Analysis of Autism Recognition from a Preliminary Symptom

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Abstract. Autism is a category of beginning sign of deficiency in early phase of life and difficult to detecting, particularly in small children. This is for the reason that the autism symptoms are depend on the reaction of children to their cognitive function. On the other hand, if autism is not distinguished and delighted among the age of 2-5 years. The treatment next to a later on next phase, it becomes more complicated. Furthermore, a lot of parents are not capable to articulate each and every one of the symptoms, that children is familiarity. In this article, planned a method for indicating the probable symptom starting the beginning indication through with the preceding extended expression patient report to identify the appropriate autism category. Here the proposed method applies equally the used machine learning algorithm as well as confabulation speculation to get ready a medium which assist for receiving each category of relations for producing the rules. The clarity is used to calculate the frequencies of occurrence on a couple of provisional objects. Hence it is used for coupling of symptoms to forecast the subsequently the most feasible and convinced symptom for appropriate identification of autism. By using this method, it can identify both the ordinary and uncommon type of autism. For observing the autism identification contrivance uses a lesser amount of reminiscence for its implementation. It is quicker for the reason that single instance database admittance as compare by using the Apriority algorithm.

Keywords: Austim, Latency, Classifier, Image recognition, Symptom

1. Introduction

In Autism spectrum disorder (ASD) is a type of deficiency, means that who are unable to speak and shown their behavioral changes. This disease mostly occurs for children due to genetic disorders, environmental disorders and some biological conditions etc. [1, 2, 3, 4]. ASD is difficult to diagnosis due to hard situations of child which leads to cognitive functioning. At some situations, it is hard to be familiar with the autistic and non-autistic children. The ASD is mostly start from early age or at childhood [5, 6, 7, 8]. At there is not best for diagnosis of autism. Due to illiterate parents and they are unable to explain the features symptoms and identifications of the children. In most cases this problem leads to difficulties while doing diagnosis of the type of autism. To avoid this type of problems we proposed a system which based on machine learning and confabulation theory. In this paper we efficiently predicted the ASD in children [9, 10, 11, 12, 13].

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In this system we can do the diagnose ASD in child. This method requires the earlier symptoms taken as input. By this method parents also able to identify the symptoms which are faced by their child [14, 15, 16, 17, 18]. This system helps to the doctors identify the autism and rare behavior like repetitiveness of the children for this we applied a one technique called confabulation theory and made a one type of matrix which consists of database symptoms are extracted by applying rules from the matrix only [6, 16]. We can analyse the faster diagnosis of autism of child with only an earlier symptom as in Table 1. Machine learning is the technique to find and store the useful data and information for a long-term M.L discovers many ways to maintain a relationship among different items like healthcare domain [19, 20, 21. 22]. By using CARMRMR algorithm we can detect and cure the rest of the disease we have used concept called confabulation for faster mining data and it can select the most required symptoms for premier diagnosis [8, 9, 23, 24].

Table 1. Significant signs of ASD

Behaviors	a. Narrow interest
	b. Short attention span
	c. Intense tantrums
Play	a. Prefers solitary or ritualistic play
	b. Doesn't imitate action of others
Sensory	a. Rubs surface or Licks objects
	b. Withdraw from physical contact
	c. May find normal noises painful
Social	a. Displays lack of empathy
	b. Avoid eye contact
	c. Does not play interactive games
Communication	a. Repeats words
	b. Communicates with gestures instead of words
	c. Cannot start or maintain conversation

2. Related Works

The autism investigative conservative analysis is a partly structured, homogeneous ability of child with collective relationship. Its plays an ingenious and inventiveness role to diagnosis the ASD. Consequences indicate sub-stained methods and tests consistency for entity objects are the outstanding approaches for consistency inside domain and exceptional inside reliability [9]. In early-stage identification of autism is critical with early development. This analysis explains that complete automatic mechanism for autism detection. It was observed the child's normal language environment and speech of the child. In this method it is compared with clinical observation and its repeatable behavior of child. Here data driven is more by this system [10]. ASD is a collection of neurological developmental disabilities. This may be ameliorated by early inventions. It was collected early on distinguish ASD datasets connecting children, adolescents etc [19]. This was applied so many features alteration method, counting trigonometric data sets like sine function, Z-score function. This was suggested and it will be probable to concern models on ASD primary stage. In this method, identification of ASD is observed. It is mostly dependent on investigation of illustration performance of subjects by seeing images. The main aspect is to improving performances of the system [20].

3. Method for detecting ASD

To detect the ASD following flow chart are illustrated. It represents about the operative features and structure it discusses about lot things like communication elements, environmental conditions, child conditions, diagnostic conditions, location modules, etc by using primary and secondary sensors. It consists a wearable sensor which is placed on child arm, chest, leg, hands, and any other parts of the body. This sensor traces the physical nature of child in every time. It also consists GPS device to know the child location. Ambient control device which are used to helps to interact with child by parents and observes physical space with harmful things and environmental conditions of child.

3.1. System description

The following measurements are important to perform the diagnosis process confabulation is based on low redundancy and high relevant algorithm used to extract symptoms from the ASD. This can be measured in 3 steps like Knowledge strength, generation of various rules by confabulation, selection of symptoms through Minimum Redundancy Maximum Relevance (MRMR) rule. The knowledge strength can calculate by the following Table 2.

Table 2. Redundancy of symptoms using MRMR technique

	X_1	X_2	…….	X_n
X_1	R_{11}	R_{12}	…….	R_{1n}
X_2	R_{21}	R_{22}	……..	R_{2n}
….	……	…….	……..	……..
X_n	R_{n1}	R_{n2}	……..	R_{nn}

In this each element R_{ij}if the matrix 'R' represents the symptoms 'X' in both the modules. Hence diagonal elements represent the total number of symptoms occurs through the data set. Here $X = \{X_1, X_2, X_3, \ldots, X_n\}$ set of symptoms.

Sum of signed differences: The sum of the average difference between the response to the standard and deviant stimuli is measured using the sum of signed differences.

$$SSD = \sum_{i=1}^{n} S - D \qquad\qquad (1)$$

'S' denotes the median response of standard stimuli 'D' denotes the median response of deviant stimuli. The median responses are taken for better accuracy and robustness. The standard stimuli are risky stimuli and the deviant stimuli are neutral stimuli shown in table 3.

Table 3. Symptom's representation in binary form

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
P_1	1	1	1	0	1	0	1
P_2	1	0	1	1	0	1	1
P_3	0	0	1	1	0	0	1
P_4	0	0	0	0	1	0	1
P_5	0	1	0	0	1	0	1

P_6	0	0	1	1	1	0	1
P_7	1	1	0	0	1	1	1
P_8	1	1	1	1	0	0	1

P= {P1, P2, P3,……….Pn} set of patients of ASD data base. 'P' is all the symptoms represented in binary form where '1' represents present and '0' represents absent of symptoms shown in Table 4.

Table 4. Total occurrences of symptoms throughout the database.

	S_1	S_2	S_3	S_4	S_5	S_6	S_7
S_1	2	4	2	4	2	2	5
S_2	3	6	2	4	2	6	6
S_4	2	4	3	4	3	4	4
S_5	3	2	2	5	2	2	2
S_6	1	6	4	3	2	8	8
S_7	2	5	5	3	3	8	8
S_8	2	5	5	3	3	8	8

4. Result Analysis

In this article analyzed two methods of experiments for testing the abilities of child and memory consumption according to time during diagnosis of the disease. This type of method takes early-stage symptoms as input. The output is follows according to iteration of pseudo code. The upcoming new input is the union of back or previous symptoms and targeted the highest cogency from the observed symptom shown in Table 5.

Table 5. Summary of autism datasets

Type of autism	Number of instances	Number of symptoms	% of instances in dataset
Intellectual ability	55	7	11%
Cataplexy	60	5	12%
Confabulation	75	5	15%
Circumstantial speech	35	3	7%
Bruxism	20	6	4%
Munchausen syndrome	45	7	9%
Palinopsia	50	6	10%
Akathisia	75	6	15%
Catalepsy	45	6	9%
Alice wonderland syndrome	40	7	8%

The above dataset consists of 35 different symptoms which are tested on 200 children to observe the type of autism by early stage. We considered 6 autism cases out of 10 types this method is analyzed by the classification accuracy rate MRMR (CAR-MRMR) method.

Table 6: The computation time for diagnosis

Type of autism	Algorithm applied	Execution time
Fear of elevators	Apriori	24.`19
	CAR-MRMR	6.6
Vagus nerve disorder	Apriori	30.4
	CAR-MRMR	7.9
Asperser's syndrome	Apriori	28.5
	CAR-MRMR	7.3
Multiple sclerosis	Apriori	30.6
	CAR-MRMR	6.3
Intellectual disability	Apriori	29.1
	CAR-MRMR	8
Pervasive developmental disorder	Apriori	33.2
	CAR-MRMR	5.9

The above table 6 describes about the 6 types of autism and its applied algorithm apriori and CARMRMR with their execution times. It is identified the memory consumption data it requires 8GB RAM implemented in java program. Here cataplexy is identified as 90%(predicted) actual is 86%, Munchausen syndrome is identified as 89 %(predicted) actual is 76%, intellectual disability is identified as 98 % (predicted) actual is 90% etc. 4.1 Statistical analysis: The analysis has been carried out with the hypo synthesis. The statistical analysis calculates the difference between riskiness and neutral response. The computing difference is a time window was 0 to 800ms. Machine learning based classifiers: The feature can be taken from SVM classifiers is a type of supervised learning that can be classify the provided data into domains like robustness and accuracy. Heart sensors which check the abnormal heart beat and detect conditions of heart in time to time. In this machine learning techniques contains some predefined threshold values in order to activate the manager of any variations. To observe the motion child sensors are used in this we also know the repetitive behavior of the child. Gyroscope sensor detects the movement in 3D space. All the sensors work individually to know the child safety in 24/7. These sensors can detect autistic classification.

5. Conclusion

This article reports the consequences of an ASD by using features drawn from CAR-MRMR method. The quantitative models used for autism classification those have been built up using ML and pattern recognition approaches. This report is an entirely involuntary autism detection method and completely automatic technique explained and performs very well. The child vocalization sample is capable of composed in a regular and in conspicuous method in the usual home environment. There are six types of autism and their applied algorithms are applied. Here cataplexy is identified as 90% (predicted) actual is 86%, Munchausen syndrome is identified as 89 %(predicted) actual is 76%, intellectual disability is identified as 98 %(predicted) actual is 90% etc. In calculation, the result of this study provides an efficient technique to identify the autism character for dissimilar age group. While diagnose the autism character is moderately a long procedure. It's frequently deferred since of the impenetrability of sense autism in children and young people. By the facility of autism transmission request, a person is able to guide at an early on stage. That will be stop the condition beginning receiving any inferior as well as decrease expenses connected with deferred analysis.

References

[1]. Lord C, Risi S, Lambrecht L, Cook EH, Leventhal BL, DiLavore PC, Pickles A, Rutter M. The Autism Diagnostic Observation Schedule—Generic: A standard measure of social and communication deficits associated with the spectrum of autism. Journal of autism and developmental disorders. 2000 Jun;30(3):205-23.

[2]. Xu D, Gilkerson J, Richards J, Yapanel U, Gray S. Child vocalization composition as discriminant information for automatic autism detection. In2009 Annual International Conference of the IEEE Engineering in Medicine and Biology Society 2009 Sep 3 (pp. 2518-2522). IEEE.

[3]. Soltani A, Akbarzadeh-T MR. Confabulation-inspired association rule mining for rare and frequent itemsets. IEEE Transactions on neural networks and learning systems. 2014 Jun 9;25(11):2053-64.

[4]. Pancerz K, Derkacz A, Gomula J, Ganzha M, Maciaszek L, Paprzycki M. Consistency-Based Preprocessing for Classification of Data Coming from Evaluation Sheets of Subjects with ASDs. InFedCSIS (Position Papers) 2015 Sep (pp. 63-67).

[5]. Balaji VN, Srinivas PB, Singh MK. Neuromorphic advancements architecture design and its implementations technique. Materials Today: Proceedings. 2022 Jan 1; 51:850-3.

[6]. Dutta SR, Datta S, Roy M. Using cogency and machine learning for autism detection from a preliminary symptom. In2019 9th International Conference on Cloud Computing, Data Science & Engineering (Confluence) 2019 Jan 10 (pp. 331-336). IEEE.

[7]. Omar KS, Mondal P, Khan NS, Rizvi MR, Islam MN. A machine learning approach to predict autism spectrum disorder. In2019 International conference on electrical, computer and communication engineering (ECCE) 2019 Feb 7 (pp. 1-6). IEEE.

[8]. Veerendra G, Swaroop R, Dattu DS, Jyothi CA, Singh MK. Detecting plant Diseases, quantifying and classifying digital image processing techniques. Materials Today: Proceedings. 2022 Jan 1; 51:837-41.

[9]. Singh M, Nandan D, Kumar S. Statistical Analysis of Lower and Raised Pitch Voice Signal and Its Efficiency Calculation. Traitement du Signal. 2019 Oct 1;36(5):455-61.

[10]. Akter T, Satu MS, Khan MI, Ali MH, Uddin S, Lio P, Quinn JM, Moni MA. Machine learning-based models for early-stage detection of autism spectrum disorders. IEEE Access. 2019 Nov 11; 7:166509-27.

[11]. Singh MK, Singh AK, Singh N. Disguised voice with fast and slow speech and its acoustic analysis. Int. J. Pure Appl. Math. 2018;11(14):241-6.

[12]. Padma U, Jagadish S, Singh MK. Recognition of plant's leaf infection by image processing approach. Materials Today: Proceedings. 2022 Jan 1; 51:914-7.

[13]. Anushka RL, Jagadish S, Satyanarayana V, Singh MK. Lens less Cameras for Face Detection and Verification. In2021 6th International Conference on Signal Processing, Computing and Control (ISPCC) 2021 Oct 7 (pp. 242-246). IEEE.

[14]. Singh MK, Singh AK, Singh N. Multimedia analysis for disguised voice and classification efficiency. Multimedia Tools and Applications. 2019 Oct;78(20):29395-411.

[15]. Priya, B.J., Kunda, P. and Kumar, S., 2021. Design and Implementation of Smart Real-Time Billing, GSM, and GPS-Based Theft Monitoring and Accident Notification Systems. In *Proceedings of International Conference on Recent Trends in Machine Learning, IoT, Smart Cities and Applications* (pp. 647-661). Springer, Singapore.

[16]. Punyavathi G, Neeladri M, Singh MK. Vehicle tracking and detection techniques using IoT. Materials Today: Proceedings. 2022 Jan 1; 51:909-13.

[17]. Nandini A, Kumar RA, Singh MK. Circuits Based on the Memristor for Fundamental Operations. In2021 6th International Conference on Signal Processing, Computing and Control (ISPCC) 2021 Oct 7 (pp. 251-255). IEEE.

[18]. Karri, K.P., Anil Kumar, R. and Kumar, S., 2021. Multi-point Data Transmission and Control-Data Separation in Ultra-Dense Cellular Networks. In *ICCCE 2020* (pp. 853-859). Springer, Singapore.

[19]. Singh MK, Singh AK, Singh N. Acoustic comparison of electronics disguised voice using different semitones. Int J Eng Technol (UAE). 2018;7(2):98.

[20]. Siddiqa, S.K., Apurva, K., Nandan, D. and Kumar, S., 2021. Documentation on smart home monitoring using internet of things. In *ICCCE 2020* (pp. 1115-1124). Springer, Singapore.

[21]. Campisi L, Imran N, Nazeer A, Skokauskas N, Azeem MW. Autism spectrum disorder. British Medical Bulletin. 2018 Sep 1;127(1).

[22]. Jyothi, K.D., Sekhar, M.S.R. and Kumar, S., 2021, October. Applications of Statistical Machine Learning Algorithms in Agriculture Management Processes. In *2021 6th International Conference on Signal Processing, Computing and Control (ISPCC)* (pp. 237-241). IEEE.

[23]. Satya PM, Jagadish S, Satyanarayana V, Singh MK. Stripe Noise Removal from Remote Sensing Images. In2021 6th International Conference on Signal Processing, Computing and Control (ISPCC) 2021 Oct 7 (pp. 233-236). IEEE.

[24]. Kona, A.K., Anil Kumar, R. and Kumar, S., 2021. Wireless Powered Uplink of NOMA Using Poisson Cluster Process with Two Orthogonal Signal Sets. In *ICCCE 2020* (pp. 1105-1113). Springer, Singapore.