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Artificial Intelligence in Ayurveda: A Simple Overview

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ABSTRACT

Ayurveda is regarded as a thousand-year-old science. This system of medicine has been time-proven and beneficial not just for maintaining individual's health but also in ensuring their (holistic) well-being. Combining complementary and modern medicines can help in solving patient issues and improve treatment strategies. This study looks into the use of machine learning in *Ayurveda*, an age-old Indian medical practice that is becoming more and more well-known throughout the world. In order to close the gaps in the current state of knowledge, it is imperative that modern technologies like artificial intelligence and machine learning be combined with *Ayurvedic* sciences. We have the potential to revolutionize the field of *Ayurveda* by accepting and transforming this digital landscape. Researchers have combined AI with additional technological advances to enhance Ayurvedic medicines' efficiency, availability, and reliability. The study analyses how AI influences *Ayurveda*.

Key words: *Ayurveda, Artificial intelligence, Machine learning, Research.*

INTRODUCTION

Ayurveda is a Life Science with a holistic approach to health and personalised medicine, in the scenario of globalisation, new challenges have emerged, emphasising the need to upgrade. With the advent of artificial intelligence (AI) technologies, there is growing interest in leveraging AI for improving the accuracy and efficiency of disease diagnosis in *Ayurveda*.

Central idea of *Ayurvedic* diagnosis is the assessment of individual constitution (*Prakriti*), imbalances (*Vikriti*) and disease manifestations (*Roga*) through a combination of clinical examination, patient history, and diagnostic techniques such as pulse diagnosis (*Nadi Pariksha*) and tongue examination (*Jihva Pariksha*). However, the subjective nature of these methods and the complexity of Ayurvedic diagnosis pose challenges for standardization and accuracy.[1]

Drug discovery, quality standardization, pharmacological, and clinical validation of the safety and efficacy of medicines have been the mainstream focus areas of *Ayurveda* research.

Machine learning algorithms leverage large datasets and complex patterns to analyse a patient's symptoms, medical history and *Dosha* imbalances. These algorithms can identify patterns, correlations and predictors that may not be readily apparent to human practitioners. By analysing vast amounts of data, machine learning models can assist Ayurveda experts in making accurate diagnosis and suggesting personalized treatment plans.[2]

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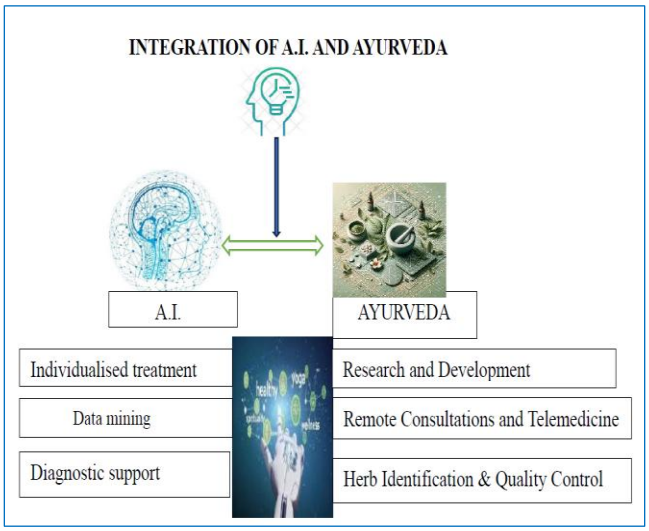

The integration of Artificial Intelligence (AI) with traditional medical systems, like Ayurveda, holds enormous potential as AI has emerged as a revolutionary force across numerous sectors. Ayurveda is poised to gain from improved diagnostic precision, customised treatment regimens and expedited research procedures with the development of AI technology.

This Work highlights AI's potential to transform healthcare practices and improving patient prognosis by examining its applications and applicability in Ayurveda.

Materials and Methods

This research is a conceptual one. As source materials, the classical Ayurveda texts, along with the commentaries available in the library are referred. Other than this, various related research articles published have also been studied. All the relevant matter is further compiled and analysed for the discussion and attempts to conclude the scientific potential of fundamental concepts.

What is artificial intelligence?

Artificial intelligence sometimes called machine intelligence, is intelligence demonstrated by machines, in contrast to natural intelligence displayed by humans and animals.

AI systems work by merging large data with intelligent, iterative processing algorithms this combination allows AI to learn from patterns and features in the analysed data.[3]

History of AI

The year 1956 is usually considered to be the year when AI was born, as it was in 1956 that Dartmouth College had organized the famous conference. However, the preceding year, t 1955, i.e. saw its first AI system that was called Logic Theorist and the International Journal of Advanced Academic Studies, people who developed it was Allen Newell, Herbert A. Simon. Nearly, 40 theorems of Principia Mathematica by Alfred N. Whitehead and Bertrand Russell were proved using this system.[4]

Uses of Artificial Intelligence

Remote Consultations and Telemedicine: AI-powered virtual assistants and telemedicine platforms let healthcare to be delivered remotely and overcome geographic limitations in an increasingly digital world. Ayurvedic doctors may communicate with patients, provide them individualised health advice and keep an eye on their progress from a distance using chatbots or virtual assistants powered by AI. For patients seeking Ayurvedic therapy, telemedicine platforms with AI algorithms enable real-time contact, data interchange, and follow-up consultations, improving accessibility and convenience.[5]

Research and Development: AI leads research and development efforts in Ayurveda. Algorithms for Natural Language Processing (NLP) can glean insightful information from academic literature and old Ayurvedic manuscripts, hence promoting knowledge development and hypothesis testing. AI-driven computational modelling also makes it possible to virtually screened herbal compounds for safety and medicinal efficacy, which speeds up the drug discovery process.[6]

Herb Identification & Quality Control: To guarantee the effectiveness and safety of Ayurvedic treatments, it is crucial to identify and authenticate medicinal plants. Even in their powdered or dried forms, medicinal plants can be accurately identified with the use of powerful image recognition technologies. AI

ISSN: 2456-3110 REVIEW ARTICLE November 2024

algorithms may also evaluate spectral data and chemical compositions to evaluate the quality and authenticity of herbal goods. AI helps to uphold standards in Ayurvedic formulations.[7]

Individualised treatment regimens: *Ayurveda* places a strong emphasis on individualised care plans that take into account each person's distinct constitution, or *"Prakriti."* By examining a patient's *Prakriti*, medical history, lifestyle choices and food preferences, AI algorithms can make customised recommendations for dietary adjustments, lifestyle adjustments and herbal formulations based on predictive analytics and the unique requirements of each patient.[8] Individualised treatment regimens increase patient compliance and satisfaction in addition to improving therapeutic efficacy.

Diagnostic Support: In Ayurveda there are many vyadhis, which exhibits similar sign and symptoms. Due to similar symptoms in Sandhivat (Osteoarthritis) and Aamvat (Rheumatoid arthritis) it can be challenging to differentiate and diagnose these conditions accurately.[9] With the help of A.I. tools we can interpret symptoms, pattern and patient history by comparing with large data base of past cases and Ayurveda text. Integration of A.I. into diagnostic procedures guarantees accuracy in Ayurvedic diagnosis and boosts efficiency, both of which benefit patients' outcomes from treatment.[10]

Algorithms analysing patient data, such as symptoms, medical history and test findings can help practitioners diagnose diseases accurately. Large datasets can be analysed using sophisticated machine learning algorithms to find patterns and connections that can predict health risks and enable early disease detection.

Data mining: Many *Acharyas* have mentioned about different topics of ayurveda for example various aspects of *Garbhini Paricharya* are explained by *Charak*, *Sushrut*, *Bhel*, *Kashyap*, *Vaghbhat*.[11,12,13] Similarly in *Ayurveda* many *Acharyas* have given different types of *Aahar Vargas*[14,15,16] which helps in choosing the specific diet for patient specially in life style diaseases. To achieve valuable information, in context of Data Mining, it follows three major steps i.e. data collection, data shrink and valuable data quest. Data mining tool of A.I. helps in easy access of information according to our needs.

Relevance of AI in present world:

1. Research and Commercialization of *Ayurveda*

Beyond research, AI is used in *Ayurveda* for business purposes. The global *Ayurveda* market is growing, with a projected value of $26.16 billion by 2032.[17] There are various Factors supporting growth of global market of Ayurveda:

- Significant and growing adoption of Ayurveda in countries like USA, UAE, Russia, Japan and many more destinations ensuring stability locally and internationally.
- There is a growing interest in natural products Specially after Covid-19 Pandemic. People are becoming more aware of the natural components in health and personal care products.
- One of the oldest systems of medicine which has gained people's trust over centuries of usage.
- Proactive International Cooperation policies of Ministry of AYUSH, including collaborations with bodies like the WHO

2. Overcoming Obstacles in the Way of a Greater Adoption

Several issues are addressed by the AI-driven method in Ayurveda, including the translation of ancient knowledge into the language of contemporary science. Ayurvedic plant bio actives are mapped into intricate formulations by some of the top brands, such as Nutri hance Diabetes, to produce synergistic effects. Opportunities to switch to Ayurvedic ingredients from standard Nutra substances are made possible by AI.[18,19]

Hands of A.I.

Ayur AI - Dr Bala Pesala is the founder and CEO of Ayur AI, it is the diptych startup. Ayur AI was founded with the intention of transforming Ayurveda using Data-driven frameworks. In order to do this, they apply the principals of Ayurveda, as well as cutting-edge digital

ISSN: 2456-3110 REVIEW ARTICLE November 2024

biomarkers, blood biochemicals, genomic markers, and deep learning & machine learning to provide highly customized Ayurvedic care.[20]

NIWARANA - The nation of Sri Lanka is home to the development of the artificial intelligence-based "NIWARANA" system for traditional medicine. Users will have access to NIWARANA's database of top Ayurvedic physicians who specialize in particular medical fields.[21] Additionally, it gives users access to a chatbot that they can use to communicate with it and locate doctors who are qualified for the condition or damage they are now experiencing.

Discussion

AI has revolutionized Ayurveda, from wellness and preventive healthcare to diagnosis and therapy optimization. a futuristic vision of AI enabling Ayurvedic practitioners to preserve the age-old wisdom of Ayurveda while providing patients with individualized, efficient, and holistic care.

AI can be used to expand the market by significantly improving user experiences. It can also be leveraged to improve economic applications that have a significant impact on cost reduction, revenue growth and asset utilization.

Conclusion

The application of these machine learning models in the domain of *Ayurveda* offers a data-driven and personalized approach to disease treatment. By leveraging large datasets and advanced algorithms, practitioners can enhance the accuracy of diagnosis, develop customized treatment plans, and improve patient outcomes in *Vata*, *Kapha*, and *Pitta* diseases.

The integration of modern technology, particularly artificial intelligence (AI) and machine learning has the potential to revolutionize the practice of *Ayurveda*, The *Ayurveda* Pharmacopoeia of India serves as a reliable resource for ensuring the quality and safety of *Ayurveda* medicines. The rising use of machine learning in Ayurveda aligns with India's push towards integrating technology in healthcare. Continued research and development in this area will further contribute to the advancement and modernization of *Ayurveda*.

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ISSN: 2456-3110 **REVIEW ARTICLE** November 2024

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