which transforms the text into meaningful nu- merical data. The core disease prediction is handled by a Gradient Boost Classifier, known for its strong performance on structured data and its ability to reduce overfitting. The final models and tokenizers were saved for integration and remedies for predicted disease is mapped. Gradient boosting classifier technique works by building an ensemble of decision trees sequentially where each new tree corrects the errors made by the previous one. It handles mixed data types, is robust to outliers, and provides valuable feature im- portance insights.

The ML models such as Support Vector Machine and Gradient Boost Classifier were trained and evaluated on a data of symptoms and corresponding diseases to analyze which produces better accuracy.

**3.7.1 Model Evaluation**

The performance of each model was evaluated using standard classification metrics such as precision, precision, recall, F1- score, and confusion matrix. These metrics provided a comprehensive view of

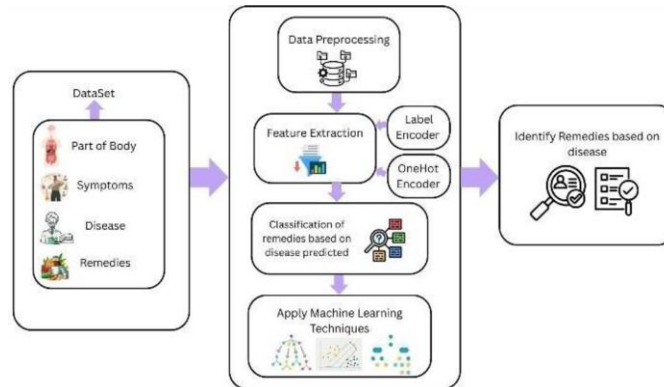


Figure 1: Project Architecture.

how well the models performed in predicting the disease.

$$TP + TN$$

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FN + FP} \quad (1)$$

$$TP + TN + FN + FP$$

$$\frac{TP}{TP + FP} \quad (2)$$

$$\text{Precision} = \frac{TP}{TP + FP} \quad (3)$$

$$\frac{TP}{TP + FN} \quad (4)$$

$$TP$$

$$\text{Recall / TPR / Sensitivity} = \frac{TP}{TP + FN} \quad (4)$$

$$TP + FN$$

$$2 \cdot \text{Precision} \cdot \text{Recall}$$

$$F1 = \frac{2 \cdot \text{Precision} \cdot \text{Recall}}{\text{Precision} + \text{Recall}}$$

$$\text{Precision} + \text{Recall}$$

Where,

TP - True Positives TN - True Negative FP - False Positive FN - False Negative

TPR - True Positive Rate FPR - False Positive Rate

Model	Accuracy	Precision	Recall	F1 Score
Support Vector Machine	70.4%	0.70	0.71	0.70
Gradient Boost Classifier	93.7%	0.93	0.91	0.92

Table 1: Performance of classification models

### 3.8 SYSTEM ARCHITECTURE

This system is built on a well-defined architecture that initiates with the symptoms get from user through user- centric interface to predict diseases and recommend personalized remedies.

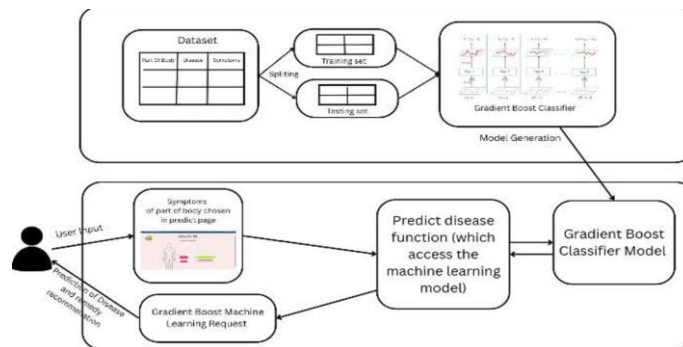
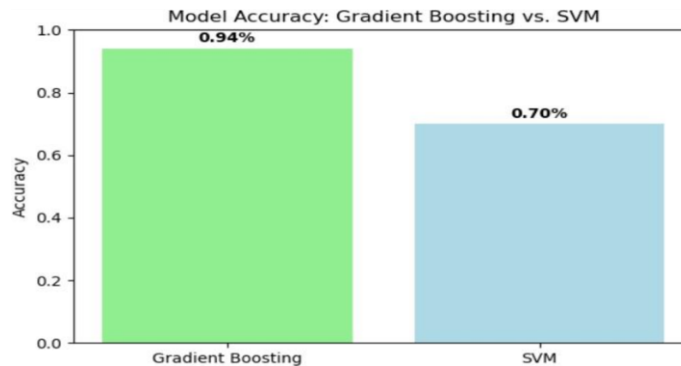


Figure 2: System Architecture.

Figure 3: ML techniques model accuracy



### 3.9 RESULTS AND INFERENCE

The models were trained by considering symptoms as key- words to predict the disease and evaluated on the test dataset. The implemented system is based on user-input symptoms and produces reliable prediction for various disease and also maps the disease with traditional and modern remedies. The developed models demonstrated effective performance in disease prediction. On testing with various symptom combinations, the application predicted diseases accurately and provided relevant remedy information, confirming the efficacy of the ML model and its integration within the Flask web app.

### 3.10 CONCLUSION

The integration of NLP-based disease prediction with remedy suggestion modules showcases the potential of machine learning techniques in creating an accessible and personalized healthcare system in real time. The system not only demonstrates the potential of digital healthcare solutions in bridging the gap between preventive care and cure but also lays a strong foundation for future innovations such as remote diagnosis, EHR integration, and smart health

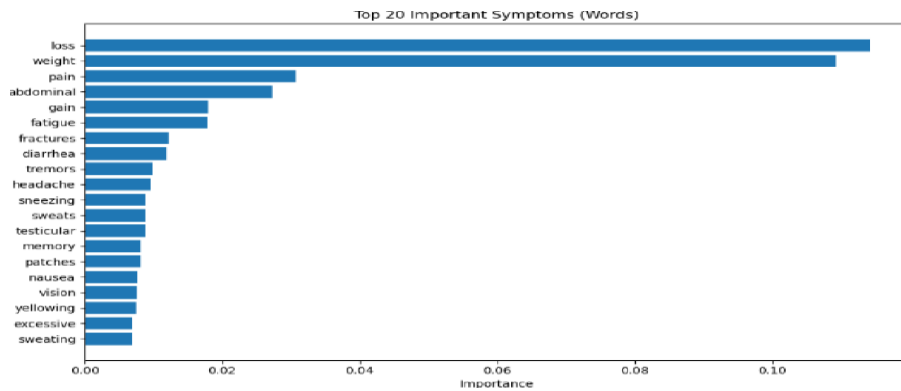


Figure 4: Classification Report for important symptoms

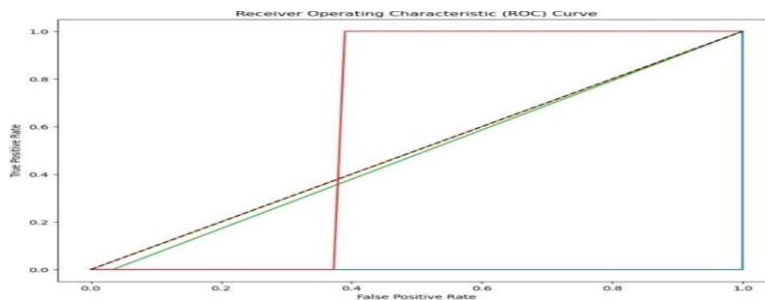


Figure 5: Receiver Operating Characteristic (ROC) Curve



Figure 6: Frontend Output

monitoring. By combining modern medical insights with traditional practices such as Ayurveda, Siddha, and home remedies, the application delivers a holistic and personalized approach to healthcare.

### **3.11 FUTURE SCOPE**

The Healthcare system can be further enhanced by expanding its support to include integrate deep learning models to analyze user health profiles, lifestyle habits, and history for more personalized disease predictions. The addition of more sophisticated contextual embedding methods and attention-based transformers can also implement recommender systems for lifestyle changes, exercises, and diet plans based on predicted diseases. In addition, a widening of the system to enable e-prescription suggestions from modern medicine and integrate teleconsultation features. Periodic updates with evolving health condition patterns of users and real-world datasets will also be important to maintain the system current and robust.

### **References**

- [1] C. Silpa, B. Sravani, D. Vinay, C. Mounika and K. Poorvitha, "Drug Recommendation System in Medical Emergencies using Machine Learning", International Conference on Innovative Data Communication Technologies and Application (ICIDCA), Uttarakhand, India (2023), pp. 107-112, doi: 10.1109/ICIDCA56705.2023.10099607..
- [2] Chinnasamy, P., Wong, W. K., Raja, A. A., Khalaf, O. I., Kiran, A., & Babu, J. C., The  $q$ "Health recommendation system using deep learning based collaborative filtering", *1.Heliyon*, [https://www.cell.com/heliyon/fulltext/S2405-8440\(23\)10052-1](https://www.cell.com/heliyon/fulltext/S2405-8440(23)10052-1), (2023).
- [3] Chinnasamy, P., Wong, W. K., Raja, A. A., Khalaf, O. I., Kiran, A., &

- Babu, J. C., The  $q$ "Health recommendation system using deep learning based collaborative filtering", *1.Heliyon*, [https://www.cell.com/heliyon/fulltext/S2405-8440\(23\)10052-1](https://www.cell.com/heliyon/fulltext/S2405-8440(23)10052-1),(2023).
- 1.K.Waghavkar and S. Chandurkar, The  $q$ "Healing Hands for Depressed People (D-HH) through analysis of human body signals to predict the level of depression and recommendation of suitable remedy", *International Conference on Computing Communication Control and automation (IC- CUBEA) Pune, India, 2016, pp. 1-6, doi: 10.1109/IC- CUBEA.2016.7860029*,(2016).
- [4] Mohapatra, Mahima & Nayak, Mamata & Mahapatra, Saswati, The  $q$ "A Machine Learning based Drug Recommendation System for Health Care"Graduate Research in Engineering and Technology, 5-10. *10.47893/GRET.2022.1109*,(2022).
- [5] Okae, Percy & Setorwu, Edmond & Henanaoeph, Ishmael & Impraim, Gideon, The  $q$ "A Disease Prediction and Medication Recommendation System Using Machine Learning Techniques", 1-6. *10.1109/ICAST61769.2024.10856494*,(2024).
- [6] R.Lee and C. Chitnis, The  $q$ "Improving Health-Care Systems by Disease Prediction", *International Conference on Computational Science and Computational Intelligence (CSCI), Las Vegas, NV, USA, 2018, pp. 726-731, doi: 10.1109/CSCI46756.2018.00145.*,(2018).
- [7] Rupali Bhagat , Taniksha Patil , Gourav Barua , S.D. Kamble, The  $q$ "Disease Prediction and Drug Recommendation using Machine Learning", *1.IJSDR-International Journal of Scientific Development and Research (www.IJSDR.org), ISSN:2455- 2631, Vol.9, Issue 4, page no.1109 - 1115, April 2024, Available:https://ijsdr.org/papers/IJSDR2404160.pdf.*,(2024).
- [8] Dr.Mage Usha U, Dr. A. M. Arun Mohan, Dr. Trupti Kaushiram Wable, Mr. Narayanam. P.S. Acharyulu , Dr Dola Sanjay S, The  $q$ "Predictive Modeling of Patient Outcomes Using Machine Learning Algorithms in Health Informatics", *DOI:https://doi.org/10.63001/tbs.2025.v20.i01.pp516- 522.*,(2025).
- [9] Akash Bhardwaj, Pawan Kumar, Aditya Tiwari, Abhineet Suman, The  $q$ "Medicine Recommendation System Using Effective Machine Learning Techniques Predict", *IJRT:International Journal Of Creative Research Thoughts,2025 IJCRT — Volume 13, Issue 5 May 2025 — ISSN: 2320-2882*,(2025).