A multi-faceted approach to improve Alzheimer's diagnosis
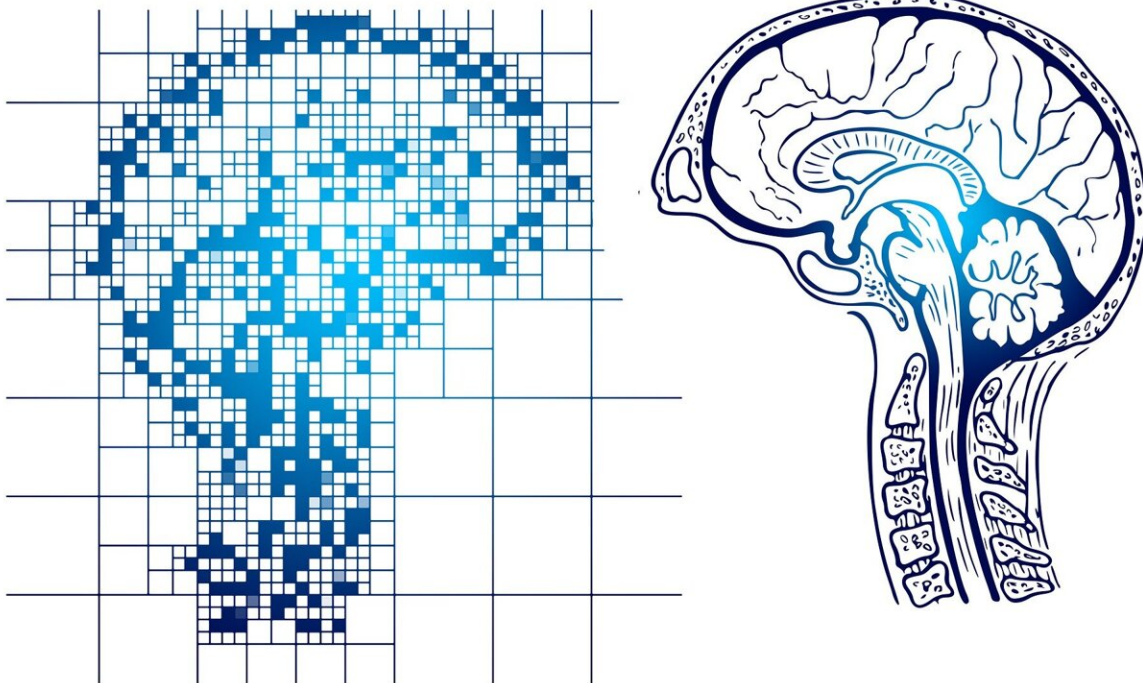
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A review in the *International Journal of Medical Engineering and Informatics* has surveyed current early detection methods for Alzheimer's disease, a prevalent neurodegenerative condition affecting

millions of people worldwide.

The work looks into the progression, causes, and diagnosis of Alzheimer's and emphasizes that a multi-modal approach coupled with advanced machine learning techniques could lead to much earlier diagnosis for many patients. Early diagnosis offers better options for planning and ongoing care. As the world population continues to age, the burden of Alzheimer's disease looms larger than ever.

Alzheimer's disease is a neurodegenerative disorder characterized by cognitive impairment and memory loss. Its precise cause is not clear although there are characteristic changes in the brain that are always present and usually observed post mortem. The disease thus presents a significant challenge in its early detection when behavioral symptoms might be mild or may well be similar to those symptoms seen in a range of other conditions.

There is no cure for this debilitating and ultimately lethal condition but the importance of detecting it in its early stages cannot be overstated given the devastating impact it has on the patient and those caring for them. Early diagnosis not only allows individuals to communicate their needs to loved ones but also empowers them to make crucial decisions regarding finances and legal matters that will come into play as the disease progresses.

While a definitive scientific diagnosis is really only possible post mortem, a combination of observations of behavior as well as brain scans can give the clinicians a near-certain diagnosis once symptoms are established. C.R. Nagarathna and Kusuma Mohanchandra of the Dayananda Sagar Academy of Technology and Management in Bangalore, India, suggest from their review, that a combination of techniques will offer a more reliable diagnosis than any single method. They add that utilizing machine learning tools could now enhance the

data from various types of brain scan and couple those results with the observations made by an expert diagnostician in the field.

Alzheimer's is a complex disease with a range of putative causes and manifestations. Indeed, the conventional wisdom regarding the role of errant proteins in the brain has not yet been settled. One scientific camp sees protein fragments as causing damage to the brain whereas the other camp suggests the errant proteins are a symptom of an underlying disease process and not causative agents themselves. Whatever the etiology, early diagnosis is key to improving life for patients and their caregivers.

Early diagnosis also offers greater hope as new therapies begin to emerge from the laboratory. An earlier intervention will almost always be preferred with the potential to slow degeneration and mitigate symptoms. There is always the hope that in the distant future a therapeutic will be designed that might even halt or reverse the disease.

More information: C.R. Nagarathna et al, An overview of early detection of Alzheimer's disease, *International Journal of Medical Engineering and Informatics* (2023). DOI: 10.1504/IJMEI.2023.133091