Chapter 16
DL-EDAD Deep Learning Approach to Early Detection for Alzheimer's Disease Using E-GKFCM

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ABSTRACT

In Alzheimer's disease (AD), memory and cognitive abilities deteriorate, affecting the capacity to do basic activities. In and around brain cells, aberrant amyloid and tau protein accumulation is believed to cause it. Amyloid deposits create plaques surrounding brain cells, whereas tau deposits form tangles inside brain cells. The plagues and tangles harm healthy brain cells, causing shrinkage. This damage seems to be occurring in the hippocampus, a brain region involved in memory formation. There are presently no methods that provide the most accurate outcomes. The current techniques do not identify AD early. The proposed DL-EDAD method achieves excellent clustering using CNN with E-GKFCM (enhanced gaussian kernel fuzzy c-means clustering). The E-GKFCM utilizes an elbow method to determine the number of clusters in a dataset. Unlike other medical pictures, brain scans are extremely sensitive.

INTRODUCTION

One of the most essential parts of the body is the brain. The brain controls and facilitates all the actions and reactions that allow individuals to speculate and perceive. It also helps to reinforce the memory, and concepts are also strengthened due to it (Armstrong, Nugent & Moore, 2009). AD is an unrepairable and progressive brain dysfunction. Every four seconds, a new case of Alzheimer's disease is discovered throughout the globe. The memory cells are ripped apart gradually, causing people to lose their ability

to think clearly. It's a neurodegenerative disorder that may lead to neuronal dysfunction or even death. After an Alzheimer's diagnosis, the usual life expectancy is between four and eight years (Coppola, Kowtko, Yamagata, Joyce, 2013).

One in ten individuals over the age of 65 has this disease on average, although it may strike at any age and is seen in various young age individuals. Alzheimer's disease is the most common form of dementia among the elderly. Cognitive abilities crucial for everyday activities are diminished in patients with Alzheimer's disease (AD). Plaques and tangles form in the brain due to this condition, and cells in the brain are damaged or killed. After her death, several clumps were found in her brain, which the doctor discovered when examining her brain. These were shown to be the primary cause of this disease (Khan & Usman, 2015). In doing so, they disrupted the brain's ability to communicate with other parts of the body. As a result, regular duties like driving, cooking, and cleaning are difficult for those with this condition. A person who has Alzheimer's disease may have difficulty remembering names, misplacing important possessions, and difficulty organizing their daily activities (Sandhya, Babu Kande & Savithri, 2017). Alzheimer's disease's intermediate stage lasts the longest and is exemplified by disposition shifts, confusion, impulsiveness, little attention periods, and difficulty identifying objects. At this point, things are at their worst (Udupa & Herman, 2000).

Figure 1. Representation of a Normal Brain and. Alzheimer affected Brain
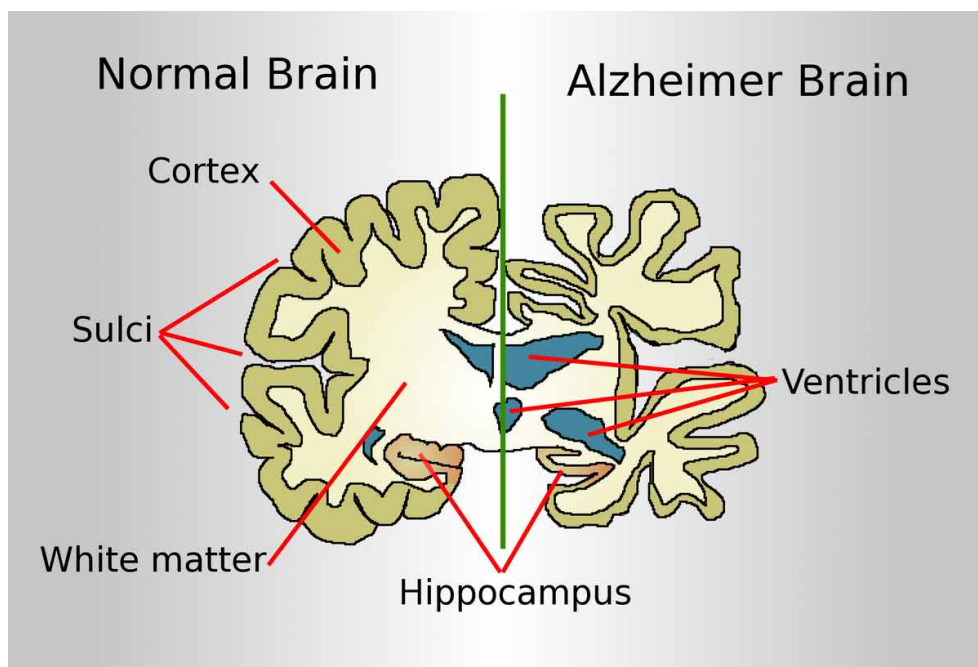
Artificial Intelligence (AI) comprises a wide range of algorithms and approaches, including genetic algorithms (Gordillo, Montseny & Sobrevilla, 2013; Jean, Kowtko, Yamagata & Joyce, 2013), neural networks (Khan & Usman, 2015), and evolutionary algorithms (Thakare & Pawar, 2016). Computers may "learn" from recorded data sets with the help of machine learning (ML), a branch of artificial

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