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Personalized Herbal Wellness for Menstrual Health

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Abstract
Women, whether from urban or rural areas, working professionals or homemakers, often sideline their menstrual health due to daily responsibilities. Many turn to painkillers for relief, unaware of potential long-term side effects, especially during menopause. Our smart menstrual health app offers a natural solution by analyzing real-time symptoms and providing personalized Ayurvedic and herbal remedies, promoting a drug-free and holistic approach to well-being. In today's fast-paced lifestyle, many women neglect their menstrual health due to busy schedules, lack of awareness, and hesitation to seek medical help. Irregular cycles, nutritional deficiencies, unmanaged PMS symptoms, and stress-related menstrual issues are increasingly common, yet often ignored. Poor dietary habits, hormonal imbalances, and reliance on quick fixes rather than holistic care further contribute to long-term reproductive health concerns.To address this, NutriElla is an AI-powered mobile application that provides personalized herbal nutritional guidance to help women manage their menstrual health effectively. Designed for adolescents (10–19 years) and women in their reproductive years (20–35 years), it offers cycle tracking, real-time symptom analysis, and tailored Ayurvedic recommendations. Using a rule-based learning approach and a decision tree model, it classifies symptoms as mild, moderate, or severe, offering Ayurvedic remedies for minor cases and location-based gynecologist consultations for severe conditions. Additionally, the app integrates stress and pain-relief music therapy to promote emotional well-being. Built with Python, Kivy, FCM, and MongoDB, NutriElla ensures secure access, real-time alerts, and efficient data management. By blending AI-driven insights with Ayurvedic wisdom, it provides a holistic and accessible solution for women neglecting their menstrual health.

Keywords: *Chatbot integration; Menstrual health; Personalized recommendations; Symptom classification; Women wellness.*

1. Introduction
Menstrual health is a crucial yet often neglected aspect of women's well-being, overshadowed by societal stigma, limited awareness, and healthcare inaccessibility. Many women experience irregular cycles, dysmenorrhea (painful periods), menorrhagia (heavy bleeding), and conditions like PCOS/PCOD, yet hesitate to seek medical help due to NutriElla is an AI-powered, Ayurveda-based mobile application that integrates cycle tracking, Ayurvedic nutritional guidance, and symptom-based recommendations tailored to an individual's body type, age, and menstrual phase. Utilizing a rule-based learning approach and decision tree models, it categorizes symptoms into mild, moderate, or severe. While mild and moderate cases receive personalized Ayurvedic remedies, severe cases are referred to gynecologists with location-based recommendations via Google's Geoencoding API. Additionally, music therapy is incorporated for stress relief and pain management. By combining AI, Ayurveda, and real-time analytics, NutriElla offers a comprehensive and accessible solution for personalized menstrual health

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management, promoting proactive and holistic well-being.Menstrual health plays a crucial role in the overall well-being of women, yet it remains an often-overlooked aspect of healthcare. The lack of awareness, inadequate resources, and cultural taboos surrounding menstruation continue to pose significant challenges, particularly in developing nations. In India, where approximately 242 million adolescents fall within the 10-19 age group, menstrual hygiene management is a key concern affecting health, education, and social empowerment. Various studies have highlighted the disparities in access to menstrual hygiene products, with factors such as education, economic status, and geographical location influencing the adoption of hygienic menstrual practices. According to the National Family Health Survey (NFHS-5), 78% of adolescent girls now use a hygienic method of protection, marking an improvement from previous years. However, gaps persist, particularly among socio-economically disadvantaged groups. Recent advancements in machine learning and artificial intelligence have opened new possibilities for menstrual health monitoring and prediction. Personalized healthcare applications integrating predictive analytics, artificial neural networks, and data-driven insights have the potential to enhance menstrual cycle tracking, detect irregularities, and provide tailored health recommendations. This study explores the application of computational techniques in menstrual health management, with a focus on improving accessibility, awareness, and personalized healthcare solutions.

2. Literature Survey

2.1. Polycystic Ovary Syndrome (PCOS) Monitoring Using Machine Learning

This study automated PCOS diagnosis using decision trees, SVM, and random forest classifiers based on symptoms, hormone levels, and ultrasound data. Random forest achieved the highest accuracy. However, the lack of real-time tracking and integration with personalized health apps limited its usefulness for continuous monitoring.

2.2. Menstrual Cycle Prediction Using Artificial Neural Networks (ANN)

This paper used ANN models to predict menstrual cycles from ovulation, hormonal, and cycle history data. ANN outperformed traditional methods in predicting irregularities. Still, it lacked integration with Ayurvedic principles and personalized nutrition, important for holistic care. [1]

2.3. Menstrual Hygiene Among Adolescents

The study explored menstrual hygiene awareness and practices in rural adolescent girls, revealing limited access to sanitary products and education. It stressed the need for educational and digital solutions but did not include AI-based health tracking or guidance.

2.4. HedhiHelp: A Health Education App for Rural Girls

HedhiHelp is an app aimed at improving menstrual health awareness among rural girls through interactive content and expert advice. While it enhanced education, it lacked AI-driven personalization, symptom tracking, and real-time support for comprehensive care. table must have a heading, and abbreviations, when necessary, should be defined in the footnotes.

3. Research Gap

- Most systems rely on static datasets and lack real-time tracking.
- NutriElla enables daily symptom input and personalized recommendations through dynamic classification.
- Current apps don’t integrate AI chatbots with medical advice.
- NutriElla features a BERT/Gemini-based chatbot offering symptom-specific herbal remedies.
- Few solutions offer location-based gynecological support.
- NutriElla suggests nearby gynecologists and plans to add booking and emergency alert features.
- Educational apps lack AI-driven personalized content.
- NutriElla provides interactive, inclusive education with upcoming multilingual support.
- Existing platforms seldom adapt to user feedback.
- NutriElla uses feedback to refine remedies and aims to add reinforcement learning and

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predictive alerts.

4. Methodology

NutriElla was developed as a personalized menstrual health solution combining machine learning, rule-based logic, NLP, and expert-validated herbal remedies. It targets conditions like dysmenorrhea, oligomenorrhea, polymenorrhea, and PCOD. [2]

4.1. Data Collection & Preprocessing

Data was gathered via Google Forms on key parameters like pain, bleeding, mood, sleep, stress, and habits. Preprocessing involved cleaning, normalization, and encoding of responses for ML readiness. [3]

4.2. Feature Selection & Symptom Classification

Important features like age, pain type, emotional states, and stress levels were selected. A Decision Tree Classifier categorized symptoms into mild, moderate, or severe, flagging potential conditions like menorrhagia or PCOS. Model performance was validated using accuracy, precision, recall, and F1-score. [4]

4.3. Rule-Based Recommendations

A parallel rule-based engine delivered personalized remedies based on Ayurvedic and gynecological guidelines. For example, spasmodic pain with fatigue triggered suggestions like ginger tea and warm compresses, while irregular cycles prompted cinnamon and spearmint recommendations. [5]

4.4. Frontend & Backend Implementation

Built with Kivy for a cross-platform UI, the app offers symptom logging and a user dashboard. Python-based backend on Google Colab processes real-time inputs using the trained classifier and rule engine, with local or cloud-based storage support. [6]

4.5. Chatbot Integration

An NLP chatbot using BERT or Gemini interprets natural queries on PMS, PCOD, and more. Trained on domain-specific data, it also detects emotional tone and offers wellness tips like music therapy or professional consultation prompts. [7]

4.6. Personalization & Optimization

The engine adapts based on user feedback and response patterns. Remedies with reported relief are prioritized, and adherence is tracked to optimize future suggestions through continuous learning. [8]

4.7. Testing & Validation

System accuracy was verified using cross-validation. Remedy relevance and chatbot responses were reviewed by a gynecologist and Ayurvedic expert. Usability testing ensured smooth user experience. (Figure 1)

5. System Architecture

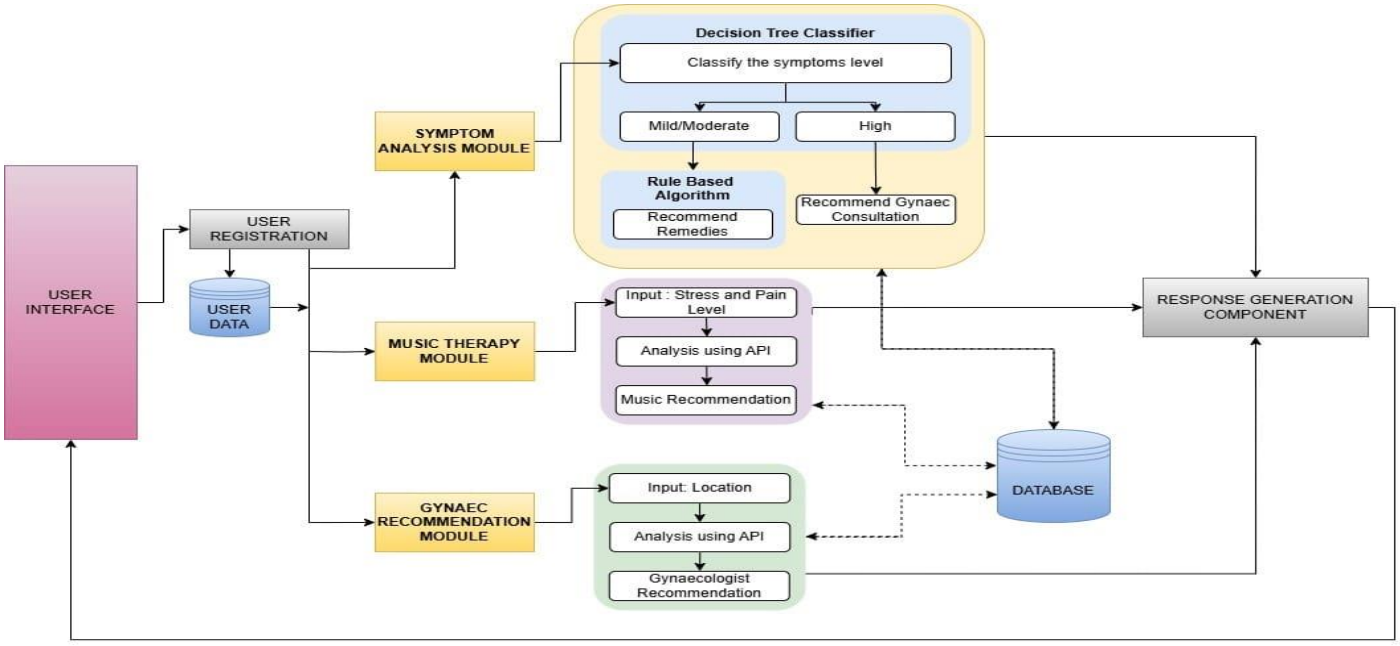

Figure 1 System Architecture

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The NutriElla application integrates multiple intelligent modules within a secure, responsive Kivy-based frontend, capturing user data on menstrual cycles, symptoms, mood, and lifestyle. A cloud-stored user profile (via Firebase or MongoDB) is secured with OAuth 2.0 and includes medical history, PMS logs, and comorbidities. The Symptom Severity Classification Engine uses a Decision Tree model trained on real user inputs to assess severity and suggest self-care or referrals. The Rule-Based Therapeutic Engine offers expert-validated herbal, nutritional, and lifestyle remedies. An NLP-powered Chatbot Module (BERT/Gemini) answers menstruation and PCOD-related queries, escalating critical issues. The Music Therapy Module delivers stress-relieving tracks based on pain and stress scores. A Gynecologist Referral Module uses geolocation to suggest nearby specialists. All outputs—ML results, remedies, chatbot insights, and alerts—are unified by an Output Rendering Module. Security is ensured through AES encryption and token authentication, with notifications managed via FCM and user behavior monitored through event logging (Figure 2) [9-11]

6. Results

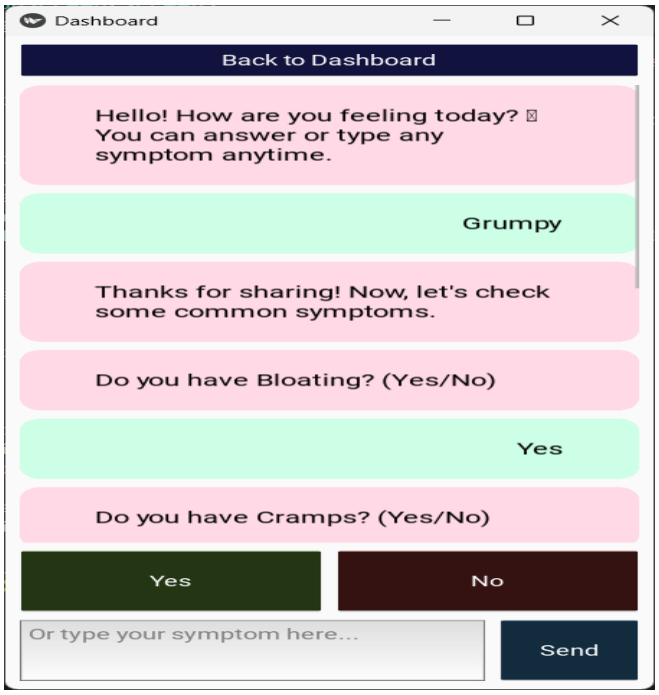

Figure 2 Result

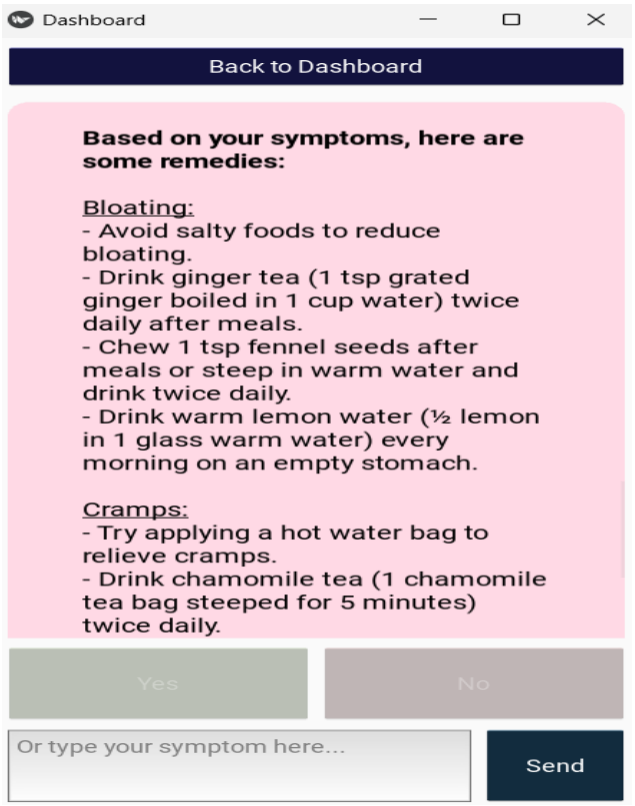

Figure 3 Get Remedy Module

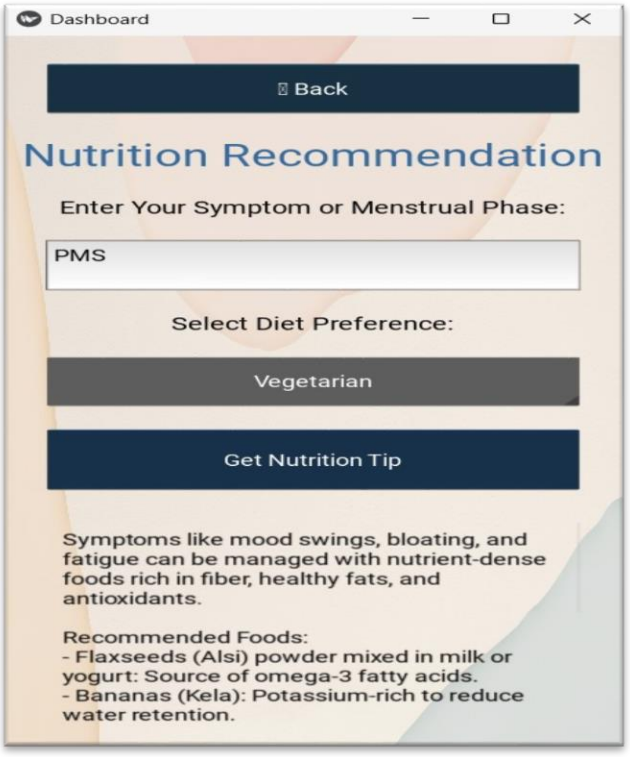

Figure 4 Nutrition Recommendation Module

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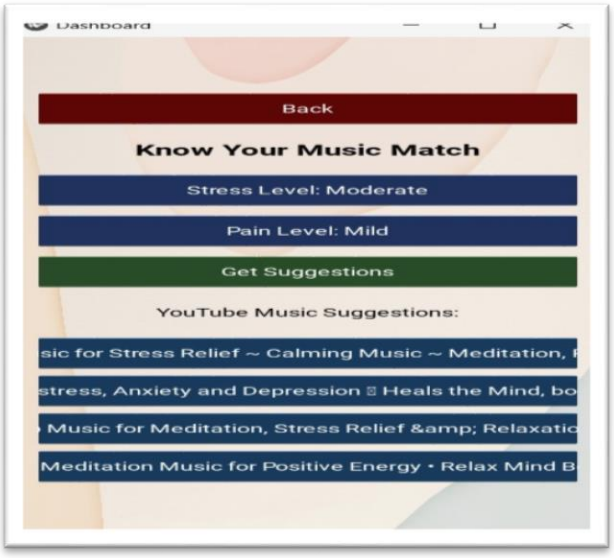

Figure 5 **Music Therapy Module**

Figure 6 **Gynecologist Recommendation Module**

Acknowledgements

We would like to express our heartfelt gratitude to our project guide, Prof. Mugdha Rane, for her invaluable guidance, constant support, and insightful suggestions throughout the development of this work. We are also deeply thankful to our mentor, Prof. Dr. Ketaki Malgi, for her encouragement and academic mentorship, which played a vital role in shaping the direction of this project.

Conclusion

NutriElla, an AI-powered app that integrates herbal remedies to deliver personalized menstrual health management. Leveraging machine learning and rule-based algorithms, it offers tailored recommendations based on symptoms, lifestyle, and stress. Positive feedback from exhibitions and strong evaluation results highlight its real-world potential. Future work will focus on enhancing features and expanding the user base to improve personalized care further.

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