Multimodal Alzheimer Diagnosis Using Instance-Based Data Representation and Multiple Kernel Learning

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Abstract

In biomarker-based Alzheimer diagnostic problems, the combination of different sources of information (modalities) as is a challenging task. Often, the simple data combination lacks diagnostic improvement due to neglecting the correlation among modalities. To deal with this issue, we introduce an approach to discriminate healthy control subjects, mild cognitive impairment patients, and Alzheimer's patients from the neurophysiological test and structural MRI data. To this end, the instance-based feature mapping composes an enhanced data representation based on clinical assessment scores and morphological measures of each brain structure. Then, the extracted multiple feature sets are combined into a single representation through the convex combination of its reproducing kernels. The weighting parameters per feature set are tuned based on the maximization of the centered-kernel alignment criterion. The proposed methodology is evaluated on the well known Alzheimer's Disease Neuroimaging Initiative (ADNI) database into multi-class and bi-class diagnosis tasks. The experimental results indicate that our proposal improves the diagnosis, enhancing data representation with a better class separability. Proposed MKL achieves the best performance in both, the multi-class task (76.6%) and the two-class task (83.1%).

Keywords: *Alzheimer's disease, Multiple-instance learning, Metric learning, Multiple kernel learning, Centered kernel alingment*

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