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Bridging Ayurvedic Wisdom with Modern Healthcare Through AI

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Abstract:

The healthcare sector is changing with the coming together of various traditional practices and latest technology. Dhanvantari, a healthcare platform based on AI, fills the essential voids in the healthcare sector by merging Ayurvedic insights with modern medicine[1]. The platform provides customized journeys of healthcare in a Dosha Quiz, symptom detection with the help of AI (AyurAI), and integrated healthcare solutions by cross-matching allopathy and Ayurveda. Moreover, it also enables users with Ayurvedic literacy via a resource centre and offers online consultation with experts in Ayurveda. The paper discusses the methodology, problems, and the possible impact of Dhanvantari in shaping healthcare practices with interdisciplinary collaboration[5].

Keywords *(must be 3-5), Healthcare, Ayurveda, Dosha Quiz, Symptom Identification*

1. INTRODUCTION

The increased need for comprehensive healthcare has caused the merger of conventional and contemporary medical prac- tice[1]. Ayurveda, an age-old system, provides individualized healthcare strategies tailored to the individual's body structure (Doshas)[8]. However, poor accessibility and unavailability of convergence with contemporary medical practice restricts its access. Dhanvantari meets this challenge by developing a platform that integrates Ayurvedic principles with artificial intelligence (AI) to deliver precise symptom identification, treatment suggestions, and comprehensive healthcare solu-tions[5]. This paper discusses how Dhanvantari leverages AI to improve healthcare outcomes while fostering Ayurvedic literacy and facilitating online consultations with Ayurvedic specialists[1][2].

2. MATERIAL AND METHODS

2.1 Problem Definition

Our objective in the Dhanvantari project was to create an integrated healthcare platform filling significant lacunas in the current medical situation—i.e., the lacuna between ancient Ayurvedic knowledge and modern healthcare technology[1][9]. With our platform, we attempted to:

- Develop an app with personalized wellness tips based on Ayurvedic knowledge.

2.2 Data Preprocessing and Collection

We employed a range of sources of data and a range of preprocessing methods to make the system feasible and beneficial to us.

a) Medical Plants Knowledge Base

- Data gathered from Ayurvedic medicinal plant PDFs, i.e., property, benefit, and traditional uses data[1].
- Transformed this text data into vector embeddings using OpenAI's embedding models for semantic similarity-based retrieval[6].

- Stored these vectors in Pinecone to enable fast and precise searching for appropriate solutions.

b) AtoZ Medicines Dataset

- Integrated a well-structured dataset of allopathic and Ayurvedic medicines, distinguished by their usage, ingredients, and side effects.

c) Dosha Quiz Results

- Created a quiz that assigns a user one of the three Doshas: Vata, Pitta, or Kapha[8].
- Dosha trait-based quiz responses to provide personalized well-being guidance.

d) Data Cleaning and Validation

- Removed duplicate records and normalized words for each data set.
- Create symptom to drug mappings with Ayurvedic physicians to increase the precision[1].

2.3 Model Building and Selection

Our approach reconciles the historical tradition and recent machine learning architectures:

a) Knowledge Extraction from LLMs

- Employed GPT-4, which is trained on Ayurveda and allopathic data[6][7].
- Along with Retrieval-Augmented Generation (RAG) and LangChain to pull contextual information from the medicinal plant embeddings and the AtoZ medicines database[2].

b) Dosha Quiz Algorithm

- Applied a weighted scoring system to place users based on their response.
- Refined the logic repeatedly with user feedback and iterative testing, giving correct Dosha evaluations[8].

c) Symptom-to-Medicine Recommendation

- Developed a similarity search engine atop Pinecone vector embeddings.
- Translated user-entered symptoms to vector representations and projected them on the nearest corresponding Ayurvedic remedies[1][6].

d) Allopathic-to-Ayurvedic Mapping

- Designed a hybrid algorithm combining rule-based reasoning and machine learning.
- Mapped therapy based on therapeutic equivalence, showing natural Ayurvedic alternatives to allopathic drugs[9].

2.4 System Deployment and Development

To enable scalability and use, we followed a modular development approach:

a) Backend Development

- Used with FastAPI to handle asynchronous and fast API processing.
- The central activities such as Dosha profiling, prescription of medication, and search for knowledge were established as RESTful endpoints.
- Integrated LLMs through LangChain and linked them to Pinecone for vector search functionality[6].

b) Frontend Development

- Built with React.js, offering the user-friendly interface for users to interact with features such as the Dosha Quiz, symptom search, and resource center[5].
- Offered guided real-time advice and consulting sessions with Ayurvedic experts.

c) Testing and Evaluation

- Conducted in-situ user testing with Ayurvedic experts.
- Tracked system latency and recommendation accuracy.
- Optimized response LLM prompts and vector search performance to minimize latency[6].
- Improved the Dosha Quiz reasoning based on feedback to enhance practitioner evaluation consistency[8].

d) Deployment Architecture

- Deployed a backend service on AWS/GCP for scalability and high availability.
- Deployed the frontend on Vercel for easy reachability.
- Utilized PostgreSQL as schema-based data and Pinecone as vector-based semantic search.
- Utilized CI/CD pipelines with continuous updates and feature rollouts[5].

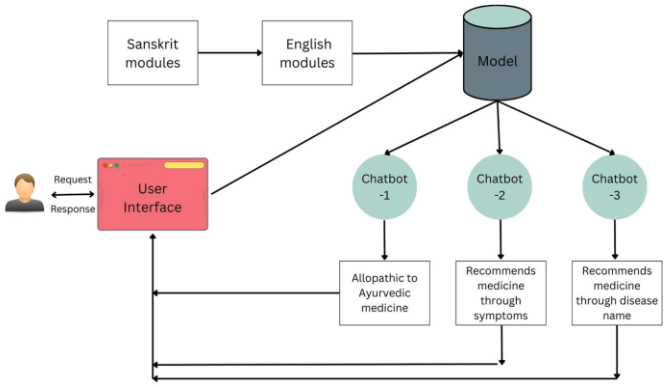

Figure 1. System Architecture

3. RESULTS AND DISCUSSIONS

To evaluate the effectiveness of the Dhanvantari platform's symptom-to-medicine recommendation engine, we used standard Large Language Model (LLM) evaluation metrics, as traditional classification metrics (like accuracy or F1-score) are not applicable due to the generative nature of the model outputs[2]. We computed **BLEU**, **ROUGE-L**, and **Semantic Similarity (Cosine Score)** to assess how closely the generated responses matched expert-annotated outputs as shown in table 1. Below is a summary of the results:

Table 1. LLM Evaluation Metrics Summary

Metric	Score Obtained	Range	Interpretation
BLEU (Bilingual Evaluation Understudy)	0.649	0 to 1 (or 0% to 100%)	- < 0.3 (30%): Poor overlap with expected output - 0.3 – 0.6: Acceptable, moderate phrasing difference - > 0.6 (60%): High-quality match, good precision in wording
ROUGE-L (Longest Common Subsequence)	0.734	0 to 1	- < 0.3: Low match, likely phrased differently - 0.3 – 0.6: Moderate overlap with target text - > 0.6: Strong content-level match
Semantic Similarity (Cosine Score using Embeddings)	0.858	-1 to 1	- < 0.5: Low semantic similarity - 0.5 – 0.75: Moderate similarity - > 0.75: High semantic match (meaning is preserved)

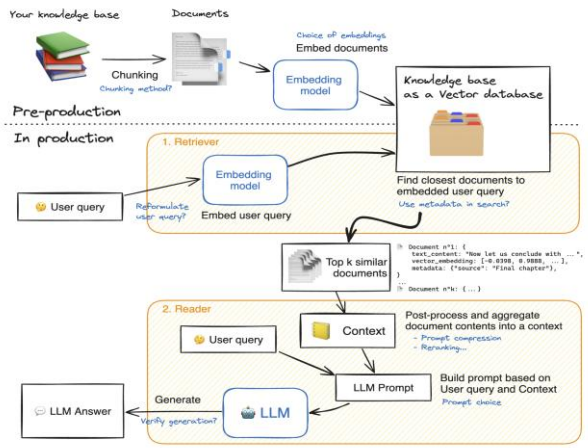

Figure 2. Model Architecture

IMPLEMENTATION

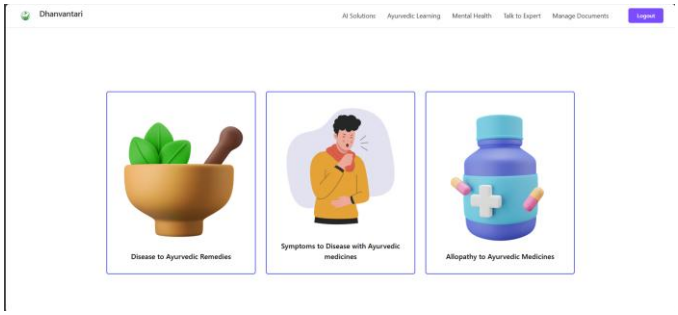

Figure 3. Home Page

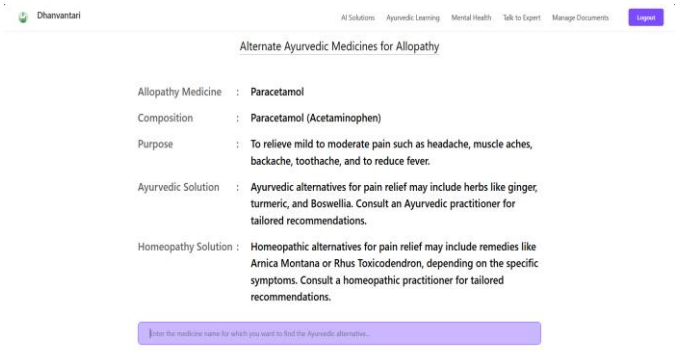

Figure 4. Allopathy To Ayurveda Medicine

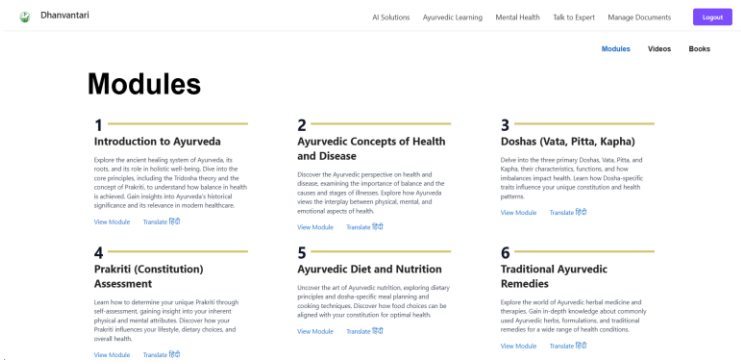

Figure 5. Ayurvedic Learning

4. CONCLUSIONS

The Dhanvantari platform shows the capability to leverage Ayurvedic knowledge with contemporary artificial intelligence methods to offer personalized, integrative healthcare solutions[1][5]. By employing

extensive large language models (LLMs), published literature-based vector embeddings of herbs and plants[6], and an approaching end-to-end medicines A to Z database, the system offers specific and accurate lists of plausible symptoms and Ayurvedic treatments[9].

Evaluated on LLM metrics—BLEU (0.649)[4], ROUGE-L (0.734)[3], and Semantic Similarity (0.858)—the platform exhibited high textual precision, a offer significant content overlap, and outstanding semantic contextualization, presenting confirmatory evidence of accurate and relevant context of system-for systems'-designed responses. Contemporaneously, the platform's capabilities of combining traditional, therapeutic Ayurveda practices with modern AI technologies offer greater access to an integrative practice of holistic medicine and promotes Ayurveda literacy of engaged consumers[1].

Additionally, through the platform's ability to provide online consultations with providers and outside experts, the site creates opportunities to align ancient wisdom with contemporary medical practice[5]. In sum, Dhanvantari models the next-generation potential for integration of conventional health food and Ayurveda—with AI at the center—as personalized health futures that promotes intelligent and scalable solutions to individual health and wellness.[10]

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper
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- **Funding information:** The authors declare that there is no funding to be acknowledged.
- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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