Chapter 9
Early Detection of Alzheimer's Using Artificial Intelligence for Effective Emotional Support Systems

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ABSTRACT

The prominence of technological progress is evident only when its fruits reaching the society. Any disruptive technology has such a profound effect; artificial intelligence is not an exception. This chapter highlights one such technological impact for the benefit of mankind. Alzheimer's is a known neurological illness, sometimes leading to terminal stage of human life. The treatment becomes complicated when diagnosis takes place at a later stage of the disease. The prognosis and diagnosis, if supported by a technology such as artificial intelligence, will be made better by delaying the disease progression. In this chapter, machine learning algorithms such as random forest, cross validation method is used to analyze, train, and predict Alzheimer's disease and its progression. This in turn helps in improving the emotional support system to the patients. Several research groups are working on this domain, and here the insights provided are going to be more significant and useful for further investigations.

1. INTRODUCTION

"Health is Wealth "is a universal truth. A healthy mind and body can do wonders in one's life time. But life is very uncertain at times, it throws unforeseen challenges. If this challenge is a terminal illness, the fight becomes much tougher. Technology intervention in such cases is much sought to make this battle better. In this chapter of the book, one such close battle that becomes better for the mankind is discussed vividly. The real essence of human evolution shall be celebrated when the achievements related to our safe existence is promised. The nexus between healthcare and technology has become so clear and significant in the recent past.

Whenever world found a disruptive technology's arrival, the impact in various fields is becoming an interesting aspect for research circles. Artificial intelligence (AI) is one such technology that research groups across the globe is enthusiastic. The usage of in spectrum of fields is exponentially increasing year by year. In the post-pandemic scenario the urge for this surge has become more in healthcare industry. Researchers are working on a specific case of "Alzheimer's Disease" prediction using AI. In this chapter of the book, an attempt has been made to provide more insights on the research gaps, analysis, interpretations, investigations and future prospects. The reading of this topic will be more useful for early researchers, techno-groups and enthusiastic academicians.

Alzheimer's disease (AD) is a form of dementia. The share of this AD is around 70% in dementia related cases as stated by World Health Organization. This is a brain disorder that leads to malfunctioning of a person's daily activity. AD pathogenesis is believed due to the overproduction of amyloid-β and hyperphosphorylation of tau protein. There are several stages in AD's progress; cognitive normal (CN), Mild cognitive impairment (MCI), Late Mild cognitive impairment (LMCI), and Alzheimer's disease (AD).

Lifestyle for Brain Health (LIBRA) index assesses the AD's risk factors. There are few risk factors mentioned related to the development of dementia, those include, age, severe diabetic condition, smoking, higher blood pressure, alcohol abuse and physical inertia. Obesity and social isolation also mentioned as other possible reasons. Even though dementia related with age is a common phenomenon but necessarily occurring for above 65 years population, AD is a specific case.

Alzheimer's is precarious because it is often leads to termination of life, if not recognized early. Some of the symptoms include loss of recent events memory, misplacement of belongings, fuzzy walking, often losing the destinations, confusion, non-familiarity of places, misjudgment in visual distances, difficulty in performing regular tasks, inability to make decisions and searching for words in common conversations. Any early intervention in finding this disease helps in prolonging the progression of the disease.

As per a study of Centers for Disease Control and Prevention (CDC), nearly 7 million people in the USA have Alzheimer's. In other parts of the world also AD effected people number is increasing, in India dementia prevalence for adults ages above 60 is 7.4% as per a survey by Jinkook Lee and group in 2023. Aforementioned statistics insists on the early detection of AD patients that may help in strengthening the emotional support system.

Socio-economic implications of AD needs more research attention. Psychological factors, emotional balance and health of caretakers needs more focused analysis, research and thorough investigations. Alzheimer's disease early detection, prognosis-diagnosis, emotional support system reduces the progression of the disease, as there is no permanent cure found in many cases so far. In this context, a novel perspective is proposed here in terms of 3D model approach.

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