

Machine Learning Prediction of Autism

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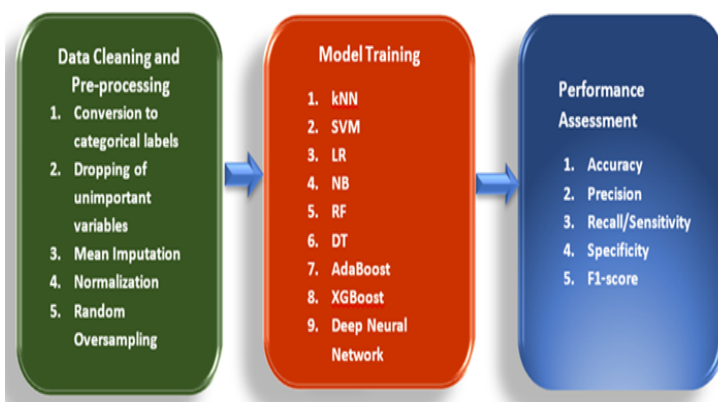
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1. INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by challenges in social communication and interaction, restricted interests, and repetitive behavior. While beginning symptoms are often observed by parents or caregivers during infancy stage, they become more prominent in the early childhood period and usually persisting till adolescence and adulthood. It is important to assess the child for ASD in the early stages so that early intervention can be proposed, thus improving the quality of life of the patient. It is in this area of early diagnosis where machine learning can be utilized, thus enhancing the whole diagnostic process leading to institution of the much-needed therapy. Our objective is to predict if a patient has autism spectrum disorder using a variety of machine learning classification algorithms namely: Logistic Regression (LR), Naive Bayes (NB), k-Nearest Neighbor (KNN), Support Vector Machine (SVM), Decision Tree (DT), Random Forest (RF), AdaBoost, XGBoost, and Deep Neural Network (DNN) evaluated on publicly available Autism datasets.

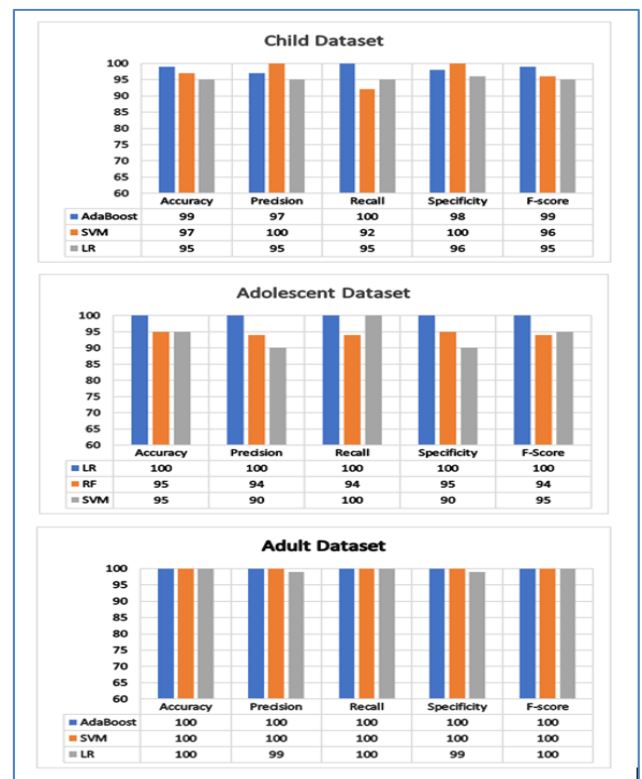
2. METHODS

ASD University of California Irvine Machine Learning Repository child, adolescent, and adult datasets



3. RESULTS

| ML Model | Dataset | Accuracy | Precision | Recall (Sensitivity) | Specificity | F-score |
|----------|------------|----------|-----------|----------------------|-------------|---------|
| LR | Child | 0.95 | 0.95 | 0.95 | 0.96 | 0.95 |
| | Adolescent | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | Adult | 1.00 | 0.99 | 1.00 | 0.99 | 1.00 |
| kNN | Child | 0.68 | 0.58 | 0.92 | 0.51 | 0.71 |
| | Adolescent | 0.76 | 0.70 | 0.89 | 0.65 | 0.78 |
| | Adult | 0.92 | 0.88 | 0.98 | 0.86 | 0.93 |
| NB | Child | 0.49 | 0.45 | 1.00 | 0.90 | 0.62 |
| | Adolescent | 0.63 | 0.57 | 0.89 | 0.40 | 0.70 |
| | Adult | 0.57 | 0.54 | 1.00 | 0.12 | 0.70 |
| SVM | Child | 0.97 | 1.00 | 0.92 | 1.00 | 0.96 |
| | Adolescent | 0.95 | 0.90 | 1.00 | 0.90 | 0.95 |
| | Adult | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DT | Child | 0.82 | 0.71 | 0.95 | 0.73 | 0.81 |
| | Adolescent | 0.84 | 0.88 | 0.78 | 0.90 | 0.82 |
| | Adult | 0.95 | 0.96 | 0.96 | 0.95 | 0.96 |
| RF | Child | 0.92 | 0.88 | 0.95 | 0.90 | 0.91 |
| | Adolescent | 0.95 | 0.94 | 0.94 | 0.95 | 0.94 |
| | Adult | 0.97 | 0.96 | 0.99 | 0.95 | 0.97 |
| AdaBoost | Child | 0.99 | 0.97 | 1.00 | 0.98 | 0.99 |
| | Adolescent | 0.92 | 1.00 | 0.83 | 1.00 | 0.91 |
| | Adult | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| XGBoost | Child | 0.92 | 0.86 | 0.97 | 0.88 | 0.91 |
| | Adolescent | 0.92 | 0.94 | 0.89 | 0.95 | 0.91 |
| | Adult | 0.99 | 0.98 | 0.99 | 0.98 | 0.99 |
| DNN | Child | 0.91 | 0.85 | 0.95 | 0.88 | 0.90 |
| | Adolescent | 0.84 | 0.77 | 0.94 | 0.75 | 0.85 |
| | Adult | 0.98 | 0.98 | 0.97 | 0.98 | 0.98 |



Performance Metrics of Best Models for Autism Classification Across Datasets

4. CONCLUSIONS

Our findings are promising and have generated significant insights in the development of faster automated models with high reliability useful in autism diagnosis across age groups. Together with prompt assessment, tools aided with ML can reduce the number of patients required to undergo the lengthy, multistep process for an official diagnosis, as early intervention ensure superior quality of care of our patients.