Identification of autism spectrum disorder stage using ordinal logistic LASSO regression

Karunathilake, T.G.I.M.
Department of Physical Science
University of Vavuniya
ik.madhushan@hotmail.com

ABSTRACT

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that affects communication, social interaction, and behavioural skills. ASD affects children at the age of two years old and continues lifelong. Occurrences of ASD are rapidly increasing, and there are no specific medications available for the cure. ASD can be categorized as mild, moderate, and severe stages. Based on the stage of autism, suitable therapies can be recommended for ASD-diagnosed children. ASD has been diagnosed by screening methods which mainly rely on simple human rules with a scoring function that adds scores associated with the questionnaire items to calculate the outcome. Clinician's experience and the number of designed tools are mandatory to make the correct decision. The machine learning technique, namely automated classification methods, has been used by many researchers in current research to make decisions efficiently. The ordinal logistic LASSO (Least Absolute Shrinkage and Selection Operator) regression has been used in recent literature as an efficient method to do ordered multiclass classification. We used the ASD toddler dataset collected using a mobile application called ASDTests. This application is developed based on AQ's sorted version called AQ-10, which includes ten selected questions from AQ. The ASD toddler dataset has 1054 observations and 14 variables, including AQ-10 items, background information of the child (age, gender, and family-ASD), and ASD class, where ASD class is the response variable. ASD toddler dataset had 1054 observations and 14 variables, including AQ-10 items, background information of the child, and ASD class, where ASD class is the response variable. Analysis was implemented using RStudio. The *caret* and *ordinalgmifs* packages were used to fit the models. Therefore this research focused on applying Ordinal logistic LASSO regression to identify the stages of ASD. Further, we compared the results with other multiclass classification techniques such as ordinal logistic regression, decision tree, conditional inference trees, and random forest. The analysis revealed that the ordinal logistic LASSO regression approach provides the best results with high accuracy in both test data and training data.

Keywords: ASD, Machine Learning, Ordinal logistic regression.