A Multimodal Deep Ensemble Network for ASD Diagnosis & Subtyping

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Autism Spectrum Disorder (ASD), a neurodevelopmental disorder marked by heterogeneity, necessitates innovative diagnostic approaches. This study pioneers a multimodal deep ensemble network, integrating a support vector machine (SVM), convolutional neural network (CNN), and an autoencoder, to revolutionize ASD diagnosis. By leveraging functional magnetic resonance imaging data from the Autism Brain Imaging Data Exchange II dataset, we demonstrate the potential of deep learning in navigating the complexities of ASD diagnosis, surpassing traditional behavioral assessments. Results reveal that individual models exhibit varying performance across neuroimaging derivatives, with the CNN model achieving 68.97% accuracy for regional homogeneity. The CNN and autoencoder models showcase promising improvements over multiple epochs. The ensemble model, combining the strengths of each, exhibits potential for further performance enhancement. This study underscores the vast potential of deep learning in ASD diagnosis and subtyping, leveraging neuroimaging data to differentiate between ASD and typical control subjects. Future research directions include optimizing model parameters, feature selection, and integrating additional data modalities to enhance accuracy.

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