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Machine Learning Approach to Predict Autism Spectrum Disorder

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Abstract
Autism Spectrum Disorder (ASD) is getting more attention these days, but figuring out if someone has it can be slow and expensive. We're using fancy computer technology, like artificial intelligence and machine learning, to try to predict autism earlier. This research wants to make a smart computer program that can tell if someone might have autism, no matter how old they are. By combining a couple of different methods, we hope to make a website where people can check for signs of autism. When we tested this program with real data, it seemed to work better than other methods people have tried before.

Keywords: Machine Learning, Logistic regression, random forest, SVC, Ann neural network, Extra trees.

1. INTRODUCTION

Autism Spectrum Disorder (ASD) is a condition that affects how people interact, communicate, and learn. It's like having a different way of seeing and experiencing the world. Signs of autism usually start showing up when someone is very young, maybe just a year or two old. But they can change as a person grows up. People with autism face all sorts of challenges. For example, they might have trouble paying attention or learning new things. They might also struggle with their emotions, feeling anxious or sad more often than others. Some people with autism find it hard to move their bodies in the same way as everyone else, or they might have trouble dealing with their senses, like finding certain sounds or smells really overwhelming.

More and more people are being diagnosed with autism all over the world. The World Health Organization (WHO) says that about 1 out of every 160 children has autism. Some people with autism can live their lives just like anyone else, doing things on their own without any trouble. But others need a lot of help and support, maybe for their whole lives.

Finding out if someone has autism can take a long time and cost a lot of money. But if we could figure it out sooner, it could make a big difference. Imagine if we could spot autism when someone is really young. We could start giving them the right kind of help and treatment right away. That might stop things from getting worse for them as they grow up. It could also save a lot of money in the long run, because we wouldn't have to spend as much on extra things that come up later when we find out about autism.

So, it would be really helpful to have a test that could check for autism quickly, accurately, and easily. This test could help us figure out if someone needs to see a doctor for a more detailed look at whether they have autism or not. It could be a big step toward making sure that everyone gets the help and support they need, no matter what challenges they might be facing.

2. LITERATURE SURVEY

In recent years, researchers have been working hard to find better ways to predict Autism Spectrum Disorder (ASD) using different methods. Let's take a closer look at some of these studies.

Wall and his team tried using something called an Alternating Decision Tree (AD Tree) to speed up the process of screening and detecting ASD. They used a method called the Autism Diagnostic Interview, Revised (ADI-R) on a group of 891 people. While they did find high accuracy, they only focused on ages 5 to 17, which meant their test couldn't predict ASD for different age groups. Bone and his colleagues took a different approach and used a fancy technique called machine learning (ML). Specifically, they used something called a support vector machine (SVM). They did pretty well in terms of sensitivity, which measures how good they were at spotting ASD traits (about 89.2%). But their test wasn't as good at specificity, which means it wasn't great at ruling out ASD when it wasn't there (only about 59% accurate). Plus, their study included people aged 4 to 55, which made it tricky to apply to all age groups.

Allison and his team came up with a different idea. They used something called 'Red Flags' along with a tool called the Autism Spectrum Quotient to screen for ASD in both kids and adults. They got really good results, with over 90% accuracy using a shorter test called AQ-10. Thabtah looked at a bunch of different ML algorithms that people have used to predict autism traits. They wanted to figure out which ones worked best. Hauck and Kliewer tried combining two different methods called the Autism Diagnostic Observation Schedule (ADOS) and ADI-R to see if that would work better. Bekerom decided to use several ML techniques, like naive Bayes and random forest, to see if they could spot ASD traits in kids. They also compared their results with things like developmental delays and obesity. Heinsfeld went even further and used super advanced stuff like deep learning algorithms and neural networks. They used brain imaging data to try and figure out if someone had ASD. They got pretty good results, with an average accuracy of 70%. Liu took a bit of a different approach. They looked at how people's eyes moved when they looked at faces and used ML to see if they could spot ASD in kids. And it turns out, they were pretty successful! Their test was accurate about 88.51% of the time.

Bone and his team also took a step back and looked at all the previous research. They wanted to see if they could find any problems with how people were doing their studies. Then, they tried doing things a little differently using ML methods. They found some issues in how studies were set up and tried to fix them.

All these studies show that we're getting better at predicting ASD, but we still have a long way to go. We need to figure out ways to predict ASD for people of all ages. Maybe we could even make an app to help with screening. With more research, we'll hopefully find a screening tool that works for everyone.

3. METHODOLOGIES

A. PROPOSED METHODOLOG

With the help of machine learning (ML), we can predict autism early on. This research wants to create a good prediction model using ML. This model will help predict autism for people of all ages. It will be fast, accurate, and not cost too much.

B. DATA COLLECTION

To create a tool that can predict autism, we used a set of information called AQ-10. This info is from three groups: kids, teens, and adults. AQ-10 asks questions about things like attention and talking. Each question gets 1 point if they answer "yes" and 0 if they say "no." There are different numbers of examples for each group: 292 for kids, 104 for teens, and 704 for adults. The info includes things like age, gender, and answers to questions. We hope to use this data and machine learning to make a tool that can quickly and accurately predict autism for people of all ages, so they can get help early on.

C. DATA SYNTHESIATION

First, we looked at all the data we collected and removed stuff we didn't need, like an ID number that didn't help predict autism.

If some information was missing, we just left out that whole piece of data.

Then, we used a method to figure out which parts of the data weren't important for making predictions. We found that we could make better predictions by getting rid of certain columns, like 'relation', 'age desc', 'used app before', and 'age'. After that, we used the remaining data to train and test our prediction model. We used a technique called random forest and regression to do this**.**

D. DEVELOPING THE PREDICTING MODEL

We tried out different ways to predict autism traits, like using Linear Regression, SVM, and Naive Bayes. After testing them, we found that Random Forest was the most accurate. So, we chose Random Forest (CART) to build our autism prediction system. We also made some tweaks to the algorithm to make it work even better.

E. DEVELOPING A WEBSITE

We designed a user-friendly website where anyone can check for autism traits. By answering a few straightforward questions, users receive a result indicating whether they may have autism traits or not. It's a simple and accessible way for anyone to understand their potential risk for autism.

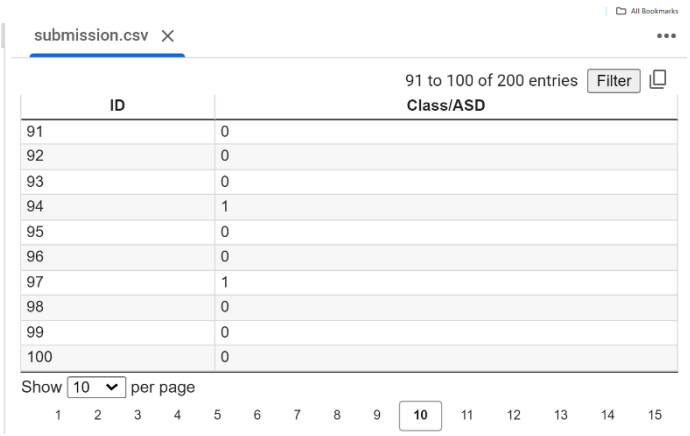
4. EVALUATION

Machine learning algorithms have shown promise in assisting with the evaluation of autism spectrum disorder (ASD). Researchers have explored using various techniques, such as natural language processing to analyze verbal and written communication, computer vision for analyzing facial expressions and gestures, and predictive modeling to identify patterns in behavioral data.

These algorithms can analyze large datasets and potentially identify patterns or features that may be indicative of ASD. However, it's important to note that machine learning algorithms are not a replacement for clinical diagnosis by trained professionals. Instead, they can serve as a complementary tool to aid in the diagnostic process and provide additional insights.

Challenges in using machine learning for ASD evaluation include ensuring the quality and diversity of the data used for training, addressing biases in the algorithms, and interpreting the results in a clinically meaningful way. Additionally, privacy concerns and ethical considerations surrounding the use of sensitive health data must be carefully managed.

5. RESULT


submission.csv

91 to 100 of 200 entries Filter

ID	Class/ASD
91	0
92	0
93	0
94	1
95	0
96	0
97	1
98	0
99	0
100	0

Show 10 per page

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

6. CONCLUSION

This study presents a promising machine learning approach for Autism Spectrum Disorder (ASD) prediction, offering a cost-effective and accessible means to identify ASD traits in individuals of all ages. By the Random Forest, Logistic Regression, Ann neural network, SVC and Extra trees and algorithms, the developed prediction model displayed improved accuracy, f-1 score and the confusion matrix when evaluated with different datasets. The ultimate goal is to enhance early ASD detection and support while ensuring ethical and equitable access for all individuals. Autism Spectrum Disorder in addition to enhance the prediction process that decide if the person has autism spectrum disorder or not and also showing the estimated percentage.

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