

Initial Classifier Development and Testing Experiments

Classifier Type	Methods*	Data Source	Subjects	Publication
A 7-feature alternating decision tree (ADTree7)	80%:20% training and testing split 10-fold cross-validation	ADI-R*	With ASD n=891 No ASD n=75	Wall DP, Dally R, Luyster R, Jung JY, Deluca TF. Use of artificial intelligence to shorten the behavioral diagnosis of autism. <i>PLoS One</i> . 2012;7(8):e43855.
8-feature alternating decision tree (ADTree8)	90%:10% training and testing split 10-fold cross-validation Classifier uses 8 of the 29 module 2 ADOS features	Score sheets from ADOS* Module 2	With ASD n=612 No ASD n=15	Wall DP, Kosmicki J, Deluca TF, Harstad L, Fusaro VA. Use of machine learning to shorten observation-based screening and diagnosis of autism. <i>Translational Psychiatry</i> . 2012;2(e100). https://doi.org/10.1038/tp.2012.10 pmid:22832900. PMID: PMC3337074
12-feature support vector machine (SVM12)	90%:10% training and testing split Training and parameter tuning were performed with stepwise backward feature selection and iterative removal of the single lowest-ranked feature across 10 folds. Classes were weighted inversely proportional to class size to manage imbalance. Several models were fit to each of the feature cross-validation folds. The model with the highest sensitivity and specificity and lowest number of features, an SVM with a radial basis function, was then applied to the test set to measure generalization error.	Score sheets from ADOS Module 3	With ASD n=510 No ASD n=93	Kosmicki JA, Sochat V, Duda M, Wall DP. Searching for a minimal set of behaviors for autism detection through feature selection-based machine learning. <i>Translational Psychiatry</i> . 2015;5(2):e514. https://doi.org/10.1038/tp.2015.7 pmid:25710120. PMID: PMC4445756
	Testing: Model tested on 1,924 individuals with autism and 214 individuals who did not qualify for an autism diagnosis.		With ASD n=1,924 No ASD n=214	
9-feature LR classifier (LR9)	90%:10% training and testing split Backward feature selection and iterative removal of the single lowest-ranked feature across 10 folds. The model with the highest sensitivity and specificity and lowest number of features, LR with L1 regularization and 9 features, was selected for testing.	ADOS Module 2	With ASD n=362 No ASD n=282	
	Testing: Model tested on independent data from individuals with and without ASD.		With ASD n=1,089 No ASD n=66	
5-feature support vector machine (SVM5)	80%:20% training and testing split Class imbalance managed by setting class weights inversely proportional to the class sizes. A 10-fold cross-validation used to select features, and a separate 10-fold cross-validation run for hyperparameter tuning prior to testing the performance.	ADOS Module 2	With ASD n=1,319 No ASD n=70	Levy S, Duda M, Haber N, Wall DP. Sparsifying machine learning models identify stable subsets of predictive features for behavioral detection of autism. <i>Mol Autism</i> . 2017;8(1):65. https://doi.org/10.1186/s13229-017-0180-6 pmid:29270283. PMID: PMC5735531
5-feature LR classifier (LR5)	80%:20% training and testing split Class imbalance managed by setting class weights inversely proportional to the class sizes. A 10-fold cross-validation used to select features, and a separate 10-fold cross-validation run for hyperparameter tuning prior to testing the performance.	ADOS Module 2	With ASD n=1,319 No ASD n=70	
10-feature LR classifier (LR10)	80%:20% training and testing split with the same proportion for participants with and without ASD in each set Class imbalance managed by setting class weights inversely proportional to the class sizes. A 10-fold cross-validation used to select features, and a separate 10-fold cross-validation run for hyperparameter tuning prior to testing the performance.	ADOS Module 3	With ASD n=2,870 No ASD n=273	
10-feature support vector machine (SVM10)	80%:20% training and testing split with the same proportion for participants with and without ASD in each set Class imbalance managed by setting class weights inversely proportional to the class sizes. A 10-fold cross-validation used to select features, and a separate 10-fold cross-validation run for hyperparameter tuning prior to testing the performance.	ADOS Module 3	With ASD n=2,870 No ASD n=273	

*The Autism Diagnostic Interview-Revised; **Autism Diagnostic Observation Schedule

(Table data summarized in Tariq et al. 2018)