Chatbot to Known Individual Prakriti (Phenotype)

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***Abstract*—Prakriti in Ayurveda refers to the mix of physical, mental, and behavioral traits that define a person's overall health, likelihood of getting sick, and preferred way of living. The main way to classify Prakriti is based on three key body energies—Vata, Pitta, and Kapha—with some people having a mix of these energies. Traditionally, identifying Prakriti involves an expert Ayurvedic doctor, their personal judgment, and questionnaires that ask about different aspects of a person's life. However, this method has some challenges, like being hard to scale, not easily accessible, and not always consistent.**

This research proposes a smart system using a chatbot that helps with these issues. It uses Artificial Intelligence (AI) and Natural Language Processing (NLP) technologies to automatically figure out a person's Prakriti and provide personalized Ayurvedic advice. The system interacts with users, understands their input through trained deep learning models, and accurately identifies their Prakriti type. It also includes a feature that suggests customized food, lifestyle, and exercise recommendations based on the identified Prakriti.

The main goal is to bring together traditional Ayurvedic knowledge with modern AI-based healthcare tools. The results show that this model is effective for classifying Prakriti and can serve as a reliable digital diagnostic tool. This framework makes Ayurveda more accessible by offering a data-driven, scalable, and easy-to-use personalized health solution. Due to its accuracy and adaptability, it can be easily integrated into preventive health programs and telemedicine services, helping to modernize and make Ayurvedic diagnostics available worldwide.

***Index Terms*—Ayurveda, Prakriti, Chatbot, Natural Language Processing, Artificial Intelligence, Personalized Healthcare**

I. Introduction

the Indian system of medicine based on the principles set forth in the Vedas, has been advocating for a healthy lifestyle based on the personalized and holistic approach of health that is Prakriti — a patient's original nature that comprises physical, mental, and behavioral characteristics. The three fundamental biological energies called Doshas — Vata, Pitta, and Kapha — whose mixture in varied proportions not only determines human health but also metabolism, temperament, and the tendency to get diseases, are the governing elements of all living beings. A person's Prakriti is the one that results in the physical and mental traits as well as the lifestyle choices that correspond to the specific individual's body composition and mind.

Generally, Ayurvedic doctors distinguish Prakriti through subjective interpretation of their visual, tactile, and detailed questionnaire-based examination of the patient. Besides the physical features like body frame, skin texture, and hair type, the assessments also consider behavioral and emotional tendencies. Nonetheless, manual assessment is subjective in nature, slow, and does not provide standard measures, thus, it is difficult to carry out large-scale or distant Prakriti assessment.

AI and NLP have also contributed to the transformation of Prakriti identification from a manual to a digital and automatic process. AI-powered systems are capable of managing both structured and unstructured data, analyzing answers to the questionnaire, and making classifications. They can also label persons according to computational frameworks that are trained using Ayurvedic information because of their automation-based knowledge. This work aims at the development of an intelligent Prakriti Chatbot — an AI-supported conversational system that experiences interaction with users, gathers answers to Prakriti questions, and uses Deep Learning algorithms to classify its users' Prakriti. The chatbot's function is to revive the old methods of diagnosing Ayurveda through the combination of data-driven strategies with the age-old Ayurvedic concepts, thus, enabling not only personalized preventive healthcare but also accessibility and precision in giving wellness advice.

II. Literature Review

Traditionally, Ayurveda determines a person's Prakriti by looking closely at one's physical, mental, and emotional traits in light of the main Tridosha Theory — Vata, Pitta, and Kapha [1]. Identification of these attributes is mostly achieved interaction-wise and by filling in survey forms concerning the queries of one's physical aspect, rest tendencies, emotional inclination, and living manner [2]. The main goal of the research is to figure out the individual's body type, i.e., the inherent mixture of Doshas, which is the core of personalized healthcare and a preventive system in Ayurveda [3].

Moreover, the different general ways several precise instrument-based methods like Pulse Diagnosis (Nadi Pariksha) and Tongue Diagnosis (Jihva Pariksha) are called upon to check the body's physiological balance.[4] Nadi Pariksha concentrates on aspects of a pulse such as rate, rhythm, and tension to infer the Dosha that is out of balance, while Jihva Pariksha inspects tongue color, texture, and coating to invite the physiological changes that are barely noticeable [5]. Besides these check-ups, emotional, and family history, and physical observation bonuses, the Ayurvedic doctors may

accurately locate with almost no doubt, the dominate Dosha with the synergy of these methods [6].

Many standardized methods have been established through time for the evaluation of Prakriti. The majority of them derive their inspiration from the personality and physiological traits vivid in ancient Ayurvedic texts like Charaka Samhita and Sushruta Samhita [7]. The Manual of Standard Operative Procedures for Prakriti Assessment (MoSOP-PA) sketches a detailed layout that sees the inclusion of both objective and subjective data [8]. It is more concerned with the consistent character of the assessments that is achieved through the use of questionnaires and the standardized diagnostic procedures (SoPs), thus, practitioners can carry out their assessment in harmony [9].

The idea of Prakriti has been translated into numerical values through different questionnaire-based scoring methods that have been presented to embody Prakriti features in numbers. In a commonly-used method, the choices that the respondents make are either "yes" or "no" and the related numerical values are assigned [10]. A "yes" response raises the score of the related Dosha, while a non-response or an uncertain one is scored as zero [11]. Another popular method gives a score of 1 to each Dosha every time the characteristic is mentioned. Then the total for each Dosha is calculated to identify the dominant Prakriti [12].

One of the limitations that manual approaches of Prakriti assessment have—which is the problem of subjectivity and dependency on the competence of a practitioner—has already made researchers think about possible digital solutions for Prakriti assessment [13]. One of such digital platforms is Ayusoft, a computer-assisted questionnaire system developed by the Centre for Development of Advanced Computing (C-DAC), Pune, India [14]. Ayusoft standardizes the entire diagnostic process by using an algorithmic scoring system and then generating the results automatically from the data provided by the user [15].

However, traditional and semi-automated systems also have some disadvantages, which include user tiredness, inability to adapt, and unchanging question sequences, among others [16]. To solve these problems, the Prakriti Assessment Chatbot is here, which utilizes Artificial Intelligence (AI) and Natural Language Processing (NLP) to have a flexible conversation, understand the text and figure out Prakriti on the fly [17]. Such a methodology is an integration of the timeless Ayurvedic approaches and the contemporary computational intelligence [18]

III. Methodology

A. Dataset Description

Three datasets were used for the model:
The model utilized three data files:

- prakriti.csv: Includes 1,200 samples and 21 features describing both physical and psychological characteristics (for example,
body size, color of the skin, appetite, and emotions).
- diet.csv: Contains the dietary and lifestyle recommendations for each Dosha type.
- videos.csv: Offers URLs to educational videos on Ayurveda according to Dosha combinations.

B. Data Preprocessing

Data preprocessing consisted of normalizing the data, encoding the categorical variables, and dividing the dataset into the training and testing sets in an 80:20 ratio. Additionally, NLP preprocessing of user input was more detailed as it included tokenization, lemmatization, and thorough stop-word removal to achieve better linguistic accuracy.

C. Model Architecture

A Feedforward Neural Network (FNN) has been trained based on the responses to a questionnaire. The architecture of the network includes:

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- Input layer consisting of 21 neurons
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- Two hidden layers with 64 and 32 neurons (ReLU activation)
- Output layer with 6 neurons representing Dosha types (Softmax activation)

The training of the model was facilitated by the Adam optimizer and categorical cross-entropy loss.

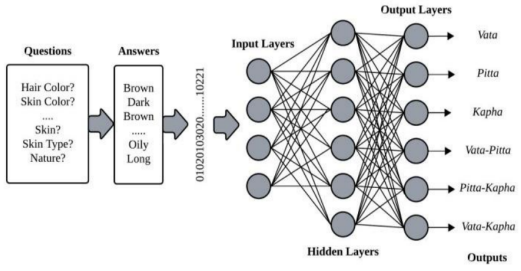

Fig. 1. Architecture of the Feedforward Neural Network for Prakriti Classification

D. Chatbot Design

The chatbot part is an interactive layer that goes deep into natural conversations with users. It collects their answers and manages the flow of information from the front-end interface to the back-end machine learning model and vice versa. The chatbot is using the FastAPI framework which is known for its high-performance, non-blocking capabilities, and compatibility with machine learning pipelines. FastAPI takes care of routing, session management, and model inference, and thus, the communication between the user and the system is in real-time is very efficient.

WebSocket protocol is what makes the communication between the user and the system continuous, two-way. Unlike conventional HTTP requests which are one-directional and require frequent polling, WebSocket connection is maintained between the client and server. Both the bot and the user can

send/receive messages instantly to/from the chatbot without the need of any other requests. Therefore, the conversation experience is as seamless as with a human. This tool for real-time interaction is also a way to keep the users engaged, and it facilitates the reduction of the response time of Prakriti evaluation as well.

The front-end interface developed with ReactJS is presenting a user-friendly chat window that keeps the record of the text-based user queries. The chatbot dynamically reorders its questions based on the environment and the past answers. For example, if a user would mention irregular appetite or bad sleep, the next questions would concentrate on digestive or mental attributes linking to Vata–Pitta imbalances.

After the user input has been received, the FastAPI backend will be making a call to the FNN model for the classification task. The text goes through the NLP pipeline where it is tokenized and has its features extracted and then the model makes a Prakriti prediction. In the next step, the chatbot goes to the recommendation module to get the required dietary, lifestyle, and video-based learning resources from the respective databases (`diet.csv` and `videos.csv`). To make sure that the user obtains the most relevant and personalized guidance, these results are being shared in a conversational manner.

Put simply, the chatbot setup is a brilliant example of how to bring together NLP, deep learning, and Ayurvedic knowledge in a single interactive framework, thus enabling real-time, user-centered, and adaptive Prakriti assessment.

IV. System Design and Implementation

The system architecture (Fig. 2) integrates three main modules: user interaction, AI-based analysis, and recommendation delivery.

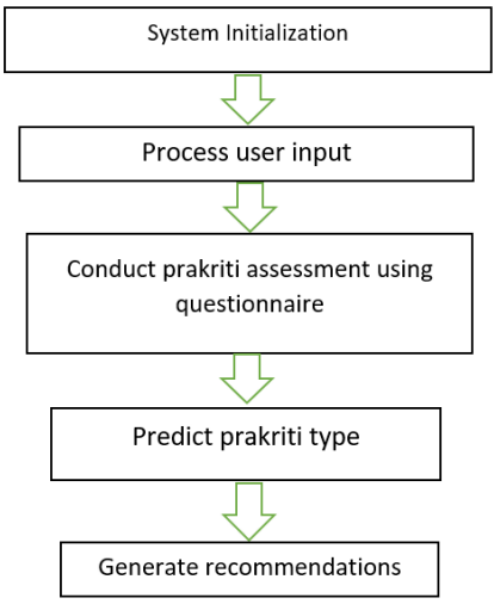

Fig. 2. System Architecture of the Prakriti Chatbot

V. Results and Analysis

Table I compares the accuracy of three models used for Prakriti classification.

TABLE I
Model Performance Comparison

Model	Accuracy	Precision	Recall	F1-Score
Feedforward Neural Net	1.00	1.00	1.00	1.00
Support Vector Machine	0.92	0.83	0.80	0.82
Naive Bayes	0.81	0.80	0.71	0.72

The FNN achieved the highest accuracy. Fig. 3 and Fig. 4 illustrate the model's training performance.

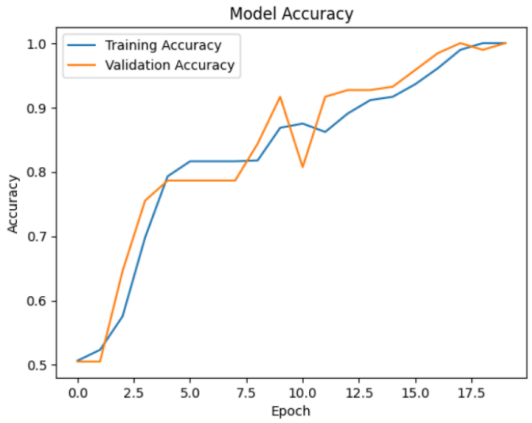

Fig. 3. Training and Validation Accuracy

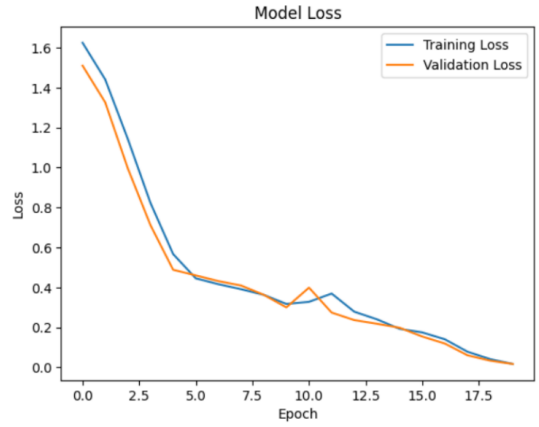

Fig. 4. Training and Validation Loss

VI. Discussion

The Prakriti chatbot is a prime example of how age-old Ayurvedic wisdom can be harmonized with cutting-edge artificial intelligence (AI) tools to craft a personalized health blueprint that can be easily scaled. The blend between the knowledge domain of Ayurveda and machine intelligence has

resulted in a user-friendly digital assistant that evaluates an individual's physiological and psychological makeup (Prakriti) and suggests relevant lifestyle changes and diet plans. Essentially, the coupling of Ayurveda and AI is a win-win situation as it not only eases the dissemination of holistic health concepts but also serves as a testimony of how ancient medical wisdom can be practically plugged into technology-driven environments of the present day.

The Feedforward Neural Network (FNN) classifier put in place has been able to pinpoint patterns in the data it was trained on, thus achieving extremely high accuracy and reflecting the model's ability to identify the relations between the answers given to the questionnaire and the Prakriti categories. Nonetheless, this extremely good performance also brings up the issue of possible overfitting, and mainly due to the small size and the nature of the dataset. Overfitting means that the model is too closely tailored to the existing data and consequently, it will not be able to perform well on new data. Hence, having a dataset of subjects belonging to different age groups, coming from different places and speaking different languages will help the model to generalize better and become more robust. The next versions might also use the transfer learning and cross-validation methods in order to solve the overfitting problem and get more trustworthy results.

Besides the classification functionality, the chatbot has incorporated natural language processing (NLP) modules with which the user can have a conversation. Essentially, the conversational capability substitutes the non-interactive questionnaire formats with a more interactive human-like conversation. By means of tokenization, lemmatization, and recognizing the correct context, the system can even infer the user's answers with lesser linguistic errors. This conversational potential enables the customer to talk directly to the system, which can thereby enhance user involvement and loyalty since users can explain their symptoms or preferences in their own words rather than choosing from the options predetermined. In this way, the chatbot's NLP unit is a perfect intermediary between traditional Ayurvedic diagnosis and contemporary AI-based personalization.

Besides, the system-planning and lifestyle intervention fetes, along with personalized meal plans, yoga sequences, and educational videos, empower the diagnostic tool with a preventive and health promoting angle. Basically, these suggestions are made available to the user on-demand depending on the predicted Prakriti and thus generate a closed-loop system consistent with Ayurveda's preventive standpoint. Through digital convenience, user-friendly interaction, and holistic counseling, the chatbot stands for a contemporary rendition of Ayurveda's personalized healthcare tradition.

In essence, the Prakriti chatbot is an embodiment of the concept of integrating old medical paradigms with AI-enabled personalization and thus making it work effectively. However, as to come, the developments should primarily concentrate on amplifying the range of data, providing explanation for decisions made by AI, and safeguarding user privacy. With continuous collaboration between different disciplines, such projects have the potential to be a game-changer in digital health thereby making Ayurveda not only scientifically credible but also technologically up-to-date for the worldwide audience.

VII. Conclusion and Future Work

The paper introduces an AI-powered automated system for determining the Prakriti phenotype of a person with the help of an interactive chatbot that combines Ayurveda, Artificial Intelligence (AI), and Natural Language Processing (NLP). The suggested system changes the way traditional Prakriti assessment is done by converting Ayurvedic diagnostic knowledge into digital format and providing personalized recommendations via conversational interaction.

The chatbot applies deep learning methods for Prakriti classification and an NLP-based dialogue system for user interaction. It issues custom diet and lifestyle Advices as per the recognized Dosha type. The experimental evaluation reveals that the deep learning model exceeds traditional algorithms such as Naïve Bayes and SVM in classification accuracy, thereby confirming the promise of AI as a means to facilitate the digitization of Ayurvedic healthcare.

Such innovative research exemplifies the increasing interaction between the age-old wisdom of the past and modern computational intelligence. This system can be seen as an effective and scalable tool for preventive healthcare, thus opening new doors for data-driven applications of Ayurveda. However, being confined to a relatively limited dataset and also relying on self-reporting as the method of data collection, the research results need some further validation.

Future endeavours will be committed to finding more samples to increase the size of the dataset, embedding physiological analyzers via wearable sensor data, introducing multilingual NLP, and explainable AI to upgrade chatbot intelligence. The chatbot's ability to integrate with telemedicine platforms and continuous learning faculties will not only enhance its accuracy but also its usability in real life situations.

To sum up, this project is a stepping stone towards AI-powered personalized Ayurveda where the leading-edge technologies can be used to support rather than replace traditional healthcare methods thus opening the possibilities for holistic, accessible, and preventive healthcare.

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