INTELLIGENT AYURVEDIC FORMULATION RECOMMENDATION SYSTEM

Prathamesh Shinde[*1], Khushi Songire[*2], Sakshi Thakur[*3], Shantanu Suryawanshi[*4], Prof. S.P. Shinde[*5]

[*1,2,3,4]Student, Department Of Information Technology, Smt. Kashibai Navale College Of Engineering, Pune, Maharashtra, India.

[*5]Asst. Prof., Department Of Information Technology, Smt. Kashibai Navale College Of Engineering, Pune, Maharashtra, India.

ABSTRACT

Ayurveda, one of the oldest systems of medicine, emphasizes holistic healing through personalized treatments. However, its reliance on practitioner expertise often limits accessibility and scalability. The Intelligent Ayurvedic Formulation Medicine Recommendation System addresses these challenges by offering a solution that predicts diseases and recommends Ayurvedic remedies based on user-input symptoms. By leveraging a structured database of symptoms, diseases, and formulations, the system ensures accurate and reliable recommendations while adhering to Ayurvedic principles. Extensive testing on a dataset of over 200 symptoms and 50 formulations has demonstrated high accuracy, making the system a valuable tool for personalized healthcare.

This system reduces dependency on skilled practitioners and minimizes the time required for traditional diagnoses. It offers an intuitive platform where users can input symptoms and receive detailed recommendations, including formulation names, usage instructions, and precautions. By automating the diagnostic process, the system enhances accessibility to Ayurvedic treatments for a broader audience. Future developments will focus on expanding the database, incorporating user feedback, and integrating region-specific Ayurvedic practices, further modernizing this ancient medical system and promoting its relevance in today's healthcare landscape..

Keywords: Ayurveda, Intelligent Medicine Recommendation, Disease Prediction, Personalized Healthcare, Ayurvedic Formulations.

I. INTRODUCTION

Ayurveda, a holistic health system from the Indian subcontinent, focuses on balancing the mind, body, and spirit. Its treatments, rooted in natural remedies, prioritize personalized care by addressing the root causes of ailments rather than merely managing symptoms. This individualized approach underscores Ayurveda's goal of promoting overall well-being and disease prevention. In modern healthcare, machine learning enhances medicine recommendation systems by leveraging patient data to create personalized treatment plans.

Techniques like decision trees and neural networks analyze medical history, symptoms, and genetic variability to predict diseases and suggest tailored medications. By integrating these technologies with Ayurvedic principles, healthcare systems can combine ancient wisdom with advanced diagnostic and therapeutic precision.

II. LITERATURE SUREVY

Ayurveda, an ancient system of medicine, has not yet fully integrated modern machine learning techniques, which could enhance the personalization and accessibility of Ayurvedic treatments. While traditional studies have digitized Ayurvedic knowledge, there is a significant gap in developing systems that can recommend personalized Ayurvedic remedies based on individual health profiles. Research by Sharma et al. (2021) and Joshi & Patel (2020) emphasizes the need for computational tools that can combine Ayurveda with modern technology.

In the broader field of medicine recommendation systems, machine learning has proven effective in allopathic medicine for recommending treatments based on patient data. Decision trees and neural networks are widely used for disease prediction and personalized drug prescriptions. Neural networks, in particular, have shown success in adapting to individual variations, improving treatment precision.

However, applying these techniques to Ayurveda remains underexplored. While some studies, like Pandey & Singh (2019), have mapped Ayurvedic remedies to diseases, they lack predictive models. Recent advances suggest that integrating machine learning algorithms such as Random Forest and Natural Language Processing (NLP) could enhance real-time Ayurvedic recommendations.

Key challenges include the lack of standardized datasets and the need to balance machine learning techniques with the authenticity of Ayurvedic principles. However, combining decision trees for clarity and neural networks for adaptability presents a promising path forward for integrating AI with Ayurveda, offering more personalized and efficient treatment options.

III. METHODOLOGY

- Research Phase: Study of existing algorithms and identification of optimal NLP , Random Forest technique.
- Design Phase: Designing system architecture, selecting datasets, and planning the UI/UX using MERN stack.
- Development Phase: Implementation of the algorithm using Python, data processing, integration of real-time data, and UI development.
- Testing Phase: Validation of system accuracy, user testing, and integration of Email API.
- Deployment Phase: Final system deployment and user feedback loop for continuous improvement.

IV. EXISTING SYSTEMS AND GAP ANALYSIS

Existing healthcare systems focus on allopathic medicine using machine learning for disease prediction and treatment recommendations. However, Ayurvedic platforms are limited to static databases and lack dynamic learning or real-time, personalized recommendations.

Key gaps include:

1. **Lack of Personalization**: Ayurvedic systems don't tailor recommendations to individual health profiles.
2. **Static Databases**: Current platforms lack dynamic updates and adaptability.
3. **Limited Technology Integration**: Minimal use of machine learning and NLP to enhance accuracy and usability.

V. PROPOSED SYSTEM

The proposed system integrates Ayurvedic principles with machine learning to provide personalized formulation recommendations based on user symptoms.

Key features include:

1. **Symptom Analysis**: Uses NLP to process and interpret user inputs.
2. **Disease Prediction**: Employs the Random Forest algorithm for accurate classification of diseases.
3. **Formulation Recommendation**: Suggests Ayurvedic remedies tailored to the predicted disease.
4. **Real-Time Updates**: Incorporates APIs to ensure recommendations align with the latest Ayurvedic knowledge.
5. **User Feedback**: Integrates feedback loops to refine accuracy and improve system reliability.

VI. SYSTEM ARCHITECTURE AND DESIGN

The project follows a structured flow for processing textual input through a natural language processing (NLP) system. It begins with a Preprocessing stage where the input text is cleaned and prepared for analysis. This involves steps like tokenization, removing stop words, and stemming. After preprocessing, the Feature Extraction phase converts the processed text into a machine-readable format, often using methods like word embeddings or TF-IDF vectors.

These features are then passed to the Classification stage, where a specialized NLP algorithm (e.g., a neural network or a traditional classifier) determines the text's classification or prediction. Finally, the Output is displayed to the user in an interpretable format, leveraging the insights gained from a trained dataset.
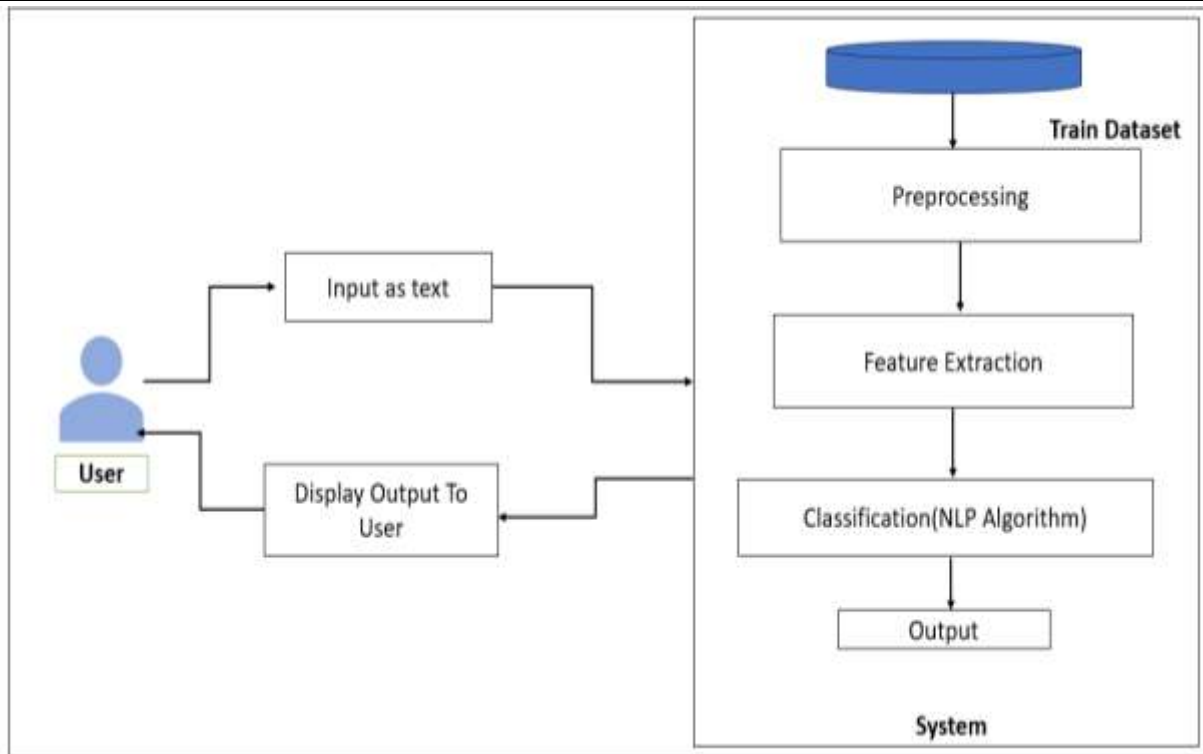
Figure 1: System Architecture.

VII.　　TOOLS AND TECHNOLOGIES

- Programming Languages: Python for machine learning, data processing, and NLP.
- Machine Learning Algorithms: Random Forest for disease classification and NLP for symptom processing.
- Data Management: Databases for storing symptoms and formulations; APIs for real-time updates.
- Libraries: Pandas, NumPy, Scikit-learn for data handling and model implementation; NLTK/Spacy for NLP tasks.
- Visualization: Matplotlib, Seaborn for data and result visualization.
- User Interface: GUI for collecting user inputs and displaying recommendations.

VIII.　　SYSTEM IMPLEMENTATION AND FEATURES

- Symptom Input: Users input symptoms through a user-friendly interface.
- Data Processing: NLP processes user inputs to match with stored symptom-disease mappings.
- Disease Prediction: The system uses the Random Forest algorithm to classify diseases based on symptoms.
- Formulation Recommendation: Ayurvedic formulations are suggested based on predicted diseases, leveraging a structured database.
- Real-Time Updates: Integrates APIs to ensure recommendations reflect the latest Ayurvedic knowledge.
- User Feedback Loop: Allows users to provide feedback, enhancing system accuracy and reliability over time.
- Output Details: Recommendations include formulation names, usage instructions, and precautions.

IX.　　CONCLUSION

The Intelligent Ayurvedic Formulation Recommendation System integrates traditional Ayurvedic medicine with modern technology, offering personalized healthcare solutions. Using NLP and the Random Forest algorithm, it processes user symptoms and provides accurate, user-friendly recommendations. Developed with the MERN stack, the system ensures scalability, real-time data integration, and automated email notifications. Positive user feedback underscores its relevance and accuracy compared to traditional methods. Despite limitations like dependence on high-quality training data, the project highlights the potential of modern technology to enhance ancient practices, paving the way for a scalable, personalized healthcare approach. Future improvements will focus on expanding datasets and refining algorithms.

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