

An Automation for Ayurveda Drug Recommendation System using ML

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Abstract— In today's digital healthcare era, Ayurveda is still a valuable but less-digitized traditional system. This paper proposes an intelligent Ayurvedic drug recommendation using Machine Learning (ML) techniques. The system automates disease prediction based on patient symptoms and recommends suitable Ayurvedic treatments. By leveraging Random Forest, Naive Bayes, and Support Vector Machine (SVM) algorithms, this system enhances diagnostic efficiency and minimizes manual errors. Integrated with a web-based platform, it also manages patient records, historical prescriptions, and doctor assignments. The proposed model demonstrates promising accuracy and scalability, offering a reliable solution for modernizing Ayurveda using data-driven technology.

Keywords— Machine Learning, Ayurveda, Disease Detection, Random Forest, Drug Recommendation System, Personalized Healthcare.

I. INTRODUCTION

Ayurveda is an age-old Indian medical system practiced for thousands of years and is based on the principles of balance between the body and spirit. Central to Ayurvedic diagnosis is the concept of Prakriti, or individual body constitution, which determines a person's physical and psychological characteristics. Treatment involves personalized approaches, including herbal medications, dietary adjustments, and lifestyle modifications. Despite its holistic approach and time-tested effectiveness, Ayurveda still depends mainly on manual diagnosis and practitioner experience. This dependency limits its scalability and accessibility, especially in rural or understaffed areas. As a result, patients may struggle to access timely and consistent care, and doctors often face difficulties in maintaining detailed records or offering standardized prescriptions.

With the growing adoption of digital healthcare technologies, it is essential to upgrade traditional healthcare systems such as Ayurveda to meet modern needs. Using ML in Ayurveda offers new ways to improve accuracy and contribute to more streamlined healthcare delivery. This project fills that gap by developing a web-based Ayurvedic drug recommendation system that utilizes ML algorithms to predict diseases based on symptoms. The system then suggests appropriate Ayurvedic treatments, helping doctors make faster and more reliable decisions. Furthermore, it includes a centralized platform to manage patient records, prescriptions, and doctor-patient interactions. By blending the wisdom of Ayurveda with the power of artificial intelligence, the system contributes to improvements in clinical workflow but also preserves and propagates traditional knowledge in a scalable, accessible, and user-friendly manner.

II. LITERATURE REVIEW

- Ligandro Singh Yumna et al. [1] developed a hybrid approach using decision trees and neural networks to predict diseases and recommend Ayurvedic treatments. Their model mapped symptoms to Prakriti types for personalized herbal solutions, highlighting AI's potential in Ayurvedic decision support. However, it faced challenges with imbalanced datasets, high computational load, and lack of real-time or clinical validation.
- Prathamesh Shinde et al. [2] created an ML-based Ayurvedic formulation suggestion system using logistic regression and random forest classifiers. The platform integrated a query-response module and provided doctors with treatment history, improving practicality. Limitations included static datasets, lack of real-time updates, and absence of patient history integration.
- Thanushree and Manjunath [4] proposed a machine learning framework for Prakriti classification, identifying Vata, Pitta, and Kapha body constitutions using decision trees and k-nearest neighbors. It automated a traditionally subjective process but did not extend to disease diagnosis or prescriptions, and dataset size limited generalizability.
- Vijay M. et al. [16] developed a personalized Ayurvedic medicine recommendation system using Decision Tree algorithms integrated with Prakriti analysis. The model's strength lay in its alignment with traditional Ayurvedic principles, offering tailored treatments based on individual dosha profiles. It simplified diagnosis by automating Prakriti classification and linking it to specific herbal remedies. However, the system was limited by its reliance on structured input formats.
- Nitya Singh et al. [18] introduced a hybrid ML framework combining Prakriti assessment with symptom mapping for personalized Ayurvedic drug recommendations. The model integrated physiological, demographic, and clinical data, enhancing adaptability and diagnostic precision. Its limitations included poor dataset diversity and the absence of clinical trials, which restricted real-world applicability.

III. METHODOLOGY

The system utilizes a clean and structured version of the dataset sourced from the AYUSH government portal. It contains binary symptom attributes and disease labels across 41 conditions, providing a balanced and diverse foundation for training and testing. The setup allows the model to capture varied symptom patterns while maintaining equal representation for evaluation.

A. Data Collection

The dataset includes 132 binary symptom features and a prognosis column for disease class, totaling 4,920 records with about 120 samples per disease, covering conditions like Dengue, Migraine, Psoriasis, and Fungal Infections. Each record represents a patient with symptom presence or absence, enabling the model to learn symptom-disease associations.

A separate 41-record test set, one per disease, ensures balanced evaluation. This setup supports thorough training and fair assessment of predictive performance.

B. Data Preprocessing

Empty columns are removed with dropna, and symptom attributes remain binary while the target variable is label-encoded for ML compatibility. Exploratory analysis shows balanced disease classes, and the dataset is split into features (X) and target (y) with an 80:20 train-test ratio. Preprocessing ensures no null values and consistent symptom encoding for clean, efficient model training.

C. Model Training

The training set (80% of the data) is used to train Random Forest, SVM, and Gaussian Naive Bayes classifiers. Random Forest ensembles decision trees to capture complex symptom-disease relationships, SVM separates disease classes with optimal hyperplanes, and Naive Bayes models probabilistic independence of symptoms. Each model is evaluated using 10-fold cross-validation to ensure consistent performance. Hyperparameter tuning, such as tree count or SVM kernel adjustments, further improves accuracy.

D. Model Testing

The remaining 20% of the dataset and a 41-record test set are used to evaluate model performance on unseen symptom data. Predicted disease labels are compared with true labels to assess accuracy. Results show consistent matches, demonstrating the models' ability to generalize to new patient cases. This validates that the models can accurately predict diseases for novel and complex symptom patterns.

E. Evaluation Metrics

Model performance is evaluated using accuracy, precision, recall, F1-score, and confusion matrices. Random Forest, SVM, and Naive Bayes achieve perfect scores, with no false positives or negatives across all 41 disease classes. Confusion matrices show ideal diagonal dominance, confirming correct classification. Ten-fold cross-validation further validates the models' stability and reliability for Ayurvedic diagnosis.

IV. IMPLEMENTATION

A. Hardware and Software Requirements

The system runs on Windows 10 or 11 and is developed using Python, with Flask for the backend and HTML, CSS, and JavaScript for the frontend. Development is done in VS Code, and data is managed via MySQL. A minimum of 4 GB RAM, 20 GB storage, and an Intel Core i5 processor is recommended for smooth model training and deployment.

B. Functional Modules

The system is a multi-module platform integrating administration, medical expertise, patient interaction, and ML-based predictions. Together, these modules enable accurate diagnosis, effective treatment, and secure record management.

Figure 1 illustrates the system architecture, highlighting the interaction of the following modules with the database and ML model through a Flask backend.

Admin Module

The admin module manages doctor profiles, patient records, and doctor-patient assignments to ensure smooth operations. It also monitors system-wide activities, oversees prescriptions, and handles transactions via the integrated payment gateway. Acting as the control centre, it maintains data integrity and ensures seamless functioning of the entire application.

Doctor Module

After logging in, doctors access a personalized dashboard with patient schedules, history, and past prescriptions. Current symptoms are entered and processed by the ML model to predict the disease. Based on the diagnosis, the system generates a preliminary Ayurvedic prescription. Doctors can review, edit, or finalize the treatment, ensuring a balance between automation and expert judgment.

Patient Module

Patients have a separate login panel to access their profile, medical history, and past prescriptions. They can view appointment schedules, receive real-time consultation notifications, and download previous prescriptions. The system also supports secure online payments for medical services. All patient data is securely stored under a unique ID, ensuring continuity of treatment records across visits.

Machine Learning Module

The ML module serves as the prediction engine, preprocessing symptom data with techniques like label encoding and normalization before feeding it into a Random Forest classifier. The model predicts the most probable disease with a confidence score, which is then mapped to the treatment database for Ayurvedic remedies.

Built with Python libraries such as Scikit-learn, Pandas, and NumPy, the model is periodically retrained to improve accuracy with new cases.

Treatment Recommendation Module

After disease prediction, this module retrieves a customized Ayurvedic treatment plan with medicines, dosages, diet, and lifestyle advice. The suggestions are displayed for doctors to review, edit, or personalize based on symptom severity and patient history. Once approved, the treatment is finalized for PDF generation, ensuring accuracy and consistency in medical advice.

PDF and Record Management Module

This module generates prescriptions in PDF format, compiling patient details, symptoms, predicted disease, and recommended treatments for download or email delivery. All data including inputs, model outputs, doctor notes, and prescriptions are securely stored in a MySQL database linked to unique patient IDs. It ensures traceability, supports long-term health record management, and maintains version history for reliable clinical documentation.

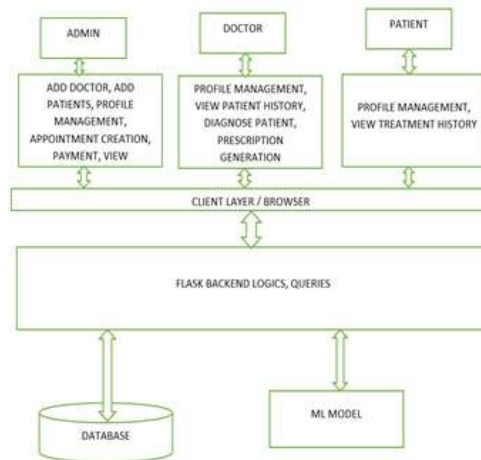


Figure 1: System Architecture

V. RESULTS

The result of this project demonstrates the integration of Ayurvedic healthcare with machine learning and web technologies. It enables accurate disease prediction, suggests treatments, and provides role-based access for Admins, Doctors, and Patients.

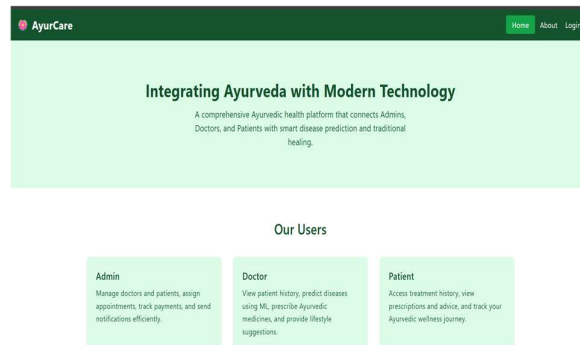


Figure 2: Home Page

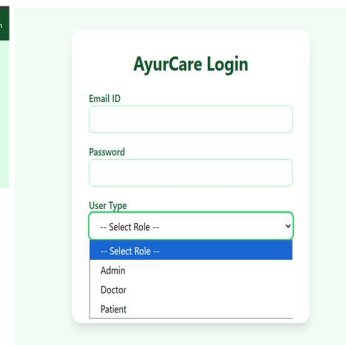


Figure 3: Login Page

Figure 2 shows Home Page which introduces the platform and its integration of Ayurveda with modern technology, highlighting features for Admins, Doctors, and Patients. Figure 3 illustrates Login Page ensures secure, role-based access through credential and role selection. Login redirects users to the appropriate authentication page, and successful login takes them to a personalized dashboard. Each dashboard provides tools and information tailored to the user's role as shown in figures 4-6.

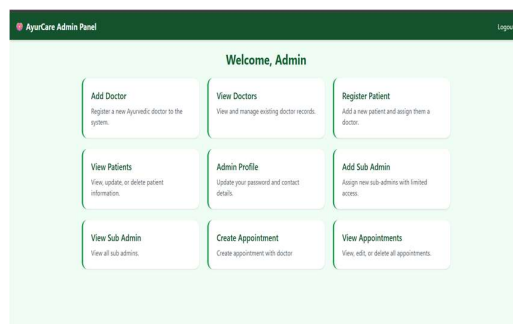


Figure 4: Admin Dashboard

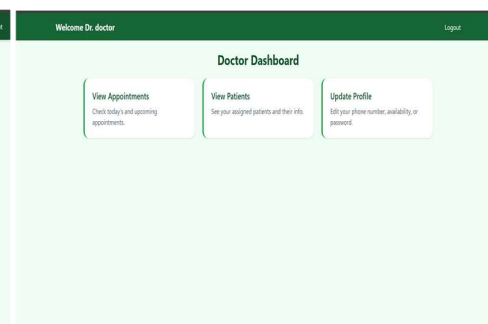


Figure 5: Doctor Dashboard

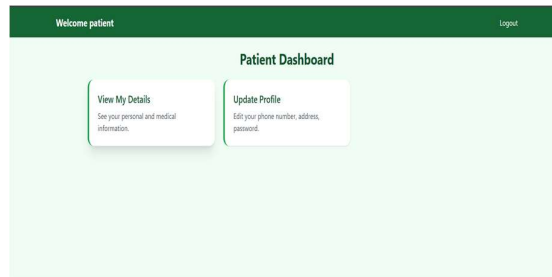


Figure 6: Patient Dashboard

The ML-powered system helps doctors generate prescriptions by recording patient symptoms, either from a predefined list or manually, shown in Figure 8. It predicts the most probable disease using machine learning and provides a detailed prescription with recommended Ayurvedic medicines and dosages, shown in Figure 9. Doctors can also add personalized advice or lifestyle instructions, combining automation with expert input.

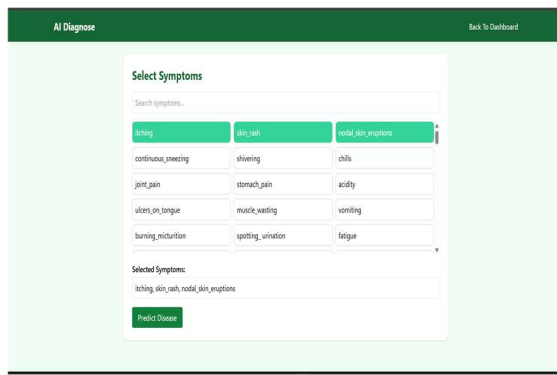


Figure 8: Symptom Selection

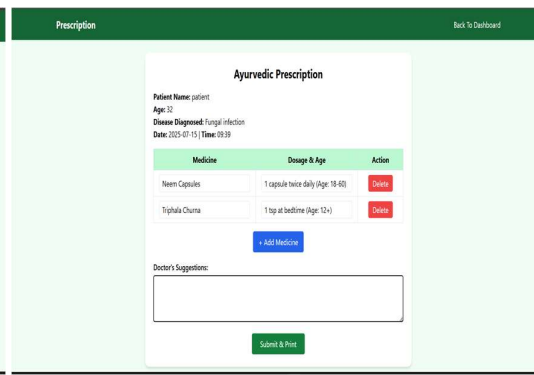


Figure 9: Prescription Generation

How Symptoms are used for Prediction

- **Data Processing:** The symptoms recorded by the Doctor are converted into binary format, where the presence of a symptom is represented as 1 and its absence as 0.
- **Model Prediction:** The Processed symptom data is fed to a Random Forest classifier made up of multiple decision trees. Each tree predicts a disease, and the final diagnosis is decided by majority voting.

The figures 10-13 depict the multi-class confusion matrices and accuracy scores for the SVM, Naive Bayes, and Random Forest classifiers, respectively.

The accuracy score is a key metric for evaluating how well models predict diseases from patient symptoms, ensuring reliable Ayurvedic prescriptions. Confusion matrices further illustrate performance, with diagonal entries showing correct predictions and off-diagonal entries highlighting misclassifications. Together, these measures provide confidence in the system's effectiveness and help identify areas needing improvement.

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SVC
Scores: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]
Mean Score: 1.0
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Gaussian NB
Scores: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]
Mean Score: 1.0
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Random Forest
Scores: [1. 1. 1. 1. 1. 1. 1. 1. 1. 1.]
Mean Score: 1.0

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Figure 10: Accuracy Scores

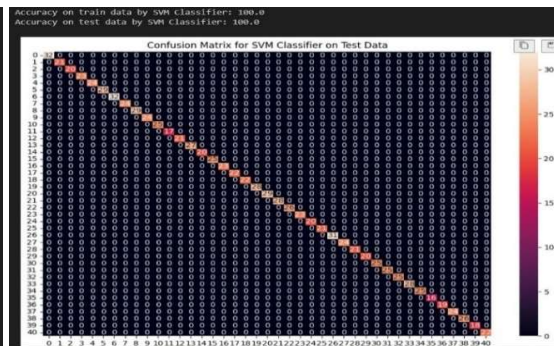


Figure 11: SVM Classifier

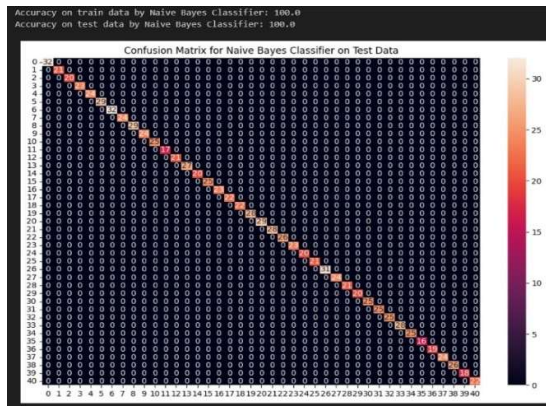


Figure 12: Naive Bayes Classifier

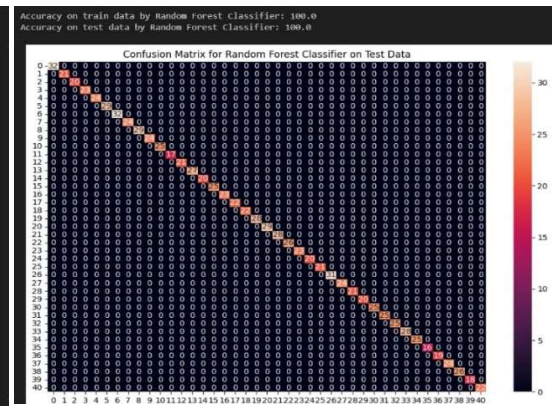


Figure 13: Random Forest Classifier

VI. CONCLUSION AND FUTURE WORKS

This work addresses the growing need for intelligent healthcare tools by integrating traditional Ayurvedic principles with modern machine learning techniques. The developed system enables accurate disease prediction from symptom inputs and generates tailored Ayurvedic treatment recommendations, thereby streamlining clinical workflows. By incorporating real-time diagnosis, automated prescription generation, and role-based access for doctors, patients, and administrators, the application delivers a complete and scalable solution for digital Ayurveda. The successful implementation illustrates the effective convergence of artificial intelligence, classical medical knowledge, and web technologies, offering improved speed, accuracy, and consistency in healthcare delivery.

Looking forward, several enhancements can be made to further improve the system. Future work may focus on adding multilingual support to increase accessibility across diverse populations, integrating voice-based symptom input to simplify user interaction, and incorporating Electronic Health Record (EHR) systems for comprehensive patient history tracking. Additionally, leveraging deep learning models could improve diagnostic precision, especially in complex or overlapping symptom scenarios. These advancements would make the system more adaptive, inclusive, and aligned with the evolving needs of modern healthcare environments.

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