



Swasthya AI: An AI-Based Ayurvedic Health Assistant for Personalized Wellness

Department of Computer Engineering
Indira College of Engineering & Management, Pune, India
Gayatri Ingole gayatriingole48@gmail.com
Prathamesh Kadam prathameshkadam2907@gmail.com
Hemani Raina rainahemani14@gmail.com
Karan Chavan karanc4143@gmail.com

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Abstract—Swasthya AI is an innovative AI-powered mobile application that integrates traditional Ayurvedic medicine with modern artificial intelligence to deliver personalized healthcare solutions. The system addresses the growing need for accessible healthcare in rural India by combining classical Ayurvedic knowledge with Natural Language Processing (NLP) and machine learning technologies. Built on React Native for cross-platform mobile development and Spring Boot for backend services, the application analyzes user symptoms, body constitution (Vata, Pitta, Kapha), and lifestyle factors to provide customized herbal remedies, diet plans, and preventive care suggestions. The conversational interface supports both text and voice input for enhanced accessibility, particularly benefiting users with limited English proficiency or internet connectivity. A vector database efficiently handles remedies, user profiles, and health records, while geolocation APIs connect users to verified Ayurvedic practitioners. Preliminary testing demonstrates the system's potential in improving healthcare accessibility while maintaining data privacy and scalability. Future enhancements include multilingual support, wearable device integration, and AI-assisted video consultations with certified Ayurvedic doctors.

Index Terms—Ayurveda AI, Personalized Healthcare, Natural Language Processing, Mobile Health Application, Dosha Detection, Traditional Medicine, Preventive Care, Healthcare Accessibility



I. INTRODUCTION

A. Background and Motivation

Ayurveda, India's 5,000-year-old system of medicine, continues to be a trusted approach for holistic health and wellness. Despite its proven effectiveness, accessing authentic Ayurvedic guidance remains challenging, particularly in rural areas where healthcare infrastructure is limited [1]. With over 65% of India's population residing in rural regions and facing significant healthcare accessibility issues, there is an urgent need for technology-driven solutions that can bridge this gap.

The motivation behind Swasthya AI stems from three critical observations:

- 1) **Healthcare Accessibility Gap:** Rural populations often lack access to qualified Ayurvedic practitioners, forcing them to rely on general health advice or travel long distances for consultations.
- 2) **Language Barriers:** Existing health applications predominantly support English, creating barriers for regional language speakers who constitute the majority of India's population.
- 3) **Authenticity Concerns:** Many current AI health applications provide generic or unverified recommendations, lacking the depth and authenticity required for traditional medicine systems like Ayurveda.

B. Problem Statement

Current AI-based health applications face several limitations when addressing Ayurvedic healthcare: inability to accurately interpret Ayurvedic concepts such as doshas and body constitution; lack of personalized recommendations based on individual prakriti (body type); limited support for regional languages and voice-based interactions; absence of integration with verified Ayurvedic practitioners; and generic suggestions that don't account for lifestyle, geography, and seasonal variations.

C. Objectives

The primary objectives of Swasthya AI are:

- 1) To develop an AI-powered mobile application that provides authentic Ayurvedic health guidance accessible to users regardless of language proficiency or location
- 2) To implement NLP and LLM technologies for accurate symptom analysis and dosha detection
- 3) To create a comprehensive knowledge base derived from classical Ayurvedic texts and validated by certified practitioners
- 4) To enable seamless connection between users and verified Ayurvedic experts through geolocation services
- 5) To ensure data privacy, security, and offline functionality for users with limited internet connectivity

II. LITERATURE SURVEY

A. AI and Ayurvedic Knowledge Integration

Recent research has explored the integration of artificial intelligence with traditional Ayurvedic knowledge. Swaroop et al. [1] proposed AyuRAG, a retrieval-augmented lightweight large language model designed to integrate Ayurvedic knowledge from classical texts. Their approach demonstrated efficient retrieval of relevant information for reasoning-based applications, though it lacked clinical validation.

B. Machine Learning for Ayurvedic Diagnosis

Manjula and AnandaRaj [2] developed a machine learning framework using the AyurDataMart repository to predict diseases based on Ayurvedic diagnostic parameters. The system achieved high classification accuracy in identifying disease patterns but showed dependency on dataset completeness, limiting its real-world applicability.

Chinnaiah et al. [3] applied machine learning algorithms to analyze Pitta dosha imbalance in young Indian adults, emphasizing preventive healthcare through early detection. However, their scope was limited to single dosha analysis and did not encompass comprehensive constitutional assessment.



C. *Ayurvedic Mobile Applications*

Shanmathi et al. [4] created a mobile application offering personalized diet recommendations based on Ayurvedic nutrition principles. While successfully integrating traditional Ayurveda with mobile technologies, the application relied heavily on user-input accuracy and lacked clinical supervision.

D. *Constituent Balancing Prediction*

Madaan and Goyal [5] collected data from 807 healthy individuals and applied various machine learning algorithms including ANN, KNN, SVM, Naïve Bayes, Decision Tree, and ensemble methods like CatBoost to predict dosha balance. Their work focused on constitutional balance (Prakriti) rather than imbalance detection and symptom-based diagnosis.

E. *Gap analysis*

Table I presents a comparative analysis of existing systems and the proposed Swasthya AI system.

TABLE I
 GAP ANALYSIS OF EXISTING SYSTEMS

integrates AI-powered diagnosis, multilingual voice interaction, expert consultation, and offline functionality specifically designed for Ayurvedic healthcare accessibility.

Feature/Paper	AI Int.	Dosha Det.	Multi-lingual	Voice In-put	Expert Con-nect
AyuRAG [1]	✓	×	×	×	×
AyurDataMart [2]	✓	✓	×	×	×
Pitta Analysis [3]	✓	Partial	×	×	×
Diet App [4]	Partial	×	×	×	×
Prakriti Pred. [5]	✓	Partial	×	×	×
Swasthya AI	✓	✓	✓	✓	✓

III. PROPOSED SYSTEM

A. *System Architecture*

Swasthya AI employs a three-tier architecture designed for scalability, maintainability, and performance:

- 1. Presentation Layer:** React Native mobile application providing cross-platform support (Android/iOS), conversational UI with text and voice input capabilities, multilingual interface supporting regional Indian languages, and offline-first design with local data caching.
- 2. Application Layer:** Spring Boot backend handling business logic and API services, NLP engine for symptom analysis and intent recognition, Large Language Model (LLM) for generating personalized recommendations, dosha detection algorithm based on symptom patterns and questionnaire responses, and geolocation service for connecting users with nearby practitioners.
- 3. Data Layer:** MongoDB database for user profiles and health records, vector database for efficient remedy retrieval and similarity matching, Ayurvedic knowledge base compiled from classical texts (Charaka Samhita, Sushruta Samhita, Ashtanga Hridaya), and encrypted local storage for offline functionality and data privacy.

B. *Core Modules*

- 1. Symptom Collection Module:** Accepts user input via text or voice in multiple languages, performs speech-to-text conversion using Google Speech Recognition API, conducts NLP preprocessing to extract relevant health information, and asks contextual follow-up questions for comprehensive assessment.
- 2. Dosha Detection Module:** Analyzes symptoms, lifestyle factors, and questionnaire responses; implements probabilistic classification model for dosha identification; determines primary and secondary dosha imbalances; and considers seasonal variations and geographical factors.



3. **Remedy Recommendation Engine:** Performs vector similarity search for matching symptoms to remedies, retrieves herbal formulations, dietary guidelines, and lifestyle modifications, prioritizes recommendations based on severity and user constitution, and includes preparation methods and dosage information.

Dosha Detection Function:

$$D(s) = \arg \max_{d \in \{Vata, Pitta, Kapha\}}$$

Remedy Recommendation Function:

$$P(d|s) \quad (1)$$

The literature review reveals that while individual components have been explored, no comprehensive system exists that

$$R(s, d) = \{r_i \mid \text{score}(r_i, s, d) > \theta\} \quad (2)$$

C. Algorithm Design

Algorithm 1 Dosha Detection

Require: Symptom vector S , Questionnaire responses Q **Ensure:** Primary dosha D_{primary} , Secondary dosha $D_{\text{secondary}}$

- 1: Preprocess symptoms using NLP
 - 2: Extract features from S and Q
 - 3: Calculate dosha scores:
 - 4: **for** each dosha d in $\{Vata, Pitta, Kapha\}$ **do**
 - 5: $\text{score}[d] = \sum (\text{weight}[\text{symptom}] \times \text{relevance}[\text{symptom}, d])$
 - 6: **end for**
 - 7: Normalize scores
 - 8: $D_{\text{primary}} =$ dosha with highest score
 - 9: $D_{\text{secondary}} =$ dosha with second highest score
 - 10: **return** $D_{\text{primary}}, D_{\text{secondary}}$
-

Algorithm 2 Remedy Recommendation

Require: Detected dosha D , Symptoms S , User profile U **Ensure:** Ranked list of remedies R

- 1: Query vector database for remedies matching D
 - 2: Filter remedies based on contraindications in U
 - 3: **for** each remedy r **do**
 - 4: Calculate $\text{relevance_score}(r, S, D)$
 - 5: **end for**
 - 6: Rank remedies by relevance_score
 - 7: Select top N remedies where N is configurable
 - 8: **return** R with preparation instructions
-



IV. IMPLEMENTATION

A. Technology Stack

Frontend: React Native 0.72 for cross-platform mobile development, Redux for state management, React Navigation for routing, Native Base UI components, and React Native Voice for speech recognition.

Backend: Spring Boot 3.0 (Java 17), Spring Security for authentication, Spring Data MongoDB for database operations, WebSocket for real-time communication, and JWT for secure token-based authentication.

Database: MongoDB 6.0 for primary data storage, Pinecone/Weaviate for vector database, and SQLite for local offline storage.

AI/ML Components: Hugging Face Transformers for NLP, OpenAI GPT-4 API for conversational AI, TensorFlow Lite for on-device inference, and scikit-learn for classification models.

B. Security and Privacy

The system implements end-to-end encryption for all communications, OAuth 2.0 and JWT-based authentication, HIPAA-compliant data storage practices, local data encryption using AES-256, anonymous usage analytics (opt-in), and regular security audits and penetration testing.

V. RESULTS AND DISCUSSION

A. System Performance

Response Time Analysis: Average API response time:

1.8 seconds; Voice-to-text conversion: 1.2 seconds; Remedy recommendation generation: 2.3 seconds; Offline mode functionality: < 0.5 seconds.

Accuracy Metrics: Dosha detection accuracy: 87% (validated against expert assessments); Symptom recognition accuracy: 92% (text), 85% (voice); Remedy relevance rating: 4.2/5 (user feedback); NLP intent classification: 89% F1-score.

B. User Experience Testing

Preliminary testing with 50 users (25 urban, 25 rural) revealed positive feedback: 94% found the voice interface helpful, 88% appreciated multilingual support, 82% reported improved understanding of their dosha, and 90% found remedies practical and accessible.

C. Comparative Analysis

Table II presents a comparative analysis of Swasthya AI with existing health applications.

TABLE II
 COMPARATIVE ANALYSIS WITH EXISTING APPLICATIONS

Metric	Generic Health Apps	Ayurvedic Apps	Swasthya AI
Personalization	Low	Medium	High
Voice Support	Limited	Rare	Comprehensive
Offline Mode	Rare	Rare	Available
Expert Access	No	Limited	Integrated
Multilingual	Limited	Limited	Extensive
Accuracy	Variable	Low-Medium	High (87%)



VI. FUTURE SCOPE

A. Short-term Enhancements (6-12 months)

- 1) Expanded Language Support: Add support for 10+ Indian regional languages
- 2) Wearable Integration: Connect with fitness trackers and smartwatches
- 3) Enhanced Offline Database: Increase offline content coverage to 80%
- 4) Community Features: User forums for sharing experiences

B. Medium-term Developments (1-2 years)

- 1) AI-Powered Video Consultations with real-time translation
- 2) Personalized Health Dashboard with comprehensive analytics
- 3) Integration with E-commerce for herb purchases
- 4) Clinical Trial Module for data validation

C. Long-term Vision (2-5 years)

- 1) Predictive Health Analytics using machine learning
- 2) AR-based Herb Identification capabilities
- 3) Global Expansion to other traditional medicine systems
- 4) Research Platform for Ayurvedic evidence generation

VII. CONCLUSION

Swasthya AI represents a significant step forward in making authentic Ayurvedic healthcare accessible to a broader population, particularly in underserved rural areas. By combining artificial intelligence, natural language processing, and traditional Ayurvedic wisdom, the system addresses critical gaps in healthcare accessibility while maintaining respect for ancient medical knowledge. The three-tier architecture ensures scalability and maintainability, while the conversational interface with voice support breaks down language barriers. Preliminary results demonstrate promising accuracy rates and positive user feedback, validating the core approach. Beyond its immediate goals, Swasthya AI contributes to the broader movement of preserving and promoting traditional knowledge systems while making them relevant and accessible in the digital age.

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