

Chapter 4

Artificial Intelligence and Machine Learning Models for Alzheimer's Disease

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ABSTRACT

Alzheimer's disease is a brain disorder that slowly destroys memory and thinking skills and, eventually, the ability to carry out the simplest tasks. In most people with the disease, those with the late-onset type symptoms first appear in their mid-60s. Early-onset Alzheimer's occurs between a person's 30s and mid-60s and is very rare. Alzheimer's disease is the most common cause of dementia among older adults. Early diagnosis of Alzheimer's disease is essential for the progress of more prevailing treatments. Machine learning (ML), a branch of artificial intelligence, employs a variety of probabilistic and optimization techniques that permits PCs to gain from vast and complex datasets. As a result, researchers focus on using machine learning frequently for diagnosis of early stages of Alzheimer's disease. This project presents a review, analysis and critical evaluation of the recent work done for the early detection of Alzheimer's disease using ML techniques.

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INTRODUCTION

Background on Alzheimer's Disease

Alzheimer's is a neurological disorder that is responsible for the gradual damage of the brain cells which leads to serious issues like memory loss, low functioning, and behavioural changes. This condition leads to the most frequent cause of dementia, which is a term that describes a decrease in mental ability affecting daily life routine. This disease was first discovered by Doctor Alois Alzheimer, in 1906, who identified several abnormal clumps along with tangled bundles of fibres in the brain tissue of a human who then died due to an unknown mental illness. These clumps and tangles, which are the primary indicators of this disease are now known as amyloid plaques and neurofibrillary tangles. Further adding, the lost connections found between neurons in the brain is another significant characteristic leading this disorder. Neurons are responsible to carry these messages and signals to different parts of the body from our human brain.

Alzheimer's disease has affected 5 million people and more according to recent researches in the United States yearly and it is expected to increase with the growth in the population. Though the main cause of this ailment is yet to be fully understood, according to the researches it is thought to result from a combination of factors including genetics, environment, along with lifestyle. Development of Alzheimer's disease is associated with age, congenital genes, high blood pressure, cholesterol, as well as head injury. Alzheimer's progression is basically classified into three stages: mild, moderate, and excess. Memory loss as well as difficulty with language and problem-solving are usual in the mild stage, while trouble with daily activities, personality, and behaviour changes may occur in the moderate stage. Lastly, in the severe or excess stage, patients tend to require complete care from others i.e. they become dependent on others and may even lose the ability to do basic things (Boschetti et al., 2018).

Alzheimer's disease, a state where abnormal proteins get assembled up in the brain, causing damage to brain cells, which in due course results in cognitive function loss and in worst cases death also. The initial symptoms of Alzheimer's include inconvenience in recalling recent events, language impairment, mood and behaviour changes, and may even face problems in performing one's basic duties like eating or dressing (Jain et al., 2018). In the far stages of this disease, one may experience more severe memory loss, confusion, and may feel hard to do daily activities. Although a cure for Alzheimer's is not yet available, but there exists treatments and medications from the latest research that can help manage symptoms and slow down the progression of this disease. To investigate the root causes of Alzheimer's with a view to add to more effective treatments and eventually finding a cure we have several studies ongoing. (Sah, Bhadula, et al., 2018).

Overview of AI and ML Models

Alzheimer's disease is degenerative and irreversible brain condition that impacts memory, cognition, and conduct. At present, there is no definitive recognition or remedy available for this disease. Artificial intelligence and machine learning models are being utilized by the researchers which will help to create new diagnostic tools and improve their understanding of the disease. AI by helping with analysis and research has altered the way data is analysed and utilized, and it keeps the potential to bring a big and a

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