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IKS as a pioneer in integrating ancient knowledge with AI

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Abstract

The rapid growth of Artificial Intelligence significantly reformed various industries such as agriculture, healthcare, insurance and widened the boundaries of innovation. But the major challenges that the modern AI systems still encounter are transparency, integrity, sustainability and human-centric design. Indian Knowledge Systems (IKS) based on philosophical and cultural knowledge which offer a rich storehouse of holistic contexts that can address these challenges.

The present study elaborates the significance of the Indian Knowledge System in the progression of modern systems by concentrating on key concepts such as moral responsibility, interconnectedness, logical reasoning and linguistic precision. It also highlights IKS potential to develop the design of context-aware modern AI models. The study further inspects the significant potential of integrating IKS with Artificial Intelligence in various domains such as healthcare, agriculture, natural language processing and decision-making systems.

Furthermore, the paper discusses the AI role in digitizing modern knowledge that generates a synergetic relationship between ancient wisdom and modern innovative technology. The paper accomplishes that integrating IKS with AI can adapt a more sensible and comprehensive technological environment encouraging innovation which is not only progressive but also ethical, sustainable and aligned with human values.

Keywords: Artificial intelligence, Indian knowledge system, traditional knowledge, knowledge representation, machine learning, explainable AI

Introduction

Artificial Intelligence has developed as an important transformative technology in the 21st century. It has inclined various domains such as agriculture, healthcare, insurance and governance. The growth of Artificial Intelligence can be drawn from initially rule based expert systems to modern data driven methodologies which included deep learning and machine learning. These developments have empowered software systems to process enormous data, identify multifaceted patterns & support smart decision making system. Despite computational power, modern Artificial Intelligence system often lacks appropriate understanding and holistic cognitive reasoning.

In analogous, Indian Knowledge System characterizes a diverse body of information established over many centuries. As it is rooted in the skill, observation and theoretical examination, it incorporates manifold disciplines such as mathematics, linguistics, medicine and health wellness practices. Among all of these, Ayurveda suggests an approach which is holistic to health by emphasizing equilibrium among mind, body and environment. Yoga offers a organized context for mental, physical & spiritual welfare. Vedic maths presents effective computational methods that makes complex calculations simpler whereas Sanskrit transcript is categorized by its extremely organized grammar and semantic accuracy that assist as a significant reserve for knowledge illustration.

Despite its relevance, there are various domains of Indian knowledge system that have been utilized in lesser extent in the modern ecosystems due to significant challenges like absence of organized depiction, limited accessibility and lack of digitization. Integrating IKS with AI represents one of the unique opportunities to bridge the gap. AI approaches, particularly Machine Learning, Deep Learning, Natural Language Processing & knowledge representation can be used to digitalize, understand and broadcast ancient knowledge in a scalable manner.

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The necessity for integration of AI & IKS is determined by the two main factors. First factor is the conservation of ancient knowledge is crucial to protect the cultural heritage & to safeguard the significant insights. Second factor is the integrating of AI with IKS can participate to increasing AI interpretability & reasoning. Unlike data-driven AI models, IKS proposes rule-based & context-aware agendas that can

improve transparency in AI systems. Therefore, the convergence of the Indian Knowledge Systems and AI embraces substantial potential for evolving smart and explainable technologies. This kind of amalgamation not only supports the safeguarding of the ancient intelligence but also supplements modern artificial intelligence with human-centric perceptions.

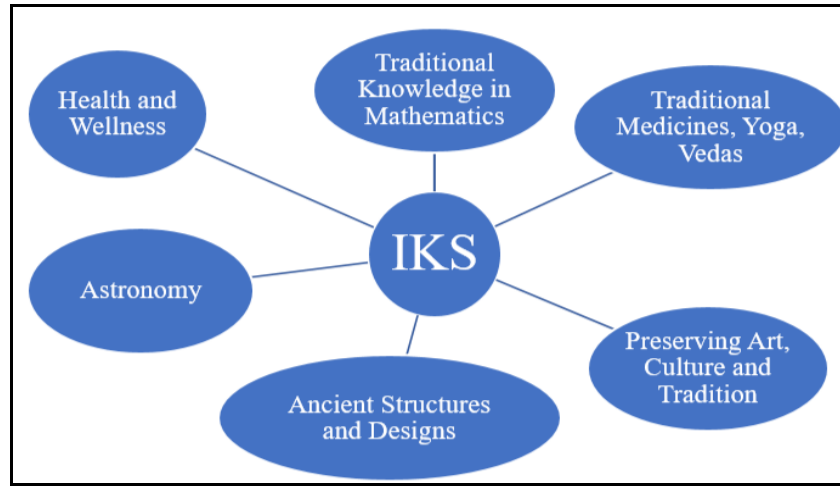


Fig 1: Indian Knowledge System Domains

Literature Review

Following is the literature review table which describes key

contributions, focus area and identified research gaps.

Table 1: Literature Review

Ref. No.	Author(s) & Year	Focus Area	Key Contributions	Research Gaps identified
[1]	Gupta U <i>et al.</i> , 2026	IKS in the Education	Roadmap for the integrating Indian knowledge system into the curriculum as per NEP 2020	Partial AI integration perspective
[2]	Patel & Iyer, 2025	AI in Ayurveda	Artificial Intelligence based healthcare amalgamation and diagnosis support system	Lack of real-life data sets & validation
[3]	Joshi & Pant, 2024	AI + IKS	Artificial Intelligence for eco-friendly awareness using Indian knowledge system principles	Absence of execution frameworks
[4]	Deshpande, 2025	AI + IKS	Conceptual amalgamation of artificial intelligence with Indian knowledge system	No technical model has been given
[5]	Mishra & Kulkarni, 2024	Sanskrit NLP	Usage of Sanskrit grammar in the natural language processing systems	Inadequate tools & annotated corpus
[6]	Lewis <i>et al.</i> , 2024	Indigenous AI	Artificial Intelligence with in indigenous knowledge agendas	Absence of India specific models
[7]	Ramteke, 2024	AI in Education	Effect of artificial intelligence in the Indian academic systems	Weak connection with Indian knowledge system domains
[8]	Sharma & Singh, 2023	AI Ethics	Indian philosophy put to the artificial intelligence governance	lacks AI system implementation
[9]	Yadav, 2023	AI in Education	AI based Gurukul model for the digital learning	Absence of scalable systems
[10]	Verma & Rao, 2023	AI + Epistemology	Compare and contrast of machine learning models with the earliest knowledge systems	Absence of the applied models
[11]	Tripathi & Desai, 2022	Ayurveda + AI	Hybrid ML models for the personalized healthcare	Partial clinical validation
[12]	Singh, 2022	Vedic Mathematics	Improves computational efficacy in the algorithms	Absence of the integration in modern artificial intelligence systems
[13]	Subramanian, 2021	Nyaya Logic	Logical reasoning agenda for artificial intelligence systems	Absence of the ML models implementation
[14]	Nguyen <i>et al.</i> , 2021	AI in the Agriculture	Artificial Intelligence applications in sustainable agriculture	Absence of AI integration with ancient practices
[16]	Abdilla & Fitch, 2016	Indigenous Systems	Pattern thinking in the indigenous knowledge	Partial relevance to Indian knowledge system

Indian Knowledge Systems): An Overview

IKS (Indian Knowledge Systems) denote as the enormous figure of the knowledge which has been established over many centuries in the Indian sub-continent through

experimentation, systematic observation & theoretical study. It incorporates miscellaneous disciplines such as mathematics, arts & science, medicinal studies, linguistics and spirituality.

The scope of Indian Knowledge Systems encompasses beyond academic knowledge to real-time applications in our routine life. It highlights harmony among nature and humans, encouraging balanced growth and well-being. In the modern technology era, IKS offers significant insights for evolving explainable and ethical artificial intelligence systems.

Key Domains of Indian Knowledge Systems

Mathematics (Vedic Mathematics)

Vedic Maths comprises of procedures and sutras which are simplifying multifaceted mathematical calculations. Such methods improve speed of the problem-solving and computational efficacy. Algorithmic nature of such problems make them significant for the modern optimization techniques in artificial intelligence.

Medicine (Ayurveda)

Ayurveda is ancient and also considered as one of the holistic health care system, concentrating on preserving equilibrium among the three doshas i.e. Pitta, Vata & Kapha. It accentuates personalized treatment, protective health care and natural therapies. The organized principles of diagnostic and therapeutic in Ayurveda make it vastly appropriate for the integration with artificial intelligence based decision making supportive systems.

Philosophy (Nyaya and Vedanta)

Nyaya and Vedanta which are the Indian ethical systems, provide frameworks for the logical reasoning & metaphysical inquiry. Nyaya emphasizes on the formal logical system and inference mechanism while Vedanta discovers the nature of realism and mindfulness. Contribution of such systems in the expansion of reasoning-based models and the explainable artificial intelligence.

Linguistics (Sanskrit Grammar)

Sanskrit is a rule-based and extremely systematic language which is governed by the grammatical outlines i.e. Panini's Ashtadhyayi. The accuracy and formal framework of Sanskrit language fabricate it appropriate for Natural Language Processing and computational modelling. Linguistic models based on Sanskrit can contribute to the semantic analysis and knowledge representation in artificial intelligence.

Artificial Intelligence Techniques Relevant to Indian Knowledge Systems

The incorporation of AI with IKS entails various AI techniques which can develop, interpret and characterize ancient knowledge efficiently. Such techniques allow the

conversion of complex and unstructured Indian knowledge system data into structured and suitable formats for smart systems.

Machine Learning

Machine Learning plays a significant role in identifying patterns and providing predictions on the basis of data from Indian knowledge system domains.

Supervised Learning encompasses training models based on the labelled datasets. For example Ayurveda Disease classification, Tailored treatment recommendations etc.

Unsupervised Learning categorizes hidden patterns in the unlabelled data. For example Gathering profiles of the patients on the basis of dosha types, Assembling alike Sanskrit texts etc.

Machine Learning approaches support in mining valuable insights from the ancient knowledge and help providing data driven decision making

Natural Language Processing

Natural Language Processing is important for managing the enormous quantity text data existing in traditional Indian scriptures especially in the regional languages. NLP comprises of natural language understanding and natural language generation. It includes Machine Translation from Sanskrit text into the modern languages, Semantic analysis of scriptures, information retrieval, Text summarization etc.

Knowledge Representation

Knowledge Representation is applied to organize information in a suitable form that computers can understand. Semantic Networks, Frames and Scripts are helpful in maintaining relationships within Indian knowledge system domains.

Expert Systems

Expert system is a computer program designed to act as an expert to solve a problem in particular domain. These are rule based artificial intelligence systems that imitate human expertise in the particular domains. In the Indian knowledge system, Ayurveda expert system can diagnose diseases based on symptoms. An early expert system MYCIN that is used to diagnose bacterial infections and recommend treatment.

Deep Learning

ML subset Deep Learning is used for managing large-scale data. It includes Image recognition for car number plate system, Speech processing for Sanskrit and other languages understanding, Pattern recognition in datasets from medical domain.

DL improves the scalability and AI systems performance applied to the IKS.

Integration Framework for AI and IKS

Data Acquisition	Digitization of ancient texts Collection of domain specific datasets Optical Character Recognition for text mining
Data Preprocessing	Data cleaning and data normalization Machine Language translation Labelling of datasets and annotation
Knowledge Representation	Development of the ontologies for organized knowledge knowledge graphs creation for relationships Encoding rules into machine readable formats
AI Model Development	Natural Language Processing for text understanding ML models for the classification and prediction Deep learning approaches for pattern identification
System Deployment	Web and mobile based apps Decision support systems Education related platforms for Indian knowledge Systems learning
Feedback and Improvement	Continuous learning with the help of user feedback Model refinement and model validation Updating datasets

The amalgamation of AI approaches like ML, Knowledge Representation, NLP, Expert Systems and Deep Learning with IKS offers a robust environment for renovating ancient knowledge into smart and scalable solutions. This amalgamation not only improves the IKS usability but also contributes to the expansion of explainable and responsible AI systems.

Applications of AI in IKS

The integration of AI with IKS has directed to the innovative applications in various domains. AI empowers personalized, scalable and effective solutions by merging ancient knowledge with up-to-date computational approaches.

Healthcare**AI-based Ayurveda Diagnosis Systems**

AI approaches particularly expert systems and deep learning are gradually being utilized to create Ayurveda based diagnostic tools. Such systems evaluate data of the patient such as their symptoms and doshas Pitta, Vata, Kapha to predict seriousness of health conditions. Combination of rule based ESs with data driven ML models improve diagnostic precision by sustaining the ideologies of ancient medicine.

Personalized Treatment Recommendations

Personalized healthcare is one of the essential strengths of Ayurveda. Artificial Intelligence systems can analyse large data sets for recommending personalized treatment plans including medicines, diets and changes in the lifestyle. This technique expands effectiveness of the treatment and aligns with the holistic approach of Indian knowledge System.

Education**Intelligent Tutoring Systems for Vedic Mathematics**

AI enabled smart tutoring systems can provide the learning of Vedic mathematics by adjusting to the level of the learner's understanding. Such systems guide step-by-step solution, immediate feedback and tailored problem sets in order to make complex calculations simpler and engaging.

AI driven Sanskrit Learning Platforms

NLP approaches are utilized to create AI enabled platforms for learning Sanskrit or any other languages. Such systems provide automatic translation approaches, pronunciation assistance, grammar checking process and significant understanding. These tools are helpful in preserving and promoting linguistic heritage by making it available to modern AI learners.

Agriculture**Traditional Farming Practices Enhanced with AI**

Indian ancient agricultural knowledge focuses on sustainability, ecological balance and crop diversity. AI approaches such as predictive analytics essentials and IoT enabled monitoring, can boost these practices by predicting crop yield, optimizing irrigation management and recommending ancient farming techniques. The integration of AI and IKS leads to efficient and sustainable agricultural systems.

Yoga and Wellness**AI-based Posture Detection**

Deep learning models and computer vision techniques are utilized to determine human posture during yoga exercises. Such systems can determine improper postures in the real time and facilitates correct feedback by ensuring effectiveness.

Personalized Yoga Routines

AI enabled applications can recommend personalized yoga routines for health conditions of an individual, lifestyle and fitness level. Amalgamation of user data with the ancient yoga principles, such systems improve mental well-being.

Challenges

Several major challenges hinder implementation despite the potential of integrating AI with IKS. The challenges arise from cultural, technical, linguistic and interdisciplinary complexities.

Data Scarcity and Quality Issues

One of the key challenges in implementing AI to IKS is the absence of high quality datasets. Most of the ancient knowledge is conserved in traditional manuscripts or unstructured formats. These sources includes Incomplete data which is difficult to digitize properly and missing accurate annotation required for the machine learning technique. The lack of standardized data sets restricts the training & validation of models thereby reducing their scalability and reliability.

Language Complexity

A major portion of Indian knowledge system is documented in the Sanskrit Language which is known for its complex structure and rich grammar. While it is extremely systematic, it poses few challenges for Natural Language Processing such as complex morphological variations and restricted accessibility of tools and annotated corpus. Such issues make tasks like semantic analysis, machine translation and text extraction more problematic for the AI systems.

Lack of Standardization

IKS incorporates assorted disciplines with erratic vocabularies and interpretations. The lack of standardized contexts leads to inconsistencies in the representation of knowledge and challenges in combining different IKS domains with modern smart systems. Standardization is mandatory for safeguarding effective knowledge sharing and interoperability.

Ethical Concerns and Cultural Sensitivity

The integration of AI with IKS elevates critical cultural and ethical considerations. Ancient knowledge is deeply entrenched in the spiritual contexts and inappropriate usage may lead to cultural misrepresentation, loss of authenticity and intellectual property concerns.

Integration Complexity

Integrating complexities presents various technical challenges such as trouble in interpreting philosophical knowledge into machine readable formats, Integration of rule based and data driven ML approaches, interdisciplinary expertise requirements across philosophy, linguistics and medicine. Such complexities imposes joint research and advanced AI deep learning models.

Conclusions and Future Directions

The integration of Artificial Intelligence with Indian Knowledge Systems bridges the gap between ancient philosophy and modern AI technological advancements. The present study has emphasized the AI evolution, the theoretical foundations of Indian knowledge systems and the significance of various domains like Yoga, Ayurveda, Sanskrit linguistics and Vedic mathematics. It has explored several AI approaches including deep learning, machine learning Natural Language Processing, expert systems and knowledge representation that aids the efficient IKS utilization in modern applications. Additionally, the present study analysed applications across agriculture, healthcare, education and mental wellness signifying the AI potential to enhance accessibility and efficiency. The study also recognized major challenges like lack of standardization, linguistic complexity, data scarcity and ethical concerns

which must be addressed fully to accomplish the potential.

The future of integrating AI with IKS is in progressing both interdisciplinary and technological efforts. The key focus must be on the large scale structured and annotated data sets advancements especially in Ayurveda & Sanskrit domains to empower effectiveness in the training of the AI models. Moreover, there is a necessity to design a hybrid systems that associate symbolic reasoning from ancient knowledge with data driven ML techniques thereby improving performance.

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