

# Classification of Alzheimer and MCI Phenotypes on MRI Data Using SVM

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**Abstract.** Alzheimer disease (AD) is a common form of dementia affecting people older than the age of 65. Moreover, AD is commonly diagnosed by behavioural paradigms, cognitive tests, and is followed by brain scans. Computer Aided Diagnosis (CAD), applies medical imaging and machine learning algorithms, to aid in the early diagnosis of Alzheimer's severity and advancement from prodromal stages i.e. Mild Cognitive Impairment (MCI) to diagnosed Alzheimer's disease. In this work, SVM (support vector machine) is used for dementia stage classification. Anatomical structures of the brain were obtained from FreeSurfer's processing of structural Magnetic Resonance Imaging (MRI) data and is utilized for as features for SVM. To be more precise, the system is processed using T1-weighted brain MRI datasets consisting of: 150 mild cognitive impairment (MCI) patients, 80 AD patients and 130 normal controls (NC) obtained from Alzheimer Disease Neuroimaging Initiative (ADNI) database. The volumes of brain structures (hippocampus, medial temporal lobe, whole brain, ventricular, cortical grey matter, entorhinal cortex and fusiform) are employed as biomarkers for multi-class classification of AD, MCI, and NC.

**Keywords:** Alzheimer disease · Mild cognitive impairment · Normal control · Structural magnetic resonance imaging · FreeSurfer · Machine learning · SVM

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Alzheimer's Disease Neuroimaging Initiative-Data used in preparation of this article were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database ([adni.loni.usc.edu](http://adni.loni.usc.edu)). As such, the investigators within the ADNI contributed to the design and implementation of ADNI and/or provided data but did not participate in analysis or writing of this report. A complete listing of ADNI investigators can be found at: [http://adni.loni.usc.edu/wp-content/uploads/how\\_to\\_apply/ADNI\\_Acknowledgement\\_List.pdf](http://adni.loni.usc.edu/wp-content/uploads/how_to_apply/ADNI_Acknowledgement_List.pdf).