

Identifying Autism Spectrum Disorder Using Optimization-Based Clustering

Authors : Sharifah Mousli, Sona Taheri, Jiayuan He

Abstract : Autism spectrum disorder (ASD) is a complex developmental condition involving persistent difficulties with social communication, restricted interests, and repetitive behavior. The challenges associated with ASD can interfere with an affected individual's ability to function in social, academic, and employment settings. Although there is no effective medication known to treat ASD, to our best knowledge, early intervention can significantly improve an affected individual's overall development. Hence, an accurate diagnosis of ASD at an early phase is essential. The use of machine learning approaches improves and speeds up the diagnosis of ASD. In this paper, we focus on the application of unsupervised clustering methods in ASD as a large volume of ASD data generated through hospitals, therapy centers, and mobile applications has no pre-existing labels. We conduct a comparative analysis using seven clustering approaches such as K-means, agglomerative hierarchical, model-based, fuzzy-C-means, affinity propagation, self organizing maps, linear vector quantisation - as well as the recently developed optimization-based clustering (COMSEP-Clust) approach. We evaluate the performances of the clustering methods extensively on real-world ASD datasets encompassing different age groups: toddlers, children, adolescents, and adults. Our experimental results suggest that the COMSEP-Clust approach outperforms the other seven methods in recognizing ASD with well-separated clusters.

Keywords : autism spectrum disorder, clustering, optimization, unsupervised machine learning

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