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Review Article

Customizing AI with Nidan Panchak: A Thematic Review

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ABSTRACT

Rog Nidan evam Vikriti Vigyan (Ayurvedic Diagnostics) is about diagnosing diseases using ancient methods. It focuses on understanding how diseases develop and the factors that cause them. "Nidana" refers to the causes of diseases, and "Vikriti" refers to the abnormal conditions of *Dosha*, *Dushya*, and *Mala*. Understanding these helps in diagnosing diseases. Diagnosing disease has been impacted by contemporary knowledge year after year.

Today, technology, especially Artificial Intelligence (AI), is changing how we diagnose and understand diseases. AI improves how we collect and do the analysis of patient's data, detect diseases in the early stage, and monitor patients. Researchers are looking into how AI can enhance the diagnostic process in a meaningful manner and create better treatment plans using techniques like Machine Learning and Deep Learning while mixing it with Ayurveda. This paper discusses the different stages of Ayurvedic diagnostics where AI can be helpful and explores current research in this field.

INTRODUCTION

Rog Nidan plays a crucial role in early disease detection and personalized treatment whereas the use of Artificial Intelligence (AI) in *Rog Nidan* (Ayurvedic diagnostics) can enhance various aspects of the diagnostic process. *Rog Nidan* combines traditional wisdom with contemporary diagnostic tools like laboratory investigations, ECG, X-rays, and ultrasound. Ayurvedic practitioners strive to provide holistic care by integrating ancient and modern approaches to Artificial Intelligence. Computers are being used in many sub-fields of Ayurveda like finding information in old Ayurvedic literature, discovering new herbs and production of drugs, studying lifestyle diseases, helping Ayurvedic doctors to make the right decisions, storing the records in a better manner, using telemedicine, personalized medicine, predicting outcomes, education, and managing data.

Literature Review: Several studies have been performed from the investigative and explorative point of view to check where the possibility of integration of computer-based modern technologies with Ayurveda. In a scientific study entitled 'Scope of Artificial Intelligence in Spectrum of Ayurveda' (Prerna Saini & Deepti Parashar, 2024) [1], the author discusses how AI can enhance Ayurveda by modernizing diagnostic and treatment methods. AI applications in Ayurveda include drug development, personalized medicine, and efficient manufacturing processes, thereby bridging gaps between traditional practices and modern technology. Few studies have been reported specifically focussing on computer science in the purview of Ayurveda i.e. Deep Learning, Machine Learning, Big Data, Use of Pattern Recognition algorithms, etc. In another study targeting Ayurvedic Diagnosis using Machine Learning Techniques [2] author highlights how machine learning can improve the accuracy and efficiency of Ayurvedic diagnosis. The integration of AI helps in better understanding individual *Doshas* and customizing treatment plans. In another study conducted by the author [3] figured out the necessity of new devices from an Ayurvedic point of view

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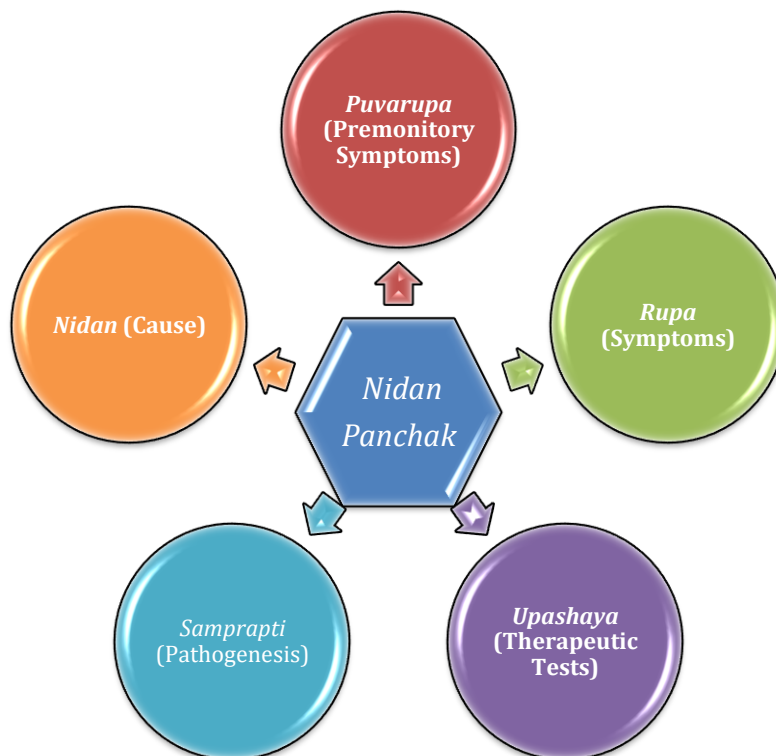


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which can help in the different subject domains i.e. *Panchkarma*, *Shalaky Tantra*, etc. This paper reviews the current diagnostic methods in Ayurveda and suggests that AI can refine these techniques. The use of AI can lead to more precise and reliable diagnostic outcomes, enhancing the overall effectiveness of Ayurvedic treatments. One more study [4] pointed out the accuracy in detection and prediction of disease through intensive *Nadi pariksha*. This study emphasizes the potential of AI in analyzing pulse data to diagnose diseases. AI can ***Nidan Panchak* has five components -**

process complex pulse signals more accurately than traditional methods, providing a more detailed health assessment. Another study [5] concluded the linking of measurement of experimental observations of patients and its assessment with the help of advanced technologies. This review article discusses how AI can assist in the comprehensive diagnostic framework of *Nidan Panchak*, which includes examining causative factors, symptoms, and other diagnostic criteria. AI can streamline this process, making it more efficient and accurate.



1. *Nidan* (Causes): Here *Nidan* means understanding the root causes of diseases. In Ayurveda, finding the root cause of a disease involves understanding various factors like *Aahar* (Diet), *Vihara* (Life style), *Mansikanidan* (emotional factors) that contribute to the imbalance of *Dosha* in the body and mind.

a. Identify *Dosha Prakriti* (Constitution): By examining the *Doshas prakriti*, an Ayurveda physician used to determine the patient's natural constitution (*Vata*, *Pitta*, *Kapha*, or their combinations) through detailed examination and questioning. Charaka Samhita," Sutra Sthana, Chapter 17, Verses 60-61, which describe the characteristics of *Dosha* imbalances.

Use of AI: Artificial Intelligence (AI) can be used to enhance the understanding of patient questioning in several ways. AI can process and understand natural language inputs from

patients, enabling systems to comprehend spoken or written questions about diet, sleep patterns, lifestyle including *Dincharya* and *Ratricharya*. NLP algorithms can analyze the context of a patient's questions to provide relevant and accurate responses. AI can also help to understand the mood (sentiment analysis) of the patient. AI can detect the emotional tone of a patient's questions, helping healthcare providers understand the patient's concerns, anxiety levels, and overall emotional state^[5,6].

b. Assess *Dosha Vikriti* (Imbalance): In the Ayurvedic disease identification method, physicians stress how much quantity of *Doshas* are currently imbalanced, causing the disease. This is done through analyzing the strength (*Bala*) of *Hetu* (cause), *Dosha*, *deSh* (course of disease change with place) *Kala* (seasonal

variation of disease course), pulse diagnosis, and other examination techniques.

Use of AI: AI can be used along with other techniques in many ways. In symptoms-based disease detection and prediction of stages, AI can be used especially AI algorithms that can analyse patient symptoms.^[7,8] This can be done through structured data (like symptom checkers) or unstructured data (like conversations with virtual health assistants for asking questions about *Desha, Kala bala*.

2. *Purvarupa* (Premonitory Symptoms):

Recognizing early signs that precede the full manifestation of a disease. "*Purvarupa*" refers to the early or premonitory symptoms that appear before the full manifestation of a disease. These early signs are crucial for the identification and prevention of diseases in its preclinical stage. The study of *Purvarupa* is an important aspect of Ayurvedic diagnostics and helps in the early detection and management of diseases (*Charaka Samhita, Sutra Sthana, Chapter 7, Verses 16-18*.)

One should distinguish these premonitory symptoms by their specific characteristics with discernment. The one who understands the signs of *Purvarupa* becomes adept at diagnosing diseases accurately."

Based on the identified *Purvarupa*, Ayurvedic practitioners can customize treatment plans to balance the *Doshas* and address the root cause of the symptoms. This may include dietary changes, herbal remedies, lifestyle modifications, and other therapeutic approaches.

Use of AI: Understanding and identifying *Purvarupa* can be integrated into Ayurvedic preventive healthcare practices along with AI, promoting early detection and proactive management of health issues. AI systems can recognize patterns in the symptoms that may indicate specific diseases. Machine learning models are trained on large datasets containing information about symptoms and corresponding diagnoses. AI can use diagnostic algorithms to provide possible diagnoses and recommend further tests or treatments. These algorithms are often developed and refined with the input of medical experts. While AI can significantly aid in disease detection^[8] it's important to remember that it should complement, not replace, professional medical advice and diagnosis.

3. *Rupa* (Symptoms): *Rupa* is the complete manifestation of disease. The classical text "*Charaka Samhita*" provides detailed descriptions

of symptoms associated with various diseases and dosha imbalances.

Charaka Samhita, Nidana Sthana, Chapter 1, Verses 13-14, discusses the identification of diseases based on symptoms.

Knowledge of the manifested condition is considered the highest understanding in terms of symptoms. All diseases are described with various symptoms for accurate identification." These verses emphasize the importance of identifying diseases based on their specific symptoms (*Rupa*), highlighting the detailed approach Ayurveda takes in diagnosing and understanding various health conditions.

Use of AI: AI systems can continuously learn and improve diagnostic accuracy by incorporating new data and outcomes-AI-powered chatbots like Buoy Health and Your.MD interacts with patients, asks questions about their symptoms, and provides potential diagnoses and advice^[9,10] Similar Apps can be redesigned with the parameters of *Rog-nidan*. Apps like Ada, Babylon Health, and WebMD use AI to analyse symptoms entered by users and suggest possible conditions.

4. *Upashaya* (Therapeutic Tests): Evaluating the effects of treatments: "*Upashaya*" is a crucial concept in the diagnosis and treatment of diseases. It refers to the therapeutic trial or test treatment used to understand the nature of a disease and confirm the diagnosis. *Upashaya* involves administering a specific treatment or therapeutic measure to observe the patient's response. The effects of this treatment help in confirming the diagnosis. *Charaka Samhita, Vimanasthana, Chapter 4, Verse 4* mentions '*Upshaya*' which talks about use of *Upshaya* as diagnostic aid for treatment by diagnosing and confirming the nature of a disease by providing therapeutic relief.

Use of AI: AI can analyze a patient's medical history, Prakriti information, lifestyle, and other health data to create personalized treatment plans. By understanding individual variations, AI can recommend the most effective treatments and dosages and accordingly, the measures for *Doshas* can be balanced. AI algorithms can predict how a patient will respond to a particular treatment based on historical data and similar patient profiles. This can help in selecting the most promising therapeutic measures^[9]. AI can continuously monitor a patient's response to treatment through advanced devices and other health monitoring tools. It can analyze real-time data to adjust treatment plans dynamically, ensuring optimal therapeutic outcomes.

5. Samprapti (Pathogenesis): Understanding the disease progression is performed in this methodology. "Samprapti" refers to the pathogenesis or the process through which a disease develops and progresses in the body. Understanding *Samprapti* is crucial in *Roga Nidana* (disease diagnosis) as it helps practitioners determine the root cause of the disease, its stage, and the appropriate approach for treatment.

Charaka Samhita, Sutra Sthana, Chapter 18, Verse 48 discusses the importance of *Samprapti*. This emphasizes the systematic approach to understanding the pathogenesis of a disease stressing on the cause (*Hetu*) should be specified, then the *Dosha* (*Vata*, *Pitta*, *Kapha*) that has become vitiated due to it, the location (*Sthana*) where it manifests, the nature (*Prakriti*) and path (*Marga*) of its movement, and the detailed process of the disease (*Samprapti*) should be described.

Samprapti encompasses the sequence of events that lead from the initial cause to the manifestation of disease symptoms.

Use of AI: AI can analyze historical data to identify risk factors associated with specific diseases, aiding in the early detection of predisposing conditions. Predictive models can simulate disease progression based on initial conditions, helping practitioners understand how different factors influence the pathogenesis over time. AI can analyze individual patient data to assess *Dosha* imbalances and *Prakriti* (constitution), providing insights into how these factors contribute to the onset and progression of diseases stressing individual *Prakriti* analysis. By understanding the specific *Dosha* imbalances and their roles in pathogenesis, AI can suggest personalized treatment plans to restore balance and address the root causes of diseases^[10,11].

Future Aspects and Challenges: The integration of AI with Ayurveda holds tremendous potential to enhance the practice of traditional medicine with modern technology, leading to advancements in diagnosis, treatment, and overall healthcare delivery^[12]. AI can analyze a patient's unique constitution (*Prakriti*), *Dosha* imbalances, genetic makeup, lifestyle, and health history to tailor highly personalized treatment plans^[13,15]. AI can predict the onset of diseases by identifying early signs and risk factors, allowing for pre-emptive measures and early interventions based on Ayurvedic principles. AI can integrate ancient Ayurvedic texts with contemporary medical research, validating traditional practices through empirical data and enhancing credibility. AI can

continuously learn and update its knowledge base, incorporating new research findings and Ayurvedic insights to stay current^[14,15]. Issues of ethics remain while integrating Ayurveda with Artificial Intelligence. AI models must be trained on diverse datasets to avoid biases and ensure equitable treatment recommendations. Bridging the gap between traditional practices and modern technology requires cultural sensitivity and acceptance from both practitioners and patients^[16]. The integration of AI with Ayurveda promises to revolutionize the field by bringing precision, personalization, and efficiency to traditional healthcare practices^[17].

Conclusion

By combining the deep, holistic insights of Ayurveda with the advanced capabilities of AI, the future holds the potential for improved health outcomes, broader accessibility, and innovative treatment approaches that honour the rich heritage of Ayurvedic medicine while embracing the benefits of modern technology.

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