Towards Improved Recognition and Diagnosis of Autism Among Females – A Novel Approach Using Machine Learning

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Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by social and verbal impairments, affecting 1 in 36 children. ASD diagnosis is based on behavioral observations, caregiver interviews, and clinical questionnaires. Autism in females is more likely to be missed, compared to males, as their behavioral symptoms present in ways that may not fit current diagnostic criteria. This study aims to evaluate the gender bias in current diagnostic tests for autism and identify behaviors that can predict autism more accurately among females. A public dataset (ABIDE) of 1112 individuals – 948 males, 164 females, 539 autistic and 573 non-autistic was used. This included test scores for the common diagnostic instruments - Autism Diagnostic Observation Schedule (ADOS), Autism Diagnostic Interview-Revised (ADI-R), Social Communication Questionnaire (SCQ), and Social Responsiveness Scale (SRS). Exploratory data analysis revealed statistical gender differences for SCQ, SRS total, and SRS communication scores. Machine learning (ML) analysis further validated the gender bias as autism classification accuracy with current behaviors was 95% for males versus 85% for females. A minimal set of 12 most predictive behavioral features for females was derived from the original 23 (reduction of 49%) and run on six ML algorithms. Random Forest had the highest accuracy (91%) in classifying female autism, with this reduced feature set. These results support potential modifications to autism diagnostic criteria for females– reducing overreliance on ADOS and emphasizing questionnaires like SCQ and SRS and interviews (ADI_R) more reliably. Building automated screening tools for these can facilitate faster, more accurate and gender equitable autism diagnoses.

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