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Enhancing Technique for Predictive Grading of Childhood Autism using Soft Computing

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Abstract: *Autism spectrum disorder (ASD) is mainly reflected in the communication and language barriers, difficulties in social communication, and it is a kind of neurological developmental disorder.*
"Psychiatrist EugenBleuler in 1908 termed Autism first. He used it to describe a schizophrenic patient who had withdrawn into his own world. Bleuler named Autism on the basis of Greek word "autós" meant self to mean morbid self-admiration and withdrawal within self."
"The concept of autism was coined in 1911 by the German psychiatrist EugenBleuler to describe a symptom of the most severe cases of schizophrenia, a concept he had also created."
Autism spectrum disorder (ASD) includes a family of neurodevelopmental disorders with very early onset that affect many aspects of behavior and cognition. In particular, it refers for deficiencies concerning three major domains: communication, social functioning and stereotyped behavior.
Abstract and conceptual thinking have been the problems of people with autism. Some may eventually acquire abstract skills, but others never will. When abstract concepts must be used, use visual cues, such as drawings or written words, to augment the abstract idea.
You can help most autistic children think conceptually by guiding them to put details together to form ideas — preferably with visual symbols. You can demonstrate abstract concepts like "more" or "less" with objects instead of explaining them in words.

Key Word: *Central Coherence Theory; Interacting with a Child Who Has Autism Spectrum Disorder; Breaking through the barriers of ASD; Communication and interaction tips for ASD; Social communication and interaction skills.*

I.INTRODUCTION

Central Coherence Theory:

In 1989, UtaFrith* proposed the Weak Central Coherence Theory of autism. "Central coherence" was the term given to a human being's ability to derive overall meaning from a mass of details.A person with strong central coherence, looking at an endless expanse of trees, would see "the forest." A person with weak central coherence would see only a whole lot of individual trees.CentralCohernce Weakness has been defined as tendancy for local rather than global processing that may underlie core deficits in Autism spectrum disorder.Research suggests that autism genes are usually inherited from the father, despite some research showing it's passed down from the mother.

A neurodevelopmental condition of variable severity with lifelong effects that can be recognized from early childhood, chiefly characterized by difficulties with social interaction and communication and by restricted or repetitive patterns of thought and behaviour.

Autism is not one type but many subtypes, most influenced by a combination of genetic and environmental factors.

Autism is associated with a combination of genetic and environmental factors.The people with autism will lead to positive outcome after the early intervention, this is showed by the research. Early speech therapy or behavioral interventions can help children with autism gain selfcare, social, and communication skills.

The autism means the people with Autism experience differences in the way they communicate and interact socially, and their behavior may be repetitive or highly focused (the term 'restricted, repetitive patterns of behavior' is often used to describe this).Autism, or Autism Spectrum Disorder (ASD), is a neurodevelopmental disorder that affects social interaction, communication, behavior, and sensory processing. It is called a spectrum disorder because it affects people in different ways and to varying degrees of severity.

Symptoms of autism typically appear in early childhood, and they can include difficulty in developing social relationships, communication challenges, repetitive behaviors or interests, and difficulty with sensory processing. Some people with autism may also have intellectual disabilities or other co-occurring conditions such as epilepsy, anxiety, or ADHD.

The causes of autism are not fully understood, but research suggests that a combination of genetic and environmental factors play a role. There is no cure for autism, but early intervention and behavioral therapies can help

improve outcomes and quality of life for people with the condition.

It is important to note that every person with autism is unique and may experience the condition differently. It is essential to respect and accommodate their individual needs and preferences to help them thrive.

Autism spectrum disorder, the name adopted in 2013, is a developmental disorder characterized by persistent problems in social communication and interaction, along with restricted and repetitive patterns of behavior, interests or activities.

Baron-Cohen proposed that children with autism suffer from mindblindness. Already hampered by the inability to achieve joint attention with others, they become unable to build on that fundamental step to intuit what others are thinking, perceiving, intending, or believing.

It is a screening tool for diagnosing autism in age between 16 to 30 months. In case of timely diagnosis of autism, the early intervention program can be started. It uses artificial intelligence techniques, neural networks, and advanced statistical tools (such as cluster analysis) to reveal trends, patterns, and relationships, which might otherwise have remained undetected.

It is the step of the knowledge discovery in databases (KDD) process concerned with the algorithmic means by which patterns or structures are enumerated from the data. Predicting the outcome of a disease is one of the most interesting and challenging tasks where to develop data mining applications.

The use of computers with automated tools, large volumes of medical data are being collected and made available to the medical research groups. As a result data mining techniques has become a popular research tool for medical researchers to identify and exploit patterns and relationships among large number of variables, and made them able to predict the outcome of a disease using the historical datasets.

Feature selection algorithm used to find the subset of input variables by eliminating the features with less or no predicting information. It significantly improves the accuracy of the future classifier models formed by different classification algorithms.

People may experience Behavioural Inappropriate social interaction, poor eye contact, compulsive behaviour, impulsivity, repetitive movements, self-harm, or persistent repetition of words or actions *Developmental: learning disability or speech delay in a child Cognitive Intense interest in a limited number of things or problem paying attention Psychological: unaware of others' emotions or depression .Also common Anxiety, change in voice, sensitivity to sound, or tic.

II.MATERIALS AND METHODS

1. Related Work

[1] JyotiSoni et.al, compared predictive data mining techniques such as Decision tree, Naïve Bayes, K-NN, and classification based on clustering for analyzing the heart disease dataset. The classified data is evaluated using 10 fold cross validation and the results are compared. Decision Tree outperforms and sometime Bayesian classification is having similar accuracy as of decision tree but other predictive methods like KNN, Neural Networks, Classification based on clustering are not performing well. The second conclusion is that the accuracy of the Decision Tree and Bayesian Classification further improves after applying genetic algorithm to reduce the actual data size to get the optimal subset of attribute sufficient for heart disease prediction.

[2] Carloz Ordonez et al.,applied association rule mining on heart disease data. Search constraints and test data validation reduces the number of association rules with high predictive accuracy.

[3] In the survey of the author proposed the minimal subset of attributes for predicting heart disease. In future this work can be expanded and enhanced for the automation of heart disease prediction. Real data should be collected from health care organizations and agencies are taken to compare the optimum accuracy with all data mining technique.

[4] G. Parthiban et al.,applied Naïve Bayes classification through WEKA ("Waikato Environment for Knowledge Analysis") tool to diagnose heart disease of diabetic patient. 10 folds cross validation is used to avoid any bias in the process and improve efficiency of the process.

[5] AbdelghaniBellaachi et al.,analysed breast cancer data with three data mining techniques such as Naïve Bayes, Back-Propagated Neural Network and C4.5. In that, C4.5 produces more accuracy of about 86.7%.

[6] GeethaRamani et al.,applied feature relevance algorithm and then different classification algorithm on the selected features. Error rate and accuracy of the different classification tool is calculated using Tanagra. In that, Rnd tree produced 100% accuracy.

[7] S. Poonkuzhali et al.,taken TP53 germline database for classification. First feature construction done by converting all input to disc to cont function. Then different filtering algorithm is applied to reduce the number of features. Different classification algorithm produced on the reduced dataset. Finally performance evaluation is done. Rnd tree produces 100% accuracy using ReliefF filtering.

[8] Christina Schweikert et al.,applied Combinatorial Fusion Analysis(CFA) and Association Rule Mining(ARM) to autism, lead, and mercury data. CFA revealed that autism prevalence has strong correlation with rank combination of mercury and lead than individual. ARM discovered a trend where increase in mercury strongly related to increase in autism prevalence.

[9] Gondy Leroy et al.,autism children are videotaped before, during and after therapy applied to them. Four conditions are taken to monitor child's inappropriate and appropriate behaviour like when alone, accompanied with parent, stranger and therapist. Decision tree and rule mining algorithm are applied on the above noted data to find out their level of behaviour.

2. Proposed work

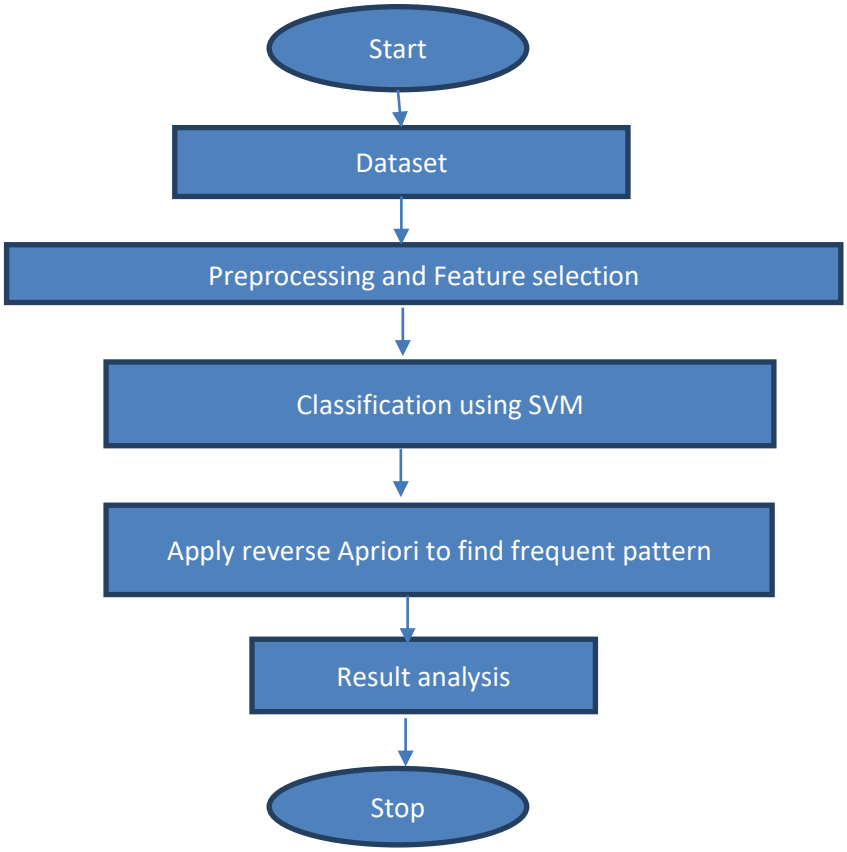

Figure 1. Block Diagram

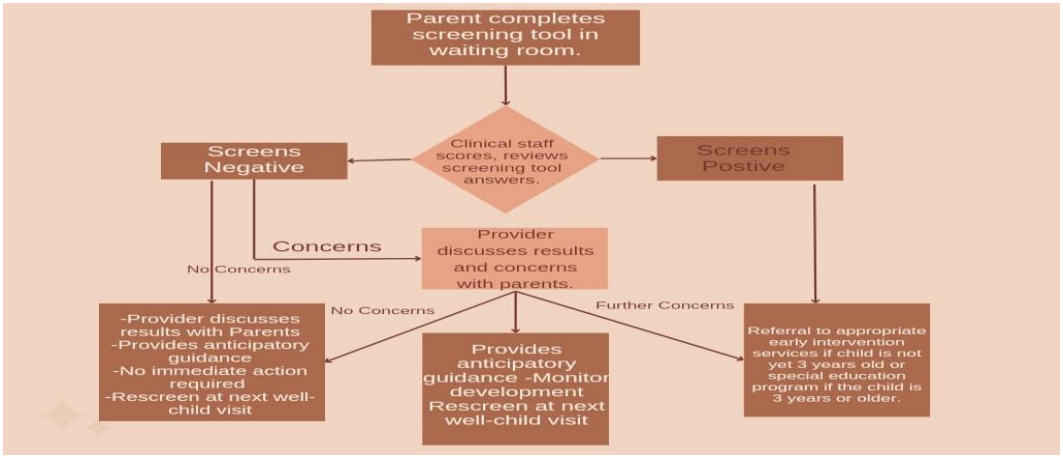

Figure 2. Pediatric Developmental screening Flowchart

3. Other Characteristics

Social communication and interaction skills can be challenging for people with ASD.

Examples of social communication and social interaction characteristics related to ASD can include

- Avoids or does not keep eye contact
- Does not respond to name by 9 months of age
- Does not show facial expressions like happy, sad, angry, and surprised by 9 months of age
- Does not pretend to be something else, like a teacher or superhero, during play by 48 months of age
- Does not play simple interactive games like pat-a-cake by 12 months of age
- Does not notice other children and join them in play by 36 months of age
- Does not sing, dance, or act for you by 60 months of age
- Uses few or no gestures by 12 months of age (for example, does not wave goodbye)

- Does not share interests with others by 15 months of age (for example, shows you an object that they like)
- Does not point to show you something interesting by 18 months of age
- Does not notice when others are hurt or upset by 24 months of age

Other Characteristics

Most people with ASD have other related characteristics. These might include

- Delayed language skills
- Delayed movement skills
- Delayed cognitive or learning skills
- Hyperactive, impulsive, and/or inattentive behavior
- Epilepsy or seizure disorder
- Unusual eating and sleeping habits
- Gastrointestinal issues (for example, constipation)
- Unusual mood or emotional reactions
- Anxiety, stress, or excessive worry
- Lack of fear or more fear than expected

III.RESULT

Repetitive Behaviors or Interests

People with ASD have behaviors or interests that can seem unusual. These behaviors or interests set ASD apart from conditions defined by problems with social communication and interaction only.

Examples of restricted or repetitive behaviors and interests related to ASD can include

- Lines up toys or other objects and gets upset when order is changed
- Repeats words or phrases over and over (called echolalia)
- Plays with toys the same way every time
- s focused on parts of objects (for example, wheels)
- Gets upset by minor changes
- Has obsessive interests
- Must follow certain routines
- Flaps hands, rocks body, or spins self in circles
- Has unusual reactions to the way things sound, smell, taste, look, or feel.

IV.DISCUSSION

1.Treatments

- Behavioral management therapy.
- Cognitive behavior therapy.
- Early intervention.
- Educational and school-based therapies.
- Joint attention therapy.
- Medication treatment.
- Nutritional therapy.
- Occupational therapy.
- Requires a medical diagnosis.

2. Interacting with that Child Who Has Autism Spectrum Disorder

Interacting with a child who has Autism Spectrum Disorder (ASD) can be a unique experience that requires a bit of patience, understanding, and empathy. Here are some tips for interacting with a child who has ASD:

2.1. Use clear, simple language: Children with ASD often have difficulty understanding sarcasm, idioms, or abstract concepts. So, it is essential to use clear and straightforward language when communicating with them.

2.2. Be patient and give them time to respond: Children with ASD may take longer to process information and respond, so it is essential to give them enough time to respond to questions or instructions.

2.3. Be aware of sensory sensitivities: Children with ASD may be hypersensitive or hyposensitive to certain sensory stimuli such as sounds, lights, or touch. Be aware of their sensory sensitivities and avoid or reduce any sensory input that may cause them distress.

2.4. Follow their lead: Children with ASD may have specific interests or preferences, so try to incorporate their interests into your interaction. This will help to build a rapport and create a positive interaction.

2.5. Use visual aids: Children with ASD may have difficulty understanding verbal instructions, so visual aids such as pictures, symbols, or written instructions can be helpful.

2.6. Avoid physical contact unless initiated by the child: Children with ASD may have sensory processing challenges and may not like physical touch or being approached too closely. Avoid physical contact unless initiated by the child.

2.7. Celebrate their strengths: Children with ASD may have unique skills and talents. Celebrate their strengths and focus on their positive attributes rather than their challenges. Overall, interacting with a child with ASD requires a lot of patience,

empathy, and understanding. By following these tips, you can create a positive and rewarding interaction that will benefit both you and the child.

3. Causes

Much of the research on autism suggests that a combination of genetic and environmental factors causes ASD. The causes of Autism Spectrum Disorder (ASD) are complex and not fully understood, but research suggests that a combination of genetic and environmental factors play a role. Here are some of the possible causes of autism:

3.1. Genetics: Studies have shown that genetic factors play a role in the development of ASD. Researchers have identified several genes that are associated with an increased risk of developing autism.

3.2. Environmental factors: Environmental factors such as exposure to certain chemicals or toxins, maternal infections during pregnancy, or prenatal stress have been linked to an increased risk of ASD.

3.3. Brain development: Research has suggested that abnormalities in brain development and functioning may contribute to the development of autism.

3.4. Immune system dysfunction: Some researchers believe that immune system dysfunction may play a role in the development of autism.

3.5. Epigenetic factors: Epigenetic factors, such as changes in gene expression without changes to the underlying DNA sequence, have also been linked to the development of ASD.

3.6. It is important to note that there is no single cause of autism, and the disorder is likely the result of a complex interplay between genetic and environmental factors. However, it is also important to note that autism is not caused by vaccines, despite the misinformation that has been spread in some communities. Multiple studies have shown that vaccines do not cause autism

4. Preventions

There's no way to prevent autism spectrum disorder, but there are treatment options. Early diagnosis and intervention is most helpful and can improve behavior, skills and language development. However, intervention is helpful at any age.

One canedetect Autism during pregnancy, by routine prenatal ultrasound can identify early signs of autism, study finds. Summary: A routine prenatal ultrasound in the second trimester can identify early signs of Autism Spectrum Disorder (ASD), a new study has found.

- Have regular check-ups, eat well-balanced meals, and exercise keeps healthy.
- Maintaining mental and physical health while planning a baby.
- Parents should stay away from drugs during pregnancy.
- Ask your doctor before you take any medication.
- Avoiding alcohol can reduce Autism.
- Seek treatment for existing health conditions.
- Acquiring vaccination.

5. Breaking through the barriers of ASD

ASD is incurable. But there is hope through some treatment for betterment. Many children can learn to communicate and interact with normal human and even can perform nominal tasks or jobs. Healthcare providers and mental health experts have learned a lot about how to break through to these children.

Love, Care, Affection, Attention helps them to recover and lead their life advanced.

Here are some things we know about children with an ASD:

- Non-Verbal communication is not understandable by them. They are a little kind of absent minded. Reacting or responding to smile or frown is very slow or neglected by them.
- They take things literally. You need to be careful to say exactly what you mean. If you hurry the child by saying "Step on it," it is not necessary to be surprised if they ask what to step on.
- They may only be able to handle one thought or idea at a time. One should keep conversations focused and simple. They may want to only talk about the one and only one thing they are really interested in at a given time. And they may want to talk about it over and over again.
- ASD patients may see things differently than you do. You may not even notice ordinary sounds, tastes, touches, smells, and sights. But these may be physically painful to the child.

6. Communication and interaction tips for ASD

There are no hard-and-fast rules on how to communicate with a child with ASD. But many family members have had success with these tips:

- Be patient

It often takes a child with ASD longer to process information. You may need to slow down your conversation to their speed. Long pauses can be helpful.

- Always stay positive

Children with ASD respond best to positive reinforcement. Be sure to talk about or reward good behavior often. Be generous with compliments for good behavior.

- Be persistent but resilient

Don't let your feelings get hurt if the child does not respond to you as you'd like. Children with ASD may have trouble both showing and controlling their emotions. They can be blunt in their responses. Don't take this personally.

- Ignore irritating attention-getting behavior

A child with ASD may act badly at times to get you to focus on them. Ignoring this behavior is often the best way to prevent it. Also talk about and reward the child's good behavior often.

- Interact through physical activity

Children with ASD tend to have short attention spans. It will also let them relax and feel calmer. This is especially true when it comes to communicating. Running around and playing outside may be a better way of sharing time together.

- Show your love and interest

Children with ASD may have trouble showing their feelings. But they still need to know that you love them. Go out of your way to express your interest, caring, and support.

- Take care of yourself

It's OK to take a break. Join parent support groups. Or ask understanding family and friends to care for your child so you can recharge. School psychologists and counselors can also provide resources to help you.

- Learn from your child

Your child's special need and abilities may show you a way to look at the world that you've never considered. As difficult as it may be on some days, relaxing, laughing, and enjoying the unique gift that is your child can provide both you and your family with many rewards.

- Believe

A child with autism is first and foremost a child. They are a growing person with unknown possibilities. Believe in what the child can do. Don't define the child by a diagnosis.

- Be affectionate and respectful

Children with ASD often need a hug, just like other children. Respect their personal space. Never force physical affection on an unwilling child. It can be challenging to interact with a child or grandchild with ASD. But it's one of the most important things you can do to help that child learn. Research shows that early, frequent, and loving involvement of family members is one of the best ways to help children with ASD.

V.CONCLUSION

Autism is not a disease, it's a temporary phase in the life of a child, if it is treated timely.

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