عنوان مقاله:

Early Detection of Alzheimer's Disease Based on Clinical Trials, Three-Dimensional Imaging Data, and Personal Information Using Autoencoders

محل انتشار:

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خلاصه مقاله:

Background: A timely diagnosis of Alzheimer's disease (AD) is crucial to obtain more practical treatments. In this article, a novel approach using Auto-Encoder Neural Networks (AENN) for early detection of AD was proposed. Method: The proposed method mainly deals with the classification of multimodal data and the imputation of missing data. The data under study involve the MiniMental State Examination, magnetic resonance imaging, positron emission tomography, cerebrospinal fluid data, and personal information. Natural logarithm was used for normalizing the data. The Auto-Encoder Neural Networks was used for imputing missing data. Principal component analysis algorithm was used for reducing dimensionality of data. Support Vector Machine (SVM) was used as classifier. The proposed method was evaluated using Alzheimer's Disease Neuroimaging Initiative (ADNI) database. Then, ۱۰fold crossvalidation was used to audit the detection accuracy of the method. Results: The effectiveness of the proposed approach was studied under several scenarios considering ۷۰۵ cases of ADNI database. In three binary classification problems, that is AD vs. normal controls (NCs), mild cognitive impairment (MCI) vs. NC, and MCI vs. AD, we obtained the accuracies of ۹۵.۵۷%, ۸۳.۰۱%, and ۷۸.۶۷%, respectively. Conclusion: Experimental results revealed that the proposed method significantly outperformed most of the stateoftheart methods.

کلمات کلیدی:

Alzheimer's disease, autoencoders, cerebrospinal fluid, early detection, magnetic resonance imaging, Mini-Mental State Examination, missing data, positron emission tomography