AyurWell: An AI-Powered Ayurvedic Wellness Chatbot System

Joel Moses[1], Himesh Patil[2], Spandan Jagtap[3] , Prof. Pranavkumar Bhadane[4]

[1]Joel Moses, Artificial Intelligence and Machine Learning, Agnel Polytechnic Vashi
[2]Himesh Patil, Artificial Intelligence and Machine Learning, Agnel Polytechnic Vashi
[3]Spandan Jagtap, Artificial Intelligence and Machine Learning, Agnel Polytechnic Vashi
[4]Prof. Pranavkumar Bhadane, Artificial Intelligence and Machine Learning, Agnel Polytechnic Vashi

---***---

Abstract - Ayurveda is a traditional Indian system of medicine that focuses on maintaining balance between body, mind, and lifestyle. However, access to reliable Ayurvedic guidance is often limited due to the need for expert consultation. This paper presents AyurWell, an AI-powered Ayurvedic wellness chatbot designed to provide basic health guidance using natural language interaction. The system allows users to describe symptoms or wellness concerns through a web-based chat interface. The chatbot processes user inputs using natural language processing techniques and retrieves relevant Ayurvedic recommendations from a structured knowledge database. The system provides suggestions related to herbal remedies, dietary practices, and lifestyle modifications based on Ayurvedic principles. The platform is implemented using modern web technologies including HTML, CSS, JavaScript, Node.js, and a PostgreSQL-based Supabase database. Experimental testing shows that the system can effectively respond to common wellness queries such as digestion issues, stress, sleep disturbances, and general health management. The proposed system demonstrates how artificial intelligence can help digitize traditional Ayurvedic knowledge and make wellness guidance more accessible to a wider audience. However, the chatbot is intended only for general wellness support and not replacement for professional medical consultation.

Key Words: Ayurvedic healing, Ayurveda, Remedy, Ayurvedic wellness

1.INTRODUCTION

Modern lifestyles have led to increased health problems such as stress, poor sleep, obesity, and digestive disorders. Sedentary work environments and unhealthy dietary habits contribute significantly to these issues. Preventive healthcare practices are therefore becoming increasingly important.

Ayurveda, an ancient Indian medical system, emphasizes maintaining balance between body, mind, and environment through proper diet, herbal medicine, and lifestyle practices. However, access to Ayurvedic knowledge often requires consultation with experts, which may not always be accessible to everyone.

Advancements in artificial intelligence and conversational systems provide new opportunities to deliver health guidance through digital platforms. Chatbots can provide interactive communication and deliver health information quickly and efficiently.

This paper proposes AyurWell, an AI-powered Ayurvedic chatbot designed to provide personalized wellness suggestions through natural language interaction.

2. . LITERATURE REVIEW

A twist came when phone tools began guiding people through health routines. Not only did they log details but also shared tips along the way. Imagine programs watching your daily moves without asking. These quietly study rhythms most wouldn't catch. Over time, one such setup detects tiny shifts in routine. What you share changes its next move. Inside, clever code studies signs users describe. It adjusts once fresh facts arrive. Nothing mystical - just number patterns found on purpose. Advice updates if habits do too. Step by step, learning moves without noise. Closer than ever, health tech pays attention now.

Out of nowhere, a device might reply when questioned on wellbeing. Words get pieced apart by unique programs before anything is grasped. From old chats, familiar shapes form - these shape fast replies. Waiting fades since responses arrive almost like echo. Feeling heard happens easier when delays shrink. What comes back ties closely to its grasp of how people speak. Nested

within every reply are levels of patterned thinking pulling sense from words.

A thumping heart, nightly rest, even daily steps - things some gadgets track without pause. Rather than counting moves, a few programs look for sickness by digging into signs with clever math tricks. When trends must be split apart, something called Logistic Regression often shows up. Lines slicing through dots on charts help machines make choices, that is what Support Vector Machines really do. Out of a crowd of tiny choices, one guess emerges - Random Forest manages that mess. Where solutions hide behind tangled clues, digital brains made of nerve-like links take over instead.

Even now, most health chatbots stick to recent medical advice while spotting diseases. Ancient approaches such as Ayurveda hardly get attention from them.

Beyond this, many health apps depend on algorithms trained using hospital archives - which usually ignore herbal knowledge and ancestral healing methods. Useful as they are, such tools seldom include wisdom handed down across decades. Rather than embracing old-world practices, they draw conclusions mainly from recent clinical files, skipping wider perspectives on well-being. As progress moves forward, longheld customs quietly fade behind screens.
Still, balance remains rare in digital health spaces.

AyurWell enters the scene through a chatbot offering everyday guidance based on Ayurveda. Instead of chasing disease detection, its path favors balance - nurturing routines that support wellness.

Chat tools meet time-tested Ayurvedic knowledge at AyurWell. This mix lets users explore age-old wellness ways smoothly. Tradition feels closer when started like this. Clarity in questioning drives its success. With stepby-step talks, ancient habits turn clearer. Floating through details without rush - this makes space for understanding
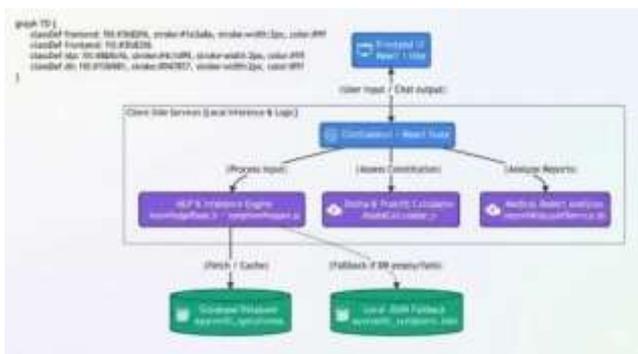

Fig-1:System Architecture

3. MATERIALS AND METHODS

AyurWell begins right inside your browser, so there is no need to grab files or install anything - just click and go. Because it uses modern web methods, answers feel instant, tied closely to trusted age-old healing knowledge. Pages adapt on their own, responding as if part of the conversation. Rather than separate software, it flows within sites you already visit. Guidance shows up simply, spoken almost like advice from a friend, though drawn from long-held traditions.

Ayurvedic wisdom had to make sense to a machine before anything else took shape. Step by step, pieces came together - needs were mapped, structure drafted.

The flow of thought behind replies got carved.

3.1.1 HARDWARE REQUIREMENTS

AyurWell doesn't ask for much in terms of hardware. Even older systems can keep up without trouble. A regular computer does the job well enough. Running it takes barely any energy at all. Pretty much every device made lately fits the needs. Built from basic parts, every feature still works just fine. Though plain in design, nothing gets lost in performance. Even without fancy upgrades, all pieces connect smoothly. From modest beginnings, operation stays complete. Lacking luxury touches, yet everything runs without gap, Desktop machine or portable notebook, A device tapping into the web, else a tool browsing pages remotely, Stable internet connection

3.1.2 SOFTWARE REQUIREMENT
Web tools today make building the system possible.

From start to finish, it runs using current online methods. Most pieces connect through live internet structures. Each part works because newer digital formats allow it. Running smoothly depends on updated network standards

- Frontend Technologies
- HTML
- CSS
- JavaScript
- Backend Technologies
- Node.js
- API integration
- Database

Ayurvedic insights live inside a Supabase setup powered by PostgreSQL. Storage handles both traditional wisdom and generated replies. This structure keeps data rooted yet flexible. Information flows without breaking form. Responses emerge from structured depth. The system holds answers alongside source roots. Knowledge stays linked through design are:

- AI Integration
- Conversational AI logic integrated with database keywords
- driven responses
- Version Control

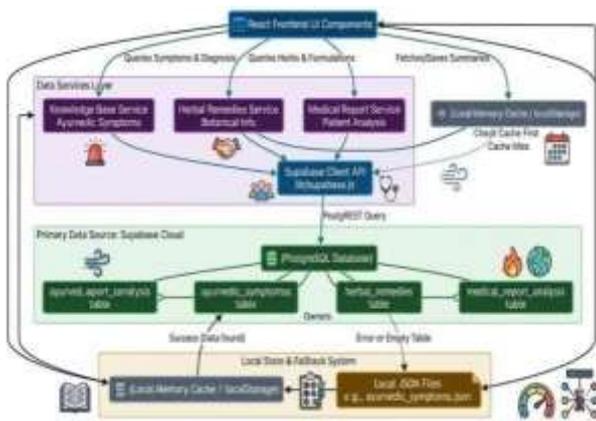Git and GitHub for project management and version tracking

Fig-2: Working Flow

4. METHODOLOGY

4.1.SYSTEM ARCHITECTURE

The AyurWell system follows a web-based client–server architecture designed to provide users with an intelligent health assistance platform. The system consists of a frontend interface, backend server, machine learning model, and a database. Users interact with the system through a web interface where they can log in, enter symptoms, and receive predictions or health advice. The backend processes user requests, manages authentication, and communicates with the machine learning model. A Random Forest algorithm is used to predict possible diseases based on the symptoms entered by the user. The system also includes a chatbot module that provides Ayurvedic health guidance and herbal remedy suggestions. All relevant data such as symptoms, diseases, user information, and remedies are stored and managed through a structured database

4.2.DATA COLLECTION

A structured database with information on Ayurvedic wellness is used by the AyurWell chatbot. The dataset contains data like: Typical signs Herbal remedies from Ayurveda Dietary guidelines Lifestyle

recommendations Preventive wellness techniques. The system's data is selected from Ayurvedic knowledge sources and instructional materials that are accessible to the general public.

4.3 DATA PREPROCESSING

Out of the blue, words entered in the chat are split apart by code looking for familiar expressions. When certain ones pop up, guidance tied to well-being surfaces from memory banks. Whether anything appears relies entirely on how near the wording is to existing entries. Only once a clear connection emerges does a reply take shape.

The process involves the following steps:

- User enters symptoms or health concerns.
- Input text is processed and analyzed.

Out of every phrase, main words begin to appear only after they connect to files kept in the system. Searches rely ontheseties ,working without noise, shaped by hidden paths left in the data Relevant Ayurvedic suggestions are retrieved.

With this approach, replies stay tidy because the bot leans more on structure than raw AI guesses. Instead of fabricating responses, it follows clearer paths to answer. Its design shifts weight away from automatic generation toward guided logic. So, outputs become neater without relying solely on machine-made content.

Fig-3: Data Preprocessing Flowchart

4.4 NLP PROCESSING

Natural Language Processing (NLP) techniques are used in the AyurWell system to interpret user inputs and chatbot queries. When a user interacts with the chatbot or enters symptoms in text format, NLP methods help process and understand the input. Techniques such as tokenization, keyword extraction, and text matching are used to identify relevant symptoms or user intents. These techniques enable the system to convert user input into structured data that can be processed by the prediction model or matched with stored responses. NLP also improves the chatbot's ability to respond to user questions by identifying relevant information from the database.
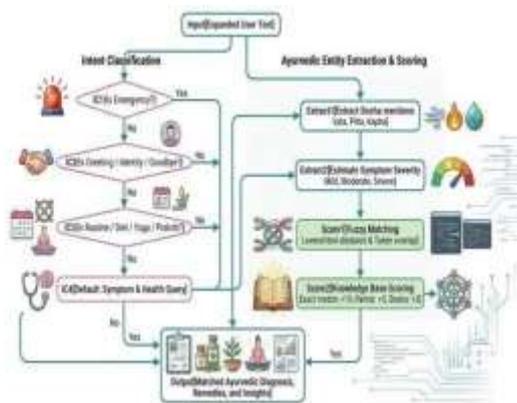

Fig-4: NLP Approach

4.5 RESPONSE GENERATION

Once the user's symptoms are processed and analyzed, the system generates responses based on the prediction results. The Random Forest model predicts the most likely disease by analyzing the symptoms entered by user. After prediction, the system retrieves relevant Ayurvedic remedies and health suggestions from the database. chatbot then presents the results to the user in a readable format, which may include predicted disease, recommended herbal treatments, basic precautionary advice. The response generation process ensures that users receive helpful health information quickly while also reminding them that the system is intended for informational purposes and should not replace professional medical

4.6 DATABASE DESIGN

The AyurWell system employs a structured database architecture to efficiently manage application data and support system functionality. The database schema consists of multiple interconnected tables that store

User information, symptom, data, disease classifications, and Ayurvedic remedy details. The user table manages authentication credentials and user profiles, ensuring secure access to the platform. The symptoms table maintains a comprehensive list of symptoms used for disease prediction, while the diseases table stores disease names and their associated symptom mappings. Additionally, the remedies table contains Ayurvedic herbal treatment recommendations linked to specific diseases.
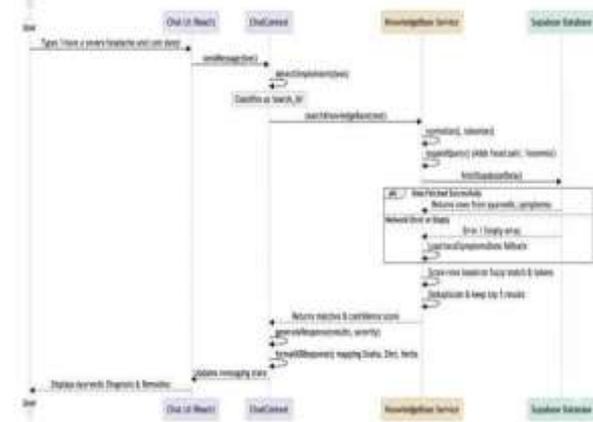

Fig-5: Retrieval-Augmented Generation (RAG) Chatbot Architecture

5.1 SYMPTOM-BASED AYURVEDIC GUIDANCE

Every message begins with a sigh, then flows into words typed slow. A quiet moment passes before the system reads each phrase like wind through leaves. Noticing patterns comes next, drawn from old knowledge tucked deep inside. What shows up feels personal, shaped by whispers of time-tested notes. Responses form not by force but by careful listening. The whole exchange rests on trust built one symptom at a time.

Usually, signs lead to a sequence - remedies rooted in Ayurveda pop up early, followed by meal thoughts, while small shifts in routine trail behind. Each response uses plain speech, built for everyone, truly, regardless of origin. Skipping endless online hunts becomes possible now, because everything gathers in one place. Helpful hints emerge fast, just like that.

5.2 Ayurvedic Herbal Remedy Suggestions

AyurWell steps in here - its core leans on time-tested Ayurveda, offering remedies rooted in plants. When a person brings up a concern, suggestions emerge quietly, shaped by herbs matched to that moment.

Each idea flows from what the system already holds, no guesswork, just recall. Wisdom lives in the details, passed through generations, now ready when needed.

Now here's a plant that shows up now and then in chats about feeling good without pills. Some green things fit different moments, maybe holding balance inside. At times, the machine mentions real habits - how folks keep them close each day. Little doses, regular steps, woven into mornings or evenings.

What's the point of this feature? Sharing wisdom about ancient plant remedies believed to help wellbeing. These are practices folks used to stay balanced and feeling right. A glimpse into grassroots healing handed down over time. Stillness in old ways shaped how people healed, relying on earth's gifts rather than clinics. Through seasons, certain steps repeated - meant to balance body and time. Some ideas clash with labs now, though echoes live in daily customs. Trust grows not by swapping experts but honoring where care began. Stories passed hand to hand, never printed, kept the lessons walking. One person might trust old ways, yet another hesitates. Still, both shape how people have looked after their well-being through time.

5.3 PERSONALIZED DIET AND LIFESTYLE RECOMMENDATION

Morning light opens doors to better eating, quiet consistency. With AyurWell, advice fits how you actually live, built from what you do, not assumptions. Small moments carry direction - when you break fast, how you space meals, where you pause. Not rigid plans, but gentle rhythm guides real change. What holds things together means more than any checklist. Life shifts, so advice drifts along too. Today's choices slip quietly into patterns still taking shape.

Sometimes, after typing out emotions, suggestions may include foods that help the stomach or sharpen morning focus. Then water intake surfaces - perhaps sleep quality follows, along with methods to slow racing thoughts, echoes of old habits woven in. Options show up slowly, built on repetition, not guarantees. Small changes gather: sipping earlier, resting longer, easing into daylight hours. Tips arrive without noise, much like words from someone nearby who waits to hear before speaking.

One step at a time means less chance of quitting down the road. Moving slow lets routines settle in naturally.

Small moves gain strength through repetition each day. What lasts beats what feels hard right now. Repeating minor decisions quietly reshapes the long run.

5.4 SYNTOMPS BASED AYURVEDIC SUGGESSTION

Something shifts when words about pain meet the AyurWell bot. Not quite a chat, more like speaking into stillness. Hints hide inside how things are said - tightness here, fatigue there - little flags pop up unseen. Old echoes stir once those signals land. Knowledge tucked away long ago wakes up slowly. Responses arrive not as answers but murmurs, almost breath-like, worn soft by time.

When headaches show up, a few quiet fixes could already be in your cupboard. Try sipping warm water instead of reaching straight for pills. Some plants have helped people feel better for ages, handed down through years of watching and waiting. Bloating after meals? Maybe it was yesterday's rhythm that set things off. Shifting how you start the morning may shift everything else behind it. Tension often hides in habits too small to notice - until now. Energy drops might follow patterns older than you think. Relief sometimes arrives quietly, tucked into routines. Old knowledge stays close, not loud but steady. Something small might be enough to begin feeling better. Many of the ideas here slip right into days just like yours. Help comes clear, stripped of clutter. Old patterns carry each idea forward

5.5 HERBAL REMEDY RECOMMENDATIONS

Green things play a big role in Ayurveda, helping hold steady both vitality and well-being. When symptom details go into AyurWell, suggestions appear - drawn from plant-based wisdom old as tradition. Not every hint fits everyone, yet patterns from lasting routines often return. Insights come from stored records, not live conversation shaped on the spot. The result that follows depends only on what words were entered before.

A name shows up when someone talks about healing. Even so, traces remain - how it wove into daily habits long ago. What's meant isn't always spelled out, though clues peek through now and then. From such faint echoes, links form toward old herbal wisdom from India. Short answers can feel empty; still, quiet spaces carry forward rhythms of past tending.

5.6 Diet and Nutrition Guidance

Food shapes health in Ayurveda more than most realize. AyurWell listens to how you're feeling, then lines up meal ideas that fit your state. A rumbling stomach? It could suggest soups instead of heavy grains. What lands on your plate holds weight here - every bite has purpose. Type in fatigue or bloating, out comes a nudge toward spices like ginger or cumin. Meals shift when symptoms show - they don't stay fixed. The body talks, the system answers through food. No strict rules, just patterns drawn from what you report. If digestion drags, warm cooked dishes appear in the suggestion list. Eating becomes a mirror reflecting inner balance - or lack of it. Signs guide bites. Fatigue whispers for grounding foods. Bloating asks for less spice. Each input bends the output slightly, like wind shaping trees. You say sluggish, it replies with lentils and warmth. Not every gut issue needs herbs - sometimes timing matters more. Lightness wins when fullness feels wrong.

Suggestions grow from clues, not guesses. When sleep fails, the menu tilts toward calming flavors. No two paths look alike because no two bodies do. Hunger cues mix with symptom logs to shape new plates. Even moods steer ingredient picks now and then. A bowl of steaming oats might work better than cold greens for some. The choice shifts based on what someone shares moments earlier.

Little changes at each meal slowly build up strength across weeks. Clear tips come first, so the bot points toward eating habits rooted in old healing practices. Rather than rigid plans, options appear that slide easily into daily rhythm. Gentle reminders shape habits without force, letting good food blend into ordinary days.

Each bite can shape how you feel by following gentle cues rooted in balance. Instead of rigid rules, small shifts guide meals toward natural harmony. A chatbot offers clear tips so better picks become part of routine. Choices begin reflecting ancient rhythms without strict labels or trends. Eating unfolds simply, quietly supporting energy and well-being.

5.7 LIFESTYLE AND WELLNESS TIPS

Starting off, the chatbot offers tips beyond just food fixes or natural cures - it nudges users toward better living through small changes. Hydration might come up, along with how you rest at night, ways to ease tension, even routines woven into your day.

Starting each day right matters a lot when following Ayurveda's path. Instead of quick fixes, small changes add up over time because consistency builds strength slowly. One step at a time feels easier once habit takes root somehow. Wellness grows quietly when daily choices align with natural rhythms. A helpful nudge now and then keeps intentions clear without pressure building up. Over months, these tiny shifts make space for deeper well-being to settle in place.

5.8 ETHICAL CONSIDERATIONS

AyurWell, a digital health tool, puts user well-being first by handling personal data carefully. Because it gives advice on health topics, the team built safeguards right into how the system works. Instead of making bold claims, the chatbot sticks to clear, honest responses. Safety shows up in small choices, like limiting what kind of guidance gets shared. Privacy isn't an afterthought - it shapes how information moves through the app. Misinformation risks were weighed early, leading to cautious output rules. Real people tested scenarios before launch, helping spot blind spots. Design decisions reflect duty more than trends or speed.

Here lies a core idea behind AyurWell - its chatbot never steps into the role of a doctor. Built around ancient Ayurvedic wisdom, it shares broad tips for daily well-being instead of giving diagnoses. When health issues linger or feel severe, speaking with trained practitioners becomes essential. Guidance appears only after users understand its place: beside care, not in place of it.

6.1 FINDINGS FROM TESTING AND ANALYSIS

AyurWell was put through a trial to judge its ability to reply correctly by using principles from Ayurveda. As users typed their queries, the system tried matching them with answers already inside it. The success of each match relied heavily on how sharply the tool grasped everyday speech. With every try, the connection between what was asked and what came back revealed alignment - or drift - from old teachings. Outcomes displayed plainly when ideas slipped away, also where they held firm. Step by step, the system moved forward until signs of repeated mistakes or wins came into view. Not until multiple passes did predictable responses start to emerge. Getting it right was key when linking symptoms to proper plant-based or daily habit advice. Adjustments grew slowly from user replies, though the main design stayed untouched. After all attempts, one

truth stood: the bot kept its balance between question and insight.

Checking the system's performance involved looking at response accuracy, speed, user-friendliness, trustworthiness of recommendations. Actual usage patterns shaped the test questions - real talk between people guided the design. Common issues popped up again and again: headaches leading the list, then stomach troubles, restless nights, constant tiredness, stress from everyday demands trailing close behind.

6.2 System Performance

Midway through tests, it answered most everyday health questions well. At times, when users asked typical things, replies made sense. Often, if someone wondered about usual symptoms, help came clearly. Now and then, basic medical concerns got proper attention. Through trials, familiar topics were handled without issue. Lately, standard inquiries found accurate answers. Sometimes, regular doubts received useful feedback

- digestion problems
- headaches
- sleep issues
- stress management
- dietary advice

Faster answers came easily since the bot pulls info straight from stored data instead of running heavy computations. Speed stayed high thanks to simpler lookups replacing intense number crunching each time.

6.3 USER INTERACTION EVALUATION

Folks found chatting with the system felt more natural than clicking through old-style web pages when looking up health tips. One after another, test sessions revealed how fluid dialogue cut down confusion. Instead of scanning menus, people just asked questions like they would a friend. That back-and-forth rhythm guided them faster to what they needed. Pages full of links seemed slower by comparison. Talking it out, step by step, trimmed the time spent searching. Each exchange peeled away extra effort. Clunky layouts lost their grip once conversation took over. Participants found the chatbot interface: simple to use intuitive for asking health questions helpful for quick wellness suggestions

7. FUTURE WORK

Although the proposed AyurWellWeb system demonstrates the feasibility of providing Ayurvedic wellness guidance through a symptom-based conversational interface, several enhancements can be explored in future work to improve the system's accuracy, scalability, and usability.

First, the system can be enhanced by integrating advanced artificial intelligence and natural language processing techniques. Currently, the chatbot processes user symptoms using rule-based matching and keyword analysis. Future versions could incorporate deep learning models and transformerbased language models to better understand complex user queries, contextual meaning, and conversational intent. This would significantly improve the quality of symptom interpretation and recommendation generation.

Second, the knowledge base can be expanded to include a larger and more structured dataset of Ayurvedic remedies, herbs, dietary guidelines, and lifestyle practices derived from classical Ayurvedic texts and verified medical resources. Incorporating a standardized ontology for symptoms, diseases, and treatments would also improve the precision of recommendations.

Third, the system can be extended with a personalized health recommendation module. By analyzing user history, lifestyle patterns, and frequently reported symptoms, the platform could generate customized wellness plans tailored to individual users. Integration with wearable health devices or health tracking applications could further enable real-time health monitoring and proactive wellness suggestions.

Another area for improvement is multilingual support. Since Ayurveda is widely practiced in different regions, supporting multiple languages would make the system accessible to a broader population and improve inclusivity.

Additionally, future work could focus on improving the reliability of the platform by integrating external medical databases and APIs for validation of remedies and safety checks. Implementing a feedback mechanism where users can rate the usefulness of recommendations would help refine the knowledge base over time.

Finally, deploying the system as a scalable mobile application and integrating cloud-based analytics could enhance performance, user engagement, and data-driven insights. These improvements would help transform the platform into a comprehensive digital wellness assistant that supports preventive healthcare and promotes traditional Ayurvedic practices in a modern technological environment.

8.1 SYSTEM LIMITATIONS

Finding that it handles everyday health questions effectively, some shortcomings did come up. Still, performance dips appeared in certain areas

What you get hinges on how full the information store is.

At times, complicated questions slip past its grasp. Medical topics often fall outside what it can follow. Tough wording might leave it guessing instead of answering.

Just because it works doesn't mean a doctor's opinion isn't still needed.

One day could bring a wider collection of Ayurvedic wisdom. Alongside that, smarter ways for machines to understand human speech might join in. Some updates may deepen how systems interpret
traditional healing ideas. At the same time, language tools could grow more precise. New layers of old medicine knowledge may appear

Chatbots show promise when sharing Ayurvedic health advice through everyday digital tools. With talk-based design linked to organized medical records, ancient healing practices reach more people than before. One way this works is by turning complex wisdom into simple replies anyone can understand. Instead of static pages, users get answers that feel like real conversations. What matters most is how easily someone can find what they need. Through smart pairing of old teachings and modern tech, guidance becomes both personal and scalable. Not every system gets it right, but well-built ones respond accurately. Accessibility improves when language stays clear and navigation feels natural. Some may doubt machines handling holistic care, yet evidence suggests otherwise. Over time, these tools adapt, learning from each exchange without losing core principles.

Few realize how machines might support age-old healing traditions - yet here it shows up quietly. This setup nudges people toward early care, not just fixing problems later. Instead of chasing symptoms, attention shifts to staying balanced day by day. Old knowledge gains new life when paired with smart tools that learn patterns.

Awareness spreads without force, more like a ripple than a shout.

What makes it work well is how straightforward the design is - leaving room down the line for things like custom health monitoring, meal scheduling, or more advanced AI insights. Built-in flexibility means new tools can slide into place without disrupting what already functions.

8.2 CONCLUSION

The AyurWell system demonstrates how artificial intelligence and conversational interfaces can be used to deliver Ayurvedic wellness guidance through digital platforms. The proposed chatbot provides users with accessible health information based on traditional Ayurvedic knowledge. Experimental evaluation indicates that the system can effectively respond to common wellness queries while maintaining a user-friendly interaction interface. Future work may include integrating advanced natural language understanding techniques, expanding the Ayurvedic knowledge database, and incorporating personalized health monitoring features.

REFERENCES

1. Lad, V. (2002). *Textbook of Ayurveda: Fundamental Principles*. The Ayurvedic Press.

2. Sharma, R. K., & Dash, B. (2013). *Charaka Samhita*. Chowkhamba Sanskrit Series.

3. World Health Organization. (2013). *WHO Traditional Medicine Strategy 2014–2023.*

4. Patwardhan, B., Warude, D., Pushpangadan, P., & Bhatt, N. (2005). **Ayurveda and Traditional Chinese Medicine: A**
   a.   **Comparative Overview.**
   b.   Journal of Evidence-Based Complementary & Alternative Medicine.

5.   Bibault, J. E., et al. (2019). **Healthcare ex Machina: Are conversational agents ready for prime time in   oncology?** Clinical and Translational Radiation Oncology.

6.   Laranjo, L., et al. (2018). **Conversational agents in healthcare: A systematic review.**
a.   Journal of the American Medical Informatics Association.

7.   Bickmore, T., & Giorgino, T. (2006). **Health Dialog Systems for Patients and Consumers.**
a.   Journal of Biomedical Informatics.

8.   Kononenko, I.   (2001).
a.   **Machine learning for medical diagnosis: history, state of the art and perspective.**
b.   Artificial Intelligence in Medicine.

9.   Shortliffe, E. H., & Cimino, J. J. (2014). *Biomedical Informatics: Computer*

10.   *Applications in Health Care and Biomedicine.*