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Abstract

The classification of neuroimaging data for the diagnosis of certain brain diseases is one of the main research goals of the neuroscience and clinical communities. In this study, we performed multiclass classification using a hierarchical extreme learning machine (H-ELM) classifier. We compared the performance of this classifier with that of a support vector machine (SVM) and basic extreme learning machine (ELM) for cortical MRI data from attention deficit/hyperactivity disorder (ADHD) patients. We used 159 structural MRI images of children from the publicly available ADHD-200 MRI dataset. The data consisted of three types, namely, typically developing (TDC), ADHD-inattentive (ADHD-I), and ADHD-combined (ADHD-C). We carried out feature selection by using standard SVM-based recursive feature elimination (RFE-SVM) that enabled us to achieve good classification accuracy (60.78%). In this study, we found the RFE-SVM feature selection approach in combination with H-ELM to effectively enable the acquisition of high multiclass classification accuracy rates for structural neuroimaging data. In addition, we found that the most important features for classification were the surface area of the superior frontal lobe, and the cortical thickness, volume, and mean surface area of the whole cortex.