Abstract

Alzheimer's disease (AD) is a type of neuronal brain disorder that is degenerative and results in memory loss, skills and cognitive changes. The primary diagnostic tests for the disorder are defined to be total brain atrophy and hippocampal atrophy. Early diagnosis is significant and the design of automatic systems is necessary for this disorder. A potential biomarker for AD is described using a hippocampal magnetic resonance imaging volumetry system that possesses certain limitations. This paper aims to analyze the transition of stages from normal cognition to different forms that ultimately leads to Alzheimer's disease. The magnetic resonance imaging (MRI) images of different stages are derived from the standard database for the segregation of hippocampal region. Later, the morphological and radiomic features are extracted from the hippocampal regions of different stages, since the hippocampus plays a major role in memory. Classification of extracted features was performed using machine learning algorithms like ensemble tree classifiers. The classification results based on performance parameters specify that the bagged tree classifier is more efficient. The 4-way classification has an accuracy of 95.6% indicating certain misclassification between the two classes MCI and PMCI. To categorize these two classes, a 2-way classification is described that has an accuracy of 98.6%. With these results, an effective method is defined for the analysis and identification of the different progressive stages of Alzheimer's disease.

Keywords: Hippocampal atrophy ▪ Progressive mild cognitive impairment ▪ Seeded region growing ▪ Radiomic features ▪ Random forest