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Transforming Autism Diagnostics Through AI: Exploring Multimodal and Epigenetic Interactions

1stMehran M Memon, 2ndNajeeb ur Rehman Malik, 3rdSyeda Tehreem Naqvi, 4th Fahad Soomro & 5thFiza Surhio

1st, 2nd, 3rd, 4th DHA Suffa University, Karachi, Pakistan

5th Institute of Biomedical engineering & technology - LUMHS Jamshoro

KEYWORDS	ABSTRACT
Autism Spectrum Disorder (ASD), Early Detection, Deep Learning (DL), Genetic Markers.	Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition characterized by challenges in social interaction, communication, and repetitive behaviours. Early detection plays a pivotal role in enabling timely intervention and tailored support. However, current diagnostic approaches are constrained by subjective assessments and limited scope, often overlooking subtle manifestations across the ASD spectrum. This study aims to address these challenges by proposing a novel framework that integrates multimodal data sources including genetic information, neuroimaging, and behavioural responses with advanced Deep Learning (DL) algorithms to enhance diagnostic precision and scalability. To increase the model's effectiveness, this study introduces a hybrid methodology by merging attention-based DL architectures with ensemble learning techniques. Attention mechanisms enable the model to focus on critical data features, while ensemble approaches leverage multiple algorithms to optimize predictions. The research further explores the dynamic interplay between environmental influences and genetic predispositions in ASD development, incorporating epigenetic data into the analysis to broaden the framework's scope.
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