A Machine Learning Approach to Predict Autism Spectrum Disorder

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Abstract: In present day Autism Spectrum Disorder (ASD) is gaining its momentum faster than ever. Detecting autism traits through screening tests is very expensive and time consuming. With the advancement of artificial intelligence and machine learning (ML), autism can be predicted at quite early stage. Though number of studies have been carried out using different techniques, these studies didn't provide any definitive conclusion about predicting autism traits in terms of different age groups. The proposed model was evaluated with AQ- 10 dataset and 1000 real dataset collected from people with and without autistic traits. The evaluation results showed that the proposed prediction model provide better results in terms of accuracy, specificity, sensitivity, precision and false positive rate (FPR) for both kinds of datasets.

Keywords —Machine Learning, Random Forest, Support Vector Machine, Adaboost.

I. INTRODUCTION

Autism spectrum disorder is a neurodevelopmental disorder that affects a person's interaction, communication and learning skills. Although diagnosis of autism can be done at any age, its symptoms generally appear in the first two years of life and develops through time. Autism patients face different types of challenges such as difficulties with concentration, learning disabilities, mental health problems such as anxiety, depression etc, motor difficulties, sensory problems and many others.

Current explosion rate of autism around the world is numerous and it is increasing at a very high rate. According to WHO, about 1 out of every 160 children has ASD. Some people with this disorder can live independently, while others require life-long care and support.

Diagnosis of autism requires significant amount of time and cost. Earlier detection of autism can come to a great help by prescribing patients with proper medication at an early stage. It can prevent the patient's condition from deteriorating further and would help to reduce long term costs associated with delayed diagnosis. Thus, a time efficient, accurate and easy screening test tool is very much required which would predict autism traits in an individual and identify whether or not they require comprehensive autism assessment.

The objective of this work is to propose an autism prediction model using ML techniques and to develop a mobile application that could effectively predict autism traits of an individual of any age. In other words, this work focuses on developing an autism screening application for predicting the ASD traits among people of age groups 4-11 years, 12-17 years and for people of age 18 and more.

II. RELATED WORKS:

Different existing data mining procedures and its application were considered or explored. Utilization of machine learning algorithms was connected in various medical data sets. Machine learning strategies have diverse power in different medical data sets. Previously mentioned conventional machine learning techniques gave less exact outcome and results additionally shifts in light of the procedures has been utilized for the prediction.

III. PROPOSED SYSTEM

Our proposed strategy focuses on a novel machine learning procedure for Autism spectrum disorder (ASD) classification and prediction, thus overcoming the existing problem. By utilizing Random Forest (RF), Support Vector Machine (SVM), AdaBooster algorithms we will make our model in order to increase the performance and accuracy.
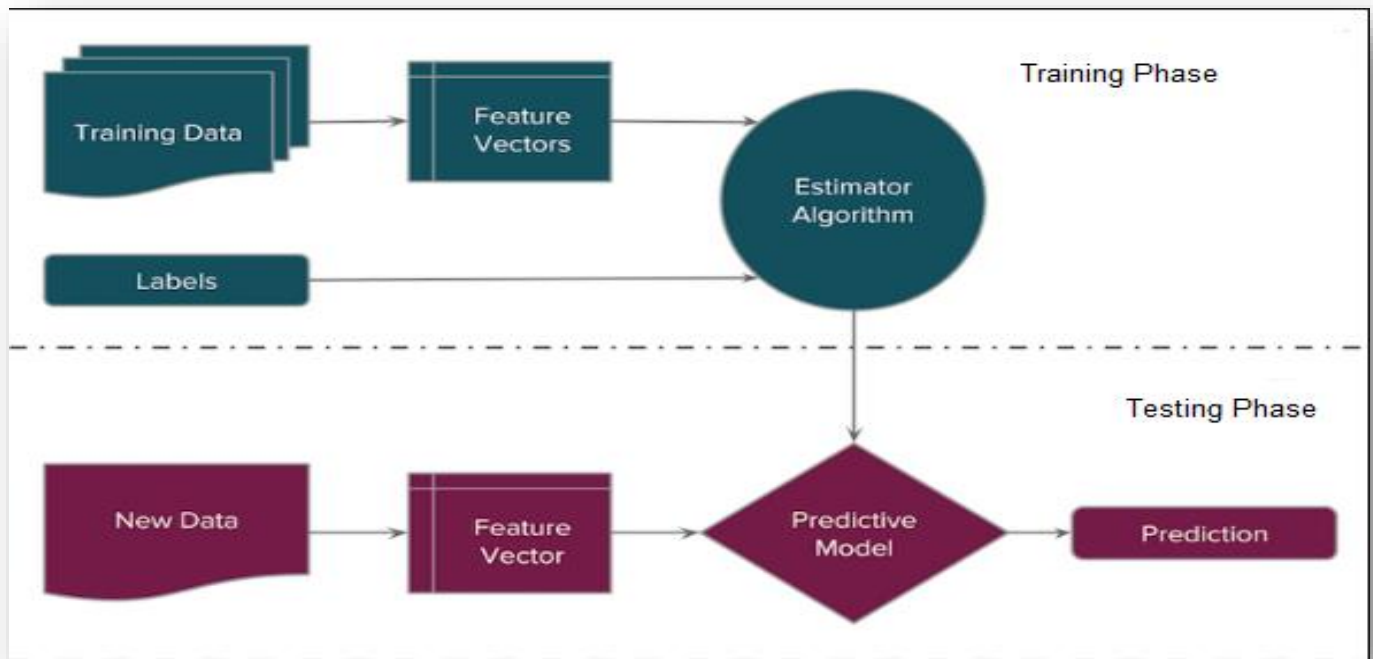

Fig.1.System Architecture

IV. SYSTEM DESIGN

ALGORITHMS USED:

RANDOM FOREST:

Random forests or random decision forests are an ensemble learning method for classification, regression and other tasks that operates by constructing a multitude of decision trees at training time and outputting the class that is the mode of the classes or mean prediction of the individual trees.
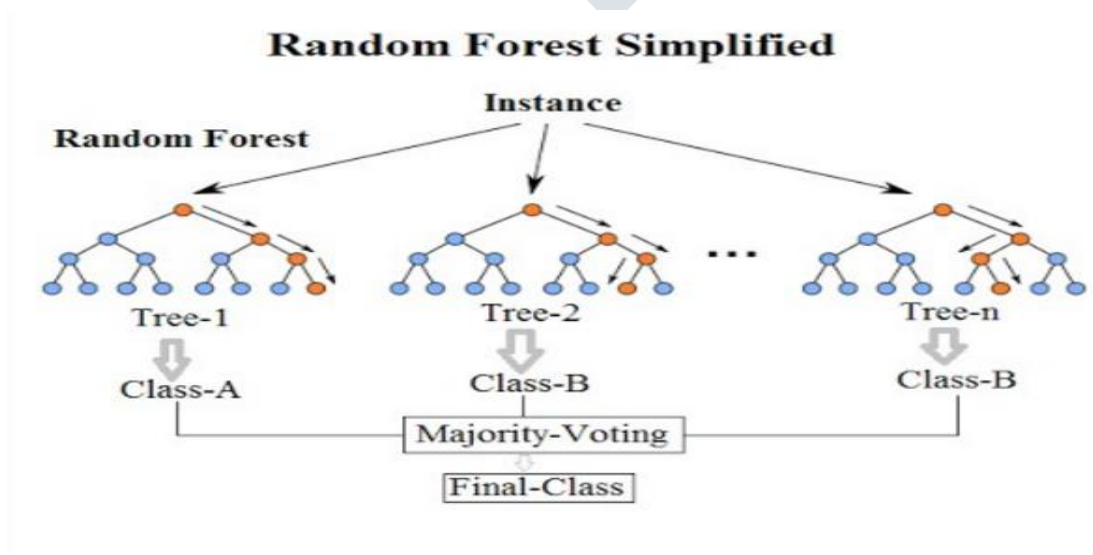

Fig.2. Random forest

SVM:

A support vector machine (SVM) is machine learning algorithm that analyses data for classification and regression analysis. SVM is a supervised learning method that looks at data and sorts it into one of two categories. ... A support vector machine is also known as a support vector network (SVN).
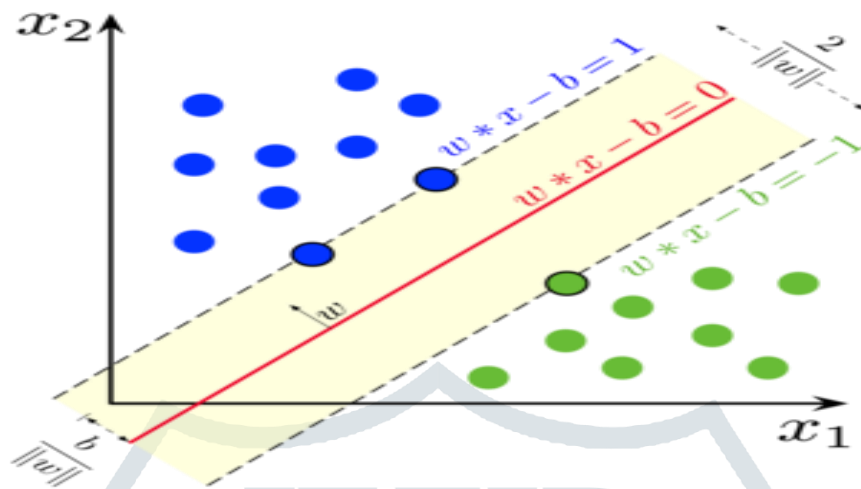

Fig.3.SVM

AdaBoost:

AdaBoost is one of the first boosting algorithms to be adapted in solving practices. Adaboost helps you **combine multiple "weak classifiers" into a single "strong classifier"**. Here are some (fun) facts about Adaboost!

- The weak learners in AdaBoost are decision trees with a single split, called decision stumps.
- AdaBoost works by putting more weight on difficult to classify instances and less on those already handled well.
- AdaBoost algorithms can be used for both classification and regression problem.

V. RESULT AND ANALYSIS

The results showed that the proposed prediction model provides better results comparing to the other two existing models for each of the performance parameter; Using three algorithms. By utilizing Random Forest (RF), Support Vector Machine (SVM), AdaBooster algorithms we will make our model in order to increase the performance and accuracy.

VI. CONCLUSION:

In conclusion, as identified through the literature review, we believe only a marginal success is achieved in the creation of predictive model for Autism spectrum disorder (ASD) patients and hence there is a need for combinational and more complex models to increase the accuracy of predicting the early onset of Autism spectrum disorder (ASD).

VII. **REFERENCES**

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