Statistical Analysis of Imaging Classification

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Abstract

Recent studies in neuroscience have shown that there are differences in binding potential (BP) in some regions of the brain between patients with major depressive disorder (MDD) and normal controls. The aim of this study was to distinguish these two groups (patients with MDD vs. normal controls) using their 3D BP images.

Regularized optimal affine discriminant (ROAD) method is a recently developed classification algorithm especially suitable for high-dimensional data. However, when applied to our high-dimensional imaging data, the original ROAD method ignores the spatial correlation structure inherited in the images. Therefore, we modified the ROAD method to adapt to our imaging data using the discrete wavelet transformation. For each slice of the image (2D image), a weak classifier is constructed using the modified ROAD method. Then our proposed classifier is obtained by assembling the weak learners from all of the slices.

We conducted some simulations to compare the relative performance (misclassification rate) of our proposed method with other approaches. In addition, we applied our proposed algorithm to classify the real 3D BP images. In this talk, we will present both simulation results and results of real data analysis.

Keywords: Image, regularized optimal affine discriminant, wavelet.