Autism Spectrum Disorder Detection Using Machine Language

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Abstract - *According to the World Health Organization (WHO), about 1 in 160 people worldwide are affected by Autism Spectrum Disorder (ASD). The increasing cases of ASD have inspired researchers globally to study it, and new technologies like Machine Learning (ML) are being used to detect ASD early. Our project aims to address these challenges. The main goals include:*

Early Detection of ASD: ASD can't be cured, but if we find it early, we can reduce its negative effects. Our focus is on spotting it as soon as possible.

Improving Diagnostic Methods: Most clinical methods are costly, take a long time, and sometimes give inaccurate results. We're using ML to make the process more affordable, accurate, and quicker for early treatment.

Enhancing Existing Techniques: Previous work usually compares methods or introduces entirely new algorithms. Our project not only compares different techniques using three datasets but also aims to create a better and more accurate algorithm.

Our project aims to make ASD detection more accessible, accurate, and timely, contributing to better outcomes for individuals affected by this condition.

***Key Words*: WHO, Early Detection , Clinical Methods , Enhanced Algorithms , Accuracy**

1. INTRODUCTION

Autism spectrum disorder is a developmental disorder that describes certain challenges associated with communication (verbal and non-verbal), social skills, and repetitive behaviors. Typically, autism spectrum disorder is diagnosed in a clinical environment by licensed specialists using procedures which can be lengthy and cost-ineffective. In addition to the clinical methods, machine learning methods have been successfully applied to shorten the duration of the diagnosis and to increase the performance of the diagnosis of the ASD. We discovered algorithms like Random Forests which show high compatibility with few of the other important algorithms and once infused give maximum accuracy which can be further improved with introduction of more compatible algorithms and methods which will not only bring out the most accurate but also a faster technique. Machine learning has the potential to make this medical field a lot more easier and advanced which will help doctors and professionals across the globe in future.

1.1 Goals

Researchers worldwide are studying ASD with the goal of early detection. Early detection is important because ASD is incurable, but early treatment can reduce the negative effects of symptoms.

- Early detection gives licensed clinical experts an advantage in treating ASD.
- However, early detection is meaningless if the results are inaccurate. Therefore, we will use machine learning (ML) techniques to improve the accuracy of ASD diagnosis.

- In the 21st century, where everyone deserves access to healthcare, the cost-effectiveness of treatment is paramount.

We plan to use ML techniques to address all of the above issues. We will compare different ML algorithms based on their ability to address these issues and propose the best modified algorithm.

1.2 Scope

In the aforementioned studies, authors primarily conducted comparisons between various algorithms or introduced new algorithms. Additionally, many research papers employ wearables, mobile phones, or video feeds to detect ASD, yet encounter high rates of false positives. Our research involves both algorithm comparisons and the proposal of an enhanced algorithm with high accuracy.

In comparison to the reviewed papers, our study offers a comprehensive overview of commonly used algorithms in this domain and introduces new ML algorithms. Our findings indicate that boosting algorithms exhibit superior accuracy in ASD detection, significantly improving their performance.

Analyzing recent works from 2021, it becomes evident that the focus lies on developing products for ASD detection. Our research serves as a foundational reference for current trends in ASD detection research, presenting a thorough comparison of eighteen diverse algorithms based on various statistical and graphical metrics.

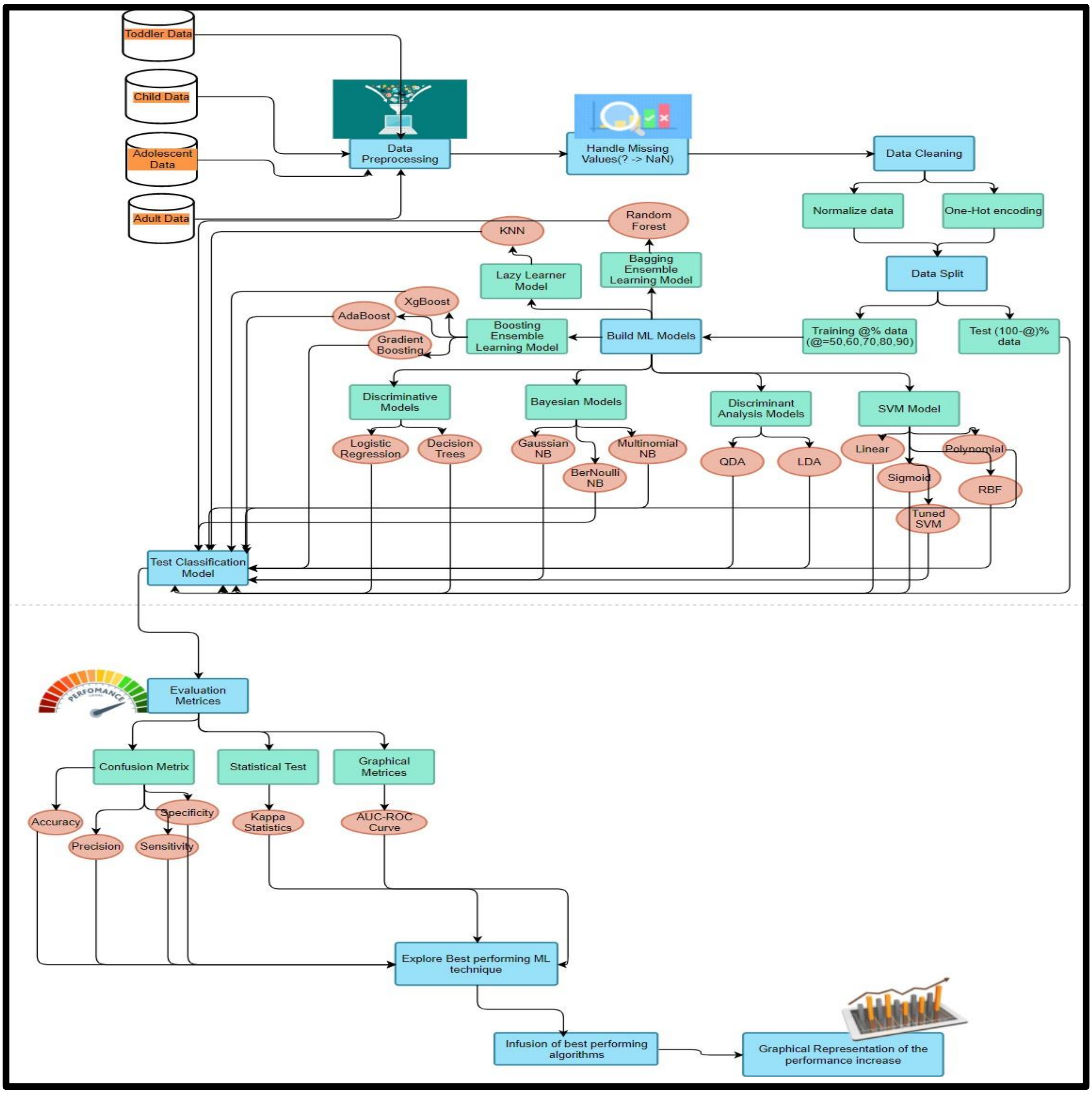
2. ACCURACY CHART FOR DIFFERENT ALGORITHMS

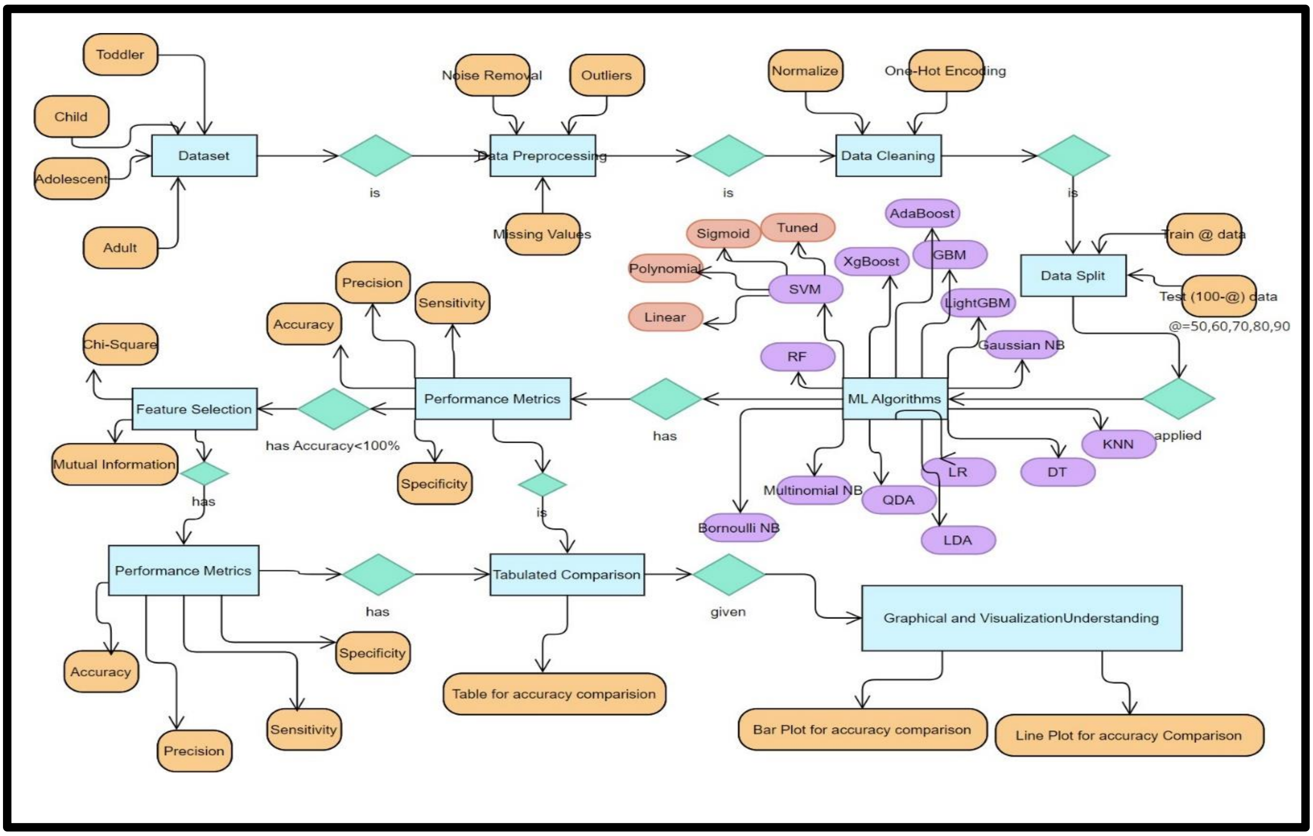
Table -1: ACCURACY CHART

S.N	Algorithms	Accuracy	Sensitivit	Specificity	Precision
1	Random Forest	100	100	100	100
2	XgBoost	100	100	100	100
3	AdaBoost	100	100	100	100
4	LightGBM	100	100	100	100
5	Gradient Boosting	100	100	100	100
6	Gaussian Naive Bayes	63.03	49.67	98.27	98.7
7	Bornouli Naive Bayes	95.26	93.46	100	100
8	Multinomial Naive Bayes	94.31	98.03	84.48	94.34
9	Quadratic Discriminant Analysis	30.8	5.22	98.27	88.89
10	Logistic Regression	100	100	100	100
11	Linear Discriminant Analysis	94.78	93.46	98.27	99.30
12	Decision Trees	100	100	100	100
13	K-Nearest Neighbors	94.31	92.81	98.27	99.3
14	Linear SVM	100	100	100	100
15	Polynomial SVM	100	100	100	100

Sr.NO	Age group	Percent of people suffering worldwide (may not be exact)	Algorithms to be used throughout the project
1	0-10	47%	Random Forest
2	12-23	63%	XG Boost
3	25-40	21%	Bagging
4	40-55	38%	KNN
5	55 and above	4%	SVM & Types

E-R DIAGRAM OF CASE STUDY & ARCHITECHTURE OF THE PROJECT





3. CONCLUSIONS

Notably, after our evaluation, we observed that prominent ensemble algorithms— XgBoost , AdaBoost, Gradient Boosting, and LightGBM—consistently demonstrated the highest accuracy of 100%. This indicates their potential in facilitating precise and early ASD detection, which could profoundly benefit clinical practices and patient outcomes.

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BIOGRAPHIES

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