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24. Indian Knowledge System: The Guiding Light for the Ethical Use of AI for the Detection of Alzheimer's Disease

Khushboo Rani[1], Md. Irfan Alam[2]
[1]Research Scholar, Jharkhand Rai University, Ranchi, Jharkhand, India
[2]Associate Professor, Jharkhand Rai University, Ranchi, Jharkhand, India
[1]khushboo20rani@gmail.com, [2]irfan2.alam2@gmail.com

Abstract:

Indian Knowledge System (IKS) consists of Gyan (knowledge), Vigyan (science), and Jeevan Darshan (philosophy). The fundamental elements include astronomy, medicine, engineering mathematics, philosophy, law, justice yoga, and conservation. These elements are governed (operated) by the core guiding principles of Parampara (tradition and wisdom), Dristi (perspective), Laukik Prayojan (pragmatic approach). Artificial Intelligence (AI) is still in its initial stage and has much development potential. AI serves an essential role in Alzheimer's disease detection. Its algorithms can detect minute structural alterations in the brain. changes in the brain structure. It can assess the cognitive condition and genetic data of the subject also. These developments in the detection of AD using AI should be guided by the principals of the IKS. Ethical considerations about deployment of technology for Alzheimer's detection should be made. These ethical considerations can be derived from the fundamental ideas of the IKS: Conservation, Karma, Integrity, Equity, and Inclusion. It will provide a guiding light for the inclusive and sustainable use of AI for the thriving of humanity.

Keywords*:* Indian Knowledge System, Artificial Intelligence, Alzheimer's Disease, Ethical Considerations, Healthcare

1. Introduction

Embedded in ancient Indian philosophy, literature, ethics, and sciences, and holistic understanding of human well-being, the Indian Knowledge System, offers the guiding principles for the ethical advancement and use of Artificial Intelligence. IKS offers wisdom for an enriched and human-oriented AI model for Alzheimer's disease (AD) detection which is sustainable, responsible and respects human dignity.

2. Objective

The objective aims to examine how the Indian Knowledge System can act as a guiding framework for the moral use of AI in the detection of Alzheimer's disease.

3. Literature Review

The Vedic books, which are among the oldest scriptures in the world, form the basis of the IKS. They help understanding the Indian way of life and contain a wealth of information on topics ranging from politics, astronomy, medicine, and mathematics to philosophy and spirituality. The significance of harmony, unity, and balance in society is particularly emphasized by the IKS (education.gov.in, 2023).

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As per (Mundhe, 2023), IKS provides a holistic approach towards life. It emphasizes the harmony in all form of existence: individuals and society, human beings and nature, the physical and the spiritual. This harmony is reflected in various Indian practices, such as Ayurveda, Yoga, and Vastu Shastra. Dharma (duty) lies at the centre of Indian spirituality. It recognizes the significance of leading a moral life and carrying out one's obligations to the cosmos, society, and oneself (Senapaty, 2018).

Attempts have been made to employ AI technologies to detect the cases of Alzheimer's disease. Based on MRI images, (Chu *et al*., 2012) attempted to find patterns which will clearly distinguish AD subjects from healthy controls and to describe the dissimilarity among mild cognitive impairment subjects and healthy controls. A deep learning framework which discriminates the MCI and AD with a single cross-sectional brain MRI was utilized (Basaia *et al.,* 2019). Deep learning was used to simulate the facial expressions of the patients, and the findings indicate that the facial expressions of delirious and non-delirious people varied significantly (Davoudi *et al.,* 2019). The diagnosis and early identification of AD were also aided by less intrusive tests like brain imaging and electroencephalograms; however, the outcomes are not yet on par with more invasive tests (Weller et al., 2018).

The first international agreement on AI ethics was adopted by UNESCO member nations in 2021. This recommendation focuses on the moral issues related to artificial intelligence, proposing a framework of interconnected values, principles, and actions that can assist societies in responsibly navigating both the known and unknown consequences of AI technologies. Furthermore, it views ethics as a fluid foundation for the normative assessment and direction of AI technologies, emphasizing human dignity, well-being and harm prevention as guiding principles, which are grounded in the ethics of science and technology.

While in India, the implementation of AI is frequently aimed at enhancing access, quality and efficiency, various risks and uncertainties pertinent to its use have also surfaced in multiple domains. If these challenges are not addressed with due diligence, they could lead to considerable adverse social and economic consequences (Bhalla et al., 2023).

Promoting prosperity is characterized by the advancement of the collective welfare, contributing positively to society, and considering the interests of all stakeholders involved (Vidgen *et al*., 2020). This ethical consideration is examined with the perspective of utilitarianism and the common good, emphasizing that the development of AI should serve the humanity (Wright *et al*., 2018). The focus is on access, consent, and individual rights with regard to personal information in the era of big data and widespread surveillance, and how this data is utilized is not made clear when consent is given (Urquhart *et al*., 2019).

AI programming is done by people, predominately men, operating within the Western scientific worldview, and their biases and notions of ethics and wisdom come through in their programming (Weidenbener, 2019).

4. Methodology

4.1. Uncovering Indian Knowledge System and its core principles

Indian Knowledge System, dating back thousands of years, is a knowledge tradition reflecting a unique fusion of spiritual and pragmatic wisdom and has influenced cultures

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across the world and especially in the Indian subcontinent. IKS is a rich collection of belief, practice and philosophies that have roots in the ancient India. It has deeply influenced the bonds and ties among different factions of the society. It helped foster essence of community and belongingness while also preserving a sense of individuality and uniqueness.

Vedas contains vast knowledge of medicine, astronomy, politics, governance, spirituality and philosophy. This scripture of IKS is in the four Vedas: Rigveda, Samaveda, Yajurveda, Atharvaveda. The ancient Vedic scriptures depict the understanding of astronomy, in Calendar systems and celestial bodies.

IKS provides a holistic approach of the subjects showing the dichotomy in the existence of the subjects in nature. It covers the internal and external (Ghar and Bahar), ying and yang, masculine and feminine, dark and light, facets of life. This entirety in the coverage is present in seen in the Indian practices of Ayurveda, Yoga and Vastu Sastra. These practices reflect harmony and equilibrium in the nature.

IKS emphasizes a set of ethical guidelines and values integrated in the Indian culture, traditions and philosophies. Some core values of IKS are Drishti (Perspective), Ahimsa (Non-Harm), Dharma (Righteousness), Atma Jnana and Samman (Autonomy and Dignity), Laukik Prayojana (Pragmatism), Vasudhaiva Kutumbakam (Inclusive development and Community), Equilibrium and Balance, Karma, Parivartan and Vidya (Continuous Learning and Adaptation).

4.2. Understanding Artificial Intelligence

"Developed and developing societies increasingly emphasize productivity and utility, which has turned knowledge into nothing more than productive information" (Miguel, 2002)

AI is the simulation of human intelligence by machines. Key components of AI include learning, reasoning, perception, language understanding and the ability to acquire information and skills through experience. Categories of AI are: (1) Narrow AI: It is the most common type of AI designed to perform a specific task. It operates under a set of constraints. (2) General AI: It is a form of AI which can learn, comprehend and apply knowledge to perform a vast range of tasks. It is still a theoretical concept.

Alzheimer's disease is commonly detected using machine learning and deep learning which is subset of AI.

Artificial Intelligence is a rapidly evolving field possessing the capacity to change various aspects of life and work. While it offers numerous benefits, it also raises important ethical and regulatory challenges that must be addressed as the technology continues to develop. Challenges pertaining to AI include bias, discrimination, transparency and regulation.

4.3. Examining the significance of AI in Healthcare

AI, with deep learning and machine learning, is creating a paradigm shift in every industry. One such industry getting impacted deeply is health care.

AI algorithms, particularly those using deep learning, can analyse complex imaging data, like CT scans, X-rays and MRIs, to detect ailments such as Alzheimer's disease, cardiovascular issues, and neurological disorders. AI can provide assistance in identifying patterns in tissue samples to diagnose diseases like cancer. This will lead to the reduction of risk of human error and enable faster diagnosis.

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Using patient data, AI can be used in identifying patients with Alzheimer's and Parkinson's at early stage. These insights help in implementing preventive measures. AI can be used in preparing personalized treatment plans by analysing the patient's genetic information, and medical history.

Virtual assistants and chatbots provide 24/7 support to patients, offering guidance, answering basic health questions, and reminding them about medication schedules. AI can manage patient queries and screen for initial symptoms thereby enhancing accessibility to healthcare and reducing the load on hospitals. Moreover, Artificial intelligence tools are being developed to detect signs of mental disorders by analysing voice patterns, facial expressions, and even social media activity which can help in detecting conditions like depression and anxiety in their early stage.

Challenges and Considerations of using AI in healthcare include privacy, security, bias, integration, adoption, regulatory and ethical issues.

The amalgamation of AI and Healthcare has created a new era of opportunities and challenges with life changing effect on diagnosis of diseases. For our study we are examining the detection of AD using AI.

4.4. Alzheimer's Disease and challenges in its detection

Alzheimer's disease is a neurological disease which affects the cognitive function. It is a kind of dementia that develops gradually overtime mainly affecting older people. The key features comprise of cognitive decline, confusion and changes in behaviour. Alzheimer's affects a person's ability to perform daily tasks and maintain independence

Although the exact cause is unknown, Alzheimer's disease is associated with the accumulation of two abnormal proteins in the brain: beta-amyloid plaques and tau tangles. These disrupt communication between neurons and ultimately lead to brain cell death. The levels of beta-amyloid and tau in the Cerebrospinal fluid are among the first indicators used to detect Alzheimer's disease (Narayanan *et al*., 2019). Genetics, age, head injuries, environmental factors and lifestyle factors may contribute to its onset. Alzheimer's is diagnosed through a combination of medical history, neurological exams, cognitive tests, and brain imaging.

Alzheimer's disease progresses from mild symptoms (like forgetting names) to severe impairment (inability to recognize loved ones, communicate, or care for oneself). Late-stage AD, characterised by significant memory loss, difficulty moving, weight loss, and loss of speech, require full time care of the patients.

Currently, there is no cure for Alzheimer's disease, but treatments focus on managing symptoms. At present, researchers are looking into potential treatments that target the underlying causes of the disease, including drugs to clear amyloid plaques.

Alzheimer's disease impacts millions worldwide, with a profound effect on both individuals and families. Support from caregivers, memory care programs, and Alzheimer's support organizations is crucial in helping those affected navigate this challenging condition.

4.5. Leveraging the advancement in Artificial intelligence in the detection of Alzheimer's disease

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AI can interpret clinical images such as MRIs and PET scans to identify biomarkers related to AD, such as neurofibrillary tangles and amyloid plaques. Most of the time, human radiologists fail to detect these patterns, especially in early stages. AI models can detect abnormal levels of tau protein and amyloid beta in these fluids, aiding in diagnosis and disease staging. This is crucial, as early intervention can slow the disease's progression.

Natural Language Processing models analyse spoken and written language patterns in patients to identify early symptoms of cognitive decline. Changes in syntax, vocabulary, and coherence can be indicators of Alzheimer's. Devices equipped with AI can monitor changes in movement patterns, speech, sleep, and other daily behaviours. Subtle changes detected by these tools may indicate cognitive decline before it's noticeable to family or clinicians

AI is paving the way for earlier and more accurate diagnosis and better understanding of Alzheimer's progression However, widespread application of AI models in clinical practice demands overcoming technical, ethical, and regulatory challenges. As technology evolves, AI holds promising potential to change the trajectory of Alzheimer's disease management, enabling proactive and personalized care.

Here, we described the Indian Knowledge System, understood the significance of AI in healthcare sector, especially in the identification of AD. Now, we will discuss how the IKS can act as the doctrine for deriving the ethical guidelines for application of AI in the detection of AD.

4.6. Using Indian Knowledge System as the guiding light for the ethical use of Artificial Intelligence in the detection of AD

"Those who think ethics is irrelevant to their work because they are not responsible for how their creations are used, and those who think that because they are very knowledgeable about engineering, they are also very knowledgeable about ethics and able to make ethics decisions for everyone regarding their creations" (Kim *et al*., 2019).

IKS emphasizes principles that could help shape AI towards a sustainable, inclusive, and humane outcome. The moral consideration of AI in detecting Alzheimer's disease can be guided by the principles of IKS, which emphasizes holistic well-being, empathy, and the interconnectedness of all life. Drawing from these values, AI solutions can be developed to respect patients' dignity, privacy, and autonomy while striving for the highest standards of care and accuracy. The set of guidelines outlined by the IKS are discussed below:

1. Knowledge (Gyan)

Indian Knowledge System views knowledge as fusion of both science and wisdom. This holistic approach encourages us to see AI beyond technical capabilities, considering its impacts on humanity and well-being.

AI in Alzheimer's detection should prioritize the overall well-being of the patient and their environment, not merely the technical detection of disease. AI models could consider factors such as emotional support, mental peace, and well being in addition to diagnosis accuracy.

2. Harmless (Ahimsa) and Responsible Use

The principle of Ahimsa teaches the importance of minimizing harm. In AI, this means responsible data usage, avoiding discriminatory practices, and reducing harm to individuals and communities. Ahimsa could help AI developers prioritize human welfare.

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In Alzheimer's detection, the Ahimsa principle means that AI should avoid false results (positives or negative) that could cause emotional distress or misdirected treatments.

3. Righteousness and Morality (Dharma)

Dharma represents duty, righteousness, and moral order. AI technology inspired by the principle of Dharma would prioritize ethical use resources and avoid activities that disrupt societal harmony, such as surveillance, deepfake and misinformation

Developers should ensure the detection technology is transparent, non-discriminatory, and developed with a commitment to patient safety. Discourage over-reliance on AI diagnoses without human involvement and emphasise the significance of using AI in ways that would benefit patients.

4. Autonomy and Dignity (Atma-Jnana and Samman)

The Indian Knowledge System respects the individual's autonomy, dignity, and inner wisdom.

AI technologies should be developed to preserve the dignity of Alzheimer's patients, respecting their privacy, choices, and autonomy in care decisions. Using data sensitively and ensuring that AI recommendations empower patients and caregivers, aligns with this principle.

5. Pragmatism (Laukik Prayojana)

The principle of pragmatism emphasizes using common sense and adaptability, where solutions are tested and refined for practicality and effectiveness.

AI should be implemented in an effective and accessible way. This involves low-cost and adaptable AI technologies which could be accessed by the rural or impoverished patients where traditional diagnostic tools are limited.

6. Inclusivity and Diversity (Vasudhaiva Kutumbakam)

The idea of Vasudhaiva Kutumbakam could encourage inclusivity and diversity in the datasets. AI applications that are sensitive to the different values, languages, and social norms worldwide.

AI technologies for Alzheimer's detection should be accessible and designed inclusively, benefiting diverse communities and ensuring equitable access.

7. Balance and Harmony (Santulan)

This principle suggests that the advancement in technologies don't overwhelm human life but rather harmonize with it. It means limiting automation, respecting privacy, and emphasizing human-centric AI design.

8. Karma and Accountability

Karma (The principle of cause and effect) can guide AI toward greater accountability. The principle of Karma emphasizes that all the actions have consequences. AI development would include mechanisms emphasizing transparency and responsibility among developers and researchers.

9. Human Flourishing, Continuous Learning (Parivartan and Vidya)

Knowledge in the Indian system is seen as a continuous, dynamic process. This implies guiding technologies to support human well-being, social good and individual growth rather than pure economic gain.

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AI technologies should be developed with adaptive algorithms that evolve with new patient data. This adaptability ensures that AI remains relevant and effective in future.

5. Conclusion

The fusion of ancient wisdom and modern technology offers a holistic and ethical approach to tackling one of the most challenging health issues. By incorporating the principles guided by IKS, the use of AI technologies in the detection of the Alzheimer's disease can become models of ethical advancement reflecting the commitment towards benefit of the humanity. The Indian Knowledge System provides a rich, ethical framework which has the potential to change the direction of the advancement in AI technologies. The technology can be guided to support human values, promote social harmony, and create a future where technology is a responsible aid to humanity.

6. Future Scope

Upcoming research should concentrate on enhancing frameworks for resolving moral dilemmas, establishing standardized processes, and investigating the long-term societal impacts.

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