GENERIC FRAMEWORK IN CONVOLUTIONAL NEURAL NETWORKS FOR AUTISM WITH PSYCHOLOGICAL APPROACH

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Abstract

Autism is a complex, lifelong developmental disability that typically appears during early childhood and can impact a person's social skills, communication, relationships, and self-regulation. Autism is defined by a certain set of behaviors and is a "spectrum condition" that affects people differently and to varying degrees. Several factors may influence the development of autism, and it is often accompanied by sensory sensitivities and medical issues such as gastrointestinal (GI) disorders, seizures or sleep disorders, as well as mental health challenges such as anxiety, depression and attention issues. Machine learning (ML) is incorporate with many application areas and human health sectors also. In this research, we used Convolution Neural Networks for analyze the history of autism patients and their activities for extracting the features. CNN is one of the powerful machine learning algorithm for image application process. We used both video and image input dataset from autism patients and processed with our CNN framework. Finally, we can get the probability of disease and remedies with the guidelines of medical experts. We proudly present that research to the society for human community because autism is the critical and psychological decease and 2 % children are affected by autism across the world.

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I INTRODUCTION

Autism is a developmental disorder characterized by difficulties with social interaction and communication, and by restricted and repetitive behavior. Signs of autism usually appear by age 2 or 3. Some associated development delays can appear even earlier, and often, it can be diagnosed as early as 18 months. Research shows that early intervention leads to positive outcomes later in life for people with autism [1]. In this present decade, parents are engaging with different type of work commitment and more stressful life since they are leading. In our society, most of the families are nucleus and parents are not able to pave in satisfied direction because of their life style and commitment. Even though this reason is not the major parameter for autism but it plays vital role across the world.

Globally, autism is estimated to affect 24.8 million people as of 2015.In the 2000s, the number of people affected was estimated at 1–2 per 1,000 people worldwide. In the developed countries, about 1.5% of children are diagnosed with ASD as of 2017, from 0.7% in 2000 in the United States. It occurs four-to-five times more often in males than females [2]

Autism Diagnostic Criteria:

1. Deficits in social-emotional reciprocity, ranging and non verbal communication by the patients
2. Stereotyped or repetitive motor movements, use of objects, or speech and hyper- or hyperactivity to sensory input or unusual interests in sensory aspects of the environment
3. Symptoms must be present in the early developmental period
4. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning

According to medical treatment history and records says that there is no proper suggested medicine and medical experts are following psychological treatment with question and answers interaction with patients.

Autism with schizophrenia

Autism is one of three disorders collectively called autism spectrum disorders (ASDs), the other two being Asperger syndrome and pervasive developmental disorder-not otherwise specified (PDD-NOS). In contrast to autism, individuals with Asperger syndrome generally lack delays in cognitive development and communication, whereas PDD-NOS is diagnosed when the full set of criteria for autism or Asperger's syndrome are not met. Several studies have reported high levels of autistic symptoms in population with schizophrenia spectrum disorders [3]. Recent studies have examined the association between autism spectrum disorder and schizophrenia spectrum disorders, describing a number of cognitive features common to both conditions (e.g., weak central coherence, difficulties in set-shifting, impairment in theory of mind)

Autism with Machine learning approach

Research has explored exponential Autism subgroups with preliminary evidence supporting the existence of behaviorally and genetically distinct subgroups; however, research has yet to leverage machine learning to identify phenotypes on a scale large enough to robustly examine treatment response across such subgroups. [4] The present study included a sample of children with ASD (N = 2400), the largest of its kind to date. Unsupervised machine learning was applied to model ASD subgroups as well as their taxonomic relationships. Retrospective treatment data were available for a portion of the sample (n =1034). Treatment response was examined within each subgroup via regression.

II LITERATURE SURVEY

Kazi Shahrukh Omar et.al had discussed the Machine Learning Approach for detecting the autism and implemented Random Forest Techniques. They have analysed three different age groups 4-11, 11-18 and 18 years above and average age group is 29.63 years. Initially they have implemented Decision tree – CART for autism trail with whole datasets. In this scenario, best features where selected and built the tree. Second phase they have implemented Random Forest CART for random forest and classified data. Both phases were finished it was completed with Mobile application format as shown in the figure.
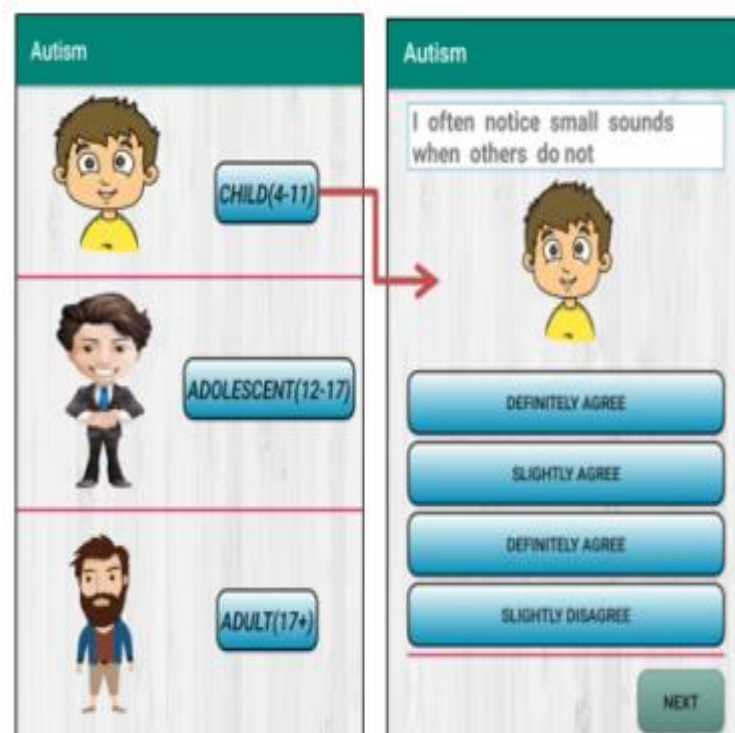
Figure 1. Mobile App implementaion

It was launched using AWS WITH Application Programmable Interface (API) for easier user of mobile users.

This exploration gives triple result: right off the bat, a forecast model was created to foresee chemical imbalance qualities. Utilizing the AQ-10 dataset, the proposed model can anticipate mental imbalance with 92.26%, 93.78%, and 97.10% precision if there should arise an occurrence of kid, juvenile and grown-up people, individually. This outcome showed better execution contrasting with the other existing methodology of screening chemical imbalance like [6], [7], and [8]. In addition, the proposed model can anticipate chemical imbalance characteristics for various age gatherings, while numerous other existing methodologies (like [5]) missed this element. The outcomes showed minor execution regarding exactness (77% to 85%) for genuine dataset. The principal purpose for this minimal outcome was the deficient number of genuine dataset. Besides, this exploration gives a similar view among different ML approach with regards to their presentation. The results showed that Irregular Backwoods Truck showed better execution than the Choice Tree-Truck calculation, while the proposed (consolidating Irregular Backwoods Truck and Arbitrary Woodland ID3) calculation give better execution contrasting to both the Arbitrary Timberland Truck and Choice Tree-Truck calculation.

At last, an easy to use versatile application has been produced for end clients in light of the proposed expectation model with the goal that any individual can utilize the application to foresee the mental imbalance attributes without any problem. This result showed an augmentation of Numerous other existing work, since a large portion of the current works primarily center around creating and contrasting the presentation of expectation model or strategies and didn't exhaust to create any portable application for end clients Zeinab Sherkatghanad et.al has described the framework of Convolutional Neural networks for automated autism detection. They distinguished ASD patients utilizing most normal resting-state utilitarian attractive reverberation imaging (fMRI) information from a multi-site dataset named the Chemical imbalance Mind Imaging Trade (Withstand). Their proposed approach had the option to group ASD and control subjects in view of the examples of useful availability. Their exploratory results show that the proposed model can recognize ASD accurately with a precision of 70.22% utilizing the Stand I dataset and the CC400 utilitarian parcellation map book of the cerebrum. Additionally, the CNN model created utilized less boundaries than the condition of-workmanship methods and is thus computationally less escalated. Our created model is fit to be tried with additional information and can be utilized to prescreen ASD patients.

III IMPLEMENTAION
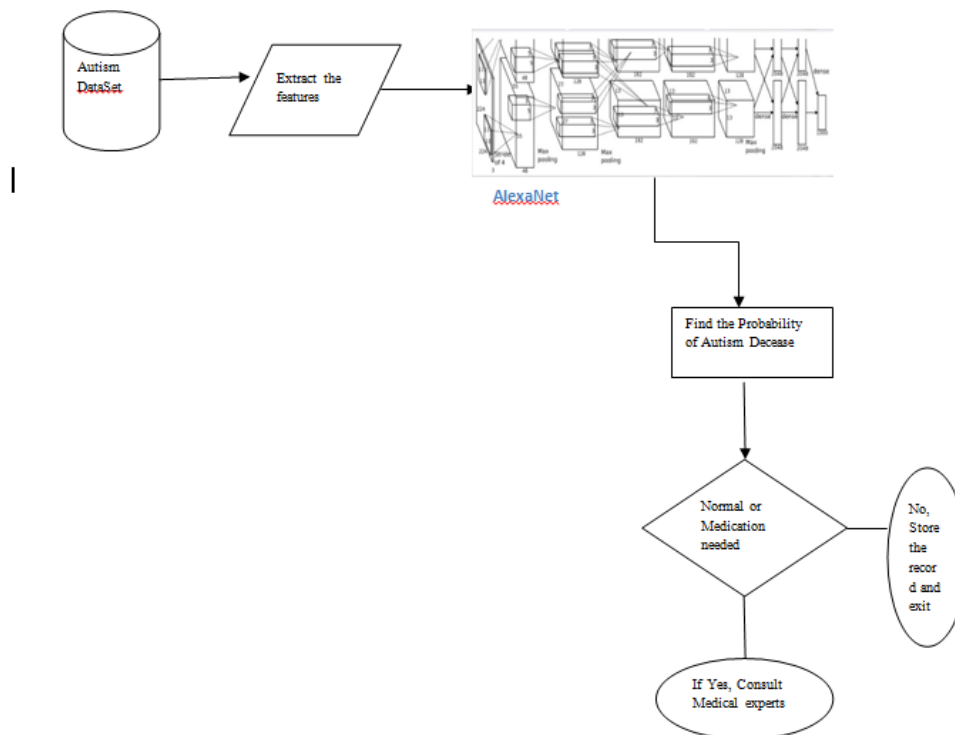
Proposed Work with AlexNet (Convolutional Neural Networks)
Figure.2 AlexNet framework for Autism analyzing

AlexNet is the name of a convolutional neural network (CNN), AlexNet contained eight layers; the first five were convolutional layers, some of them followed by max-pooling layers, and the last three were fully connected layers.

In our proposed framework, AlexNet with keras tool are implemented because it has sufficient layers for analyzing the optimum result from the datasets. We used dataset that consists of physical movements of patients and behavior and eye contacts in a time of intervals. First we extract the features from the datasets and train the network with normal and abnormal data or information. Next step, implementation with keras tool for justifying the level of autism with suggestive parameters. Finally, end user (May be patient / Medical Expert / Parent) can know the status of the autism as shown in the framework.

Autism Data Set
Table1. Autism Dataset

Case_No	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Age_Mons	Qchat-10-Score	Sex	Ethnicity	Jaundice	Family_mem_with_ASD	Who completed the test	Class/ASD Traits
1	0	0	0	0	0	0	1	1	0	1	28	3	f	middle eastern	yes	no	family member	No
2	1	1	0	0	0	1	1	0	0	0	36	4	m	White European	yes	no	family member	Yes
3	1	0	0	0	0	0	1	1	0	1	36	4	m	middle eastern	yes	no	family member	Yes
4	1	1	1	1	1	1	1	1	1	1	24	10	m	Hispanic	no	no	family member	Yes
5	1	1	0	1	1	1	1	1	1	1	20	9	f	White European	no	yes	family member	Yes
6	1	1	0	0	1	1	1	1	1	1	21	8	m	black	no	no	family member	Yes
7	1	0	0	1	1	1	0	0	1	0	33	5	m	asian	yes	no	family member	Yes
8	0	1	0	0	1	0	1	1	1	1	33	6	m	asian	yes	no	family member	Yes
9	0	0	0	0	0	0	1	0	0	1	36	2	m	asian	no	no	family member	No
10	1	1	1	0	1	1	0	1	1	1	22	8	m	south asian	no	no	Health Care Professional	Yes

11	1	0	0	1	0	1	1	0	1	1	36	6	m	Hispanic	yes	yes	family member	Yes
12	1	1	1	1	0	1	1	1	0	1	17	8	m	middle eastern	yes	no	family member	Yes
13	0	0	0	0	0	0	0	0	0	0	25	0	f	middle eastern	yes	no	family member	No
14	1	1	1	1	0	0	1	0	1	1	15	7	f	middle eastern	yes	no	family member	Yes
15	0	0	0	0	0	0	0	0	0	0	18	0	m	middle eastern	no	no	family member	No
16	1	1	1	0	1	0	1	1	0	1	12	7	m	black	no	no	family member	Yes
17	0	0	0	0	0	0	0	0	0	0	36	0	m	middle eastern	no	yes	family member	No
18	1	1	1	0	1	1	1	1	0	1	12	8	f	middle eastern	yes	no	family member	Yes
19	1	0	0	0	1	0	0	0	0	1	29	3	f	middle eastern	no	no	family member	No
20	1	1	1	0	1	0	1	1	0	1	12	7	f	black	no	no	family member	Yes
21	1	0	0	1	1	1	1	1	1	0	36	7	m	middle eastern	no	no	family member	Yes
22	1	0	1	1	1	1	1	0	1	0	36	7	m	middle eastern	no	no	family member	Yes
23	1	0	1	1	0	1	0	1	1	1	36	7	m	Native Indian	yes	yes	Health Care Professional	Yes
24	1	1	1	0	1	1	0	1	1	0	36	7	m	middle eastern	yes	yes	family member	Yes
25	1	1	1	1	1	1	1	1	1	0	22	9	m	White European	no	no	family member	Yes
26	0	0	0	0	0	0	0	0	0	0	24	0	f	middle eastern	no	no	family member	No

Data Set Descriptions:

Data Type: Predictive and Descriptive: Nominal / categorical, binary and continuous

Task: Classification

Attribute Type: Categorical, continuous and binary

Area: Medical, health and social science

Format Type: Non-Matrix

Does your data set contain missing values? No

Number of Instances (records in your data set): 1054

Number of Attributes (fields within each record): 18 including the class variable

IV Result & Discussion

Questions were asked

1. Name is remembered by the child?
2. Eye contact
3. Point indication
4. Child Interest
5. Child Pretend
6. Child Looking
7. Family issues
8. Child's First Word
9. Gesture of the Child
10. Apparent Pupose

The above questions were asked and documented for the inputting of our learning system. The answers were formulated as shown in the table with following parameters.

'Case_No', 'A1', 'A2', 'A3', 'A4', 'A5', 'A6', 'A7', 'A8', 'A9', 'A10',
    'Age_Mons', 'Qchat-10-Score', 'Sex', 'Ethnicity', 'Jaundice',
    'Family_mem_with_ASD', 'Who completed the test', 'Class/ASD Traits ']

Table2 Dataset classification

dtype='object') Case_No	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Age_Mons	Qchat-10-Score
count	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000	1054.000000
mean	527.500000	0.563567	0.448767	0.401328	0.512334	0.524668	0.576850	0.649905	0.459203	0.489564	0.586338	27.867173
std	304.407895	0.496178	0.497604	0.490400	0.500085	0.499628	0.494293	0.477226	0.498569	0.500128	0.492723	7.980354
min	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	12.000000
25%	264.250000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	23.000000

| dtype='object') Case_No	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	Age_Mons	Qchat-10-Score
50%	527.500000	1.000000	0.000000	0.000000	1.000000	1.000000	1.000000	1.000000	0.000000	0.000000	1.000000	30.000000
75%	790.750000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	36.000000
max	1054.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	36.000000
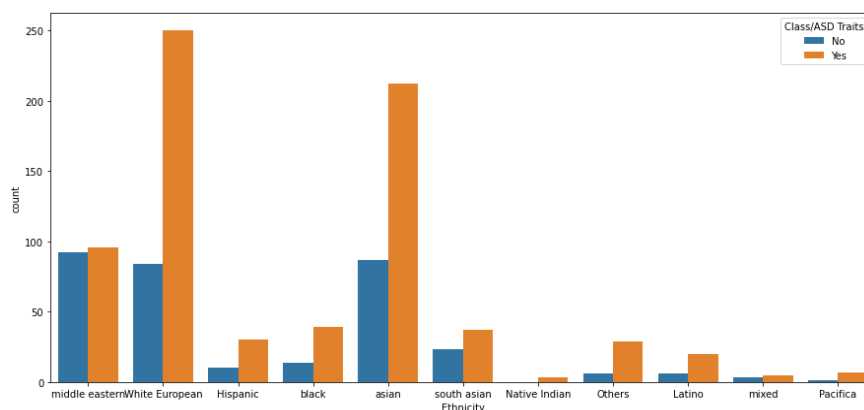
Figure3. Comparisons chart

Conclusion:

We proposed a novel framework with Alex Net CNN machine learning approach for autism treatment process. Artificial Intelligence is the branch of study and this learning techniques are widely used all the human life and IT application. Psychology or human mind cannot be analyzed with physical equipments but our proposed ML will leads the problem and identify the optimum result with its maximum layers (eight). Our ancient medicine and medical experts were used only positive and psychological approach without testing instruments but present decades, this approach is not possible for all the decease. So we incorporate with ancient model and new ML algorithm for autism. We contributed large datasets and trained values and based on the training model it produce the suggestion to the users.

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