SHAPING FUTURE AUTISM

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***Abstract*- A neurodevelopmental condition known as autism spectrum disorder can make a person exhibit repetitive behaviour and lack of social contact. It must be diagnosed and treated at an early stage; otherwise it may adversely affect the life of that individual. However, ASD affected individuals will be of different age group, we are aimed to focus mainly on children affected with ASD of age group 5-16. The main challenges faced by autism affected children(individuals) are, they may lack in speaking and listening skills, also difficulty in understanding facial expressions meaning, not having good concentration skills, and many minute problems are accompanying ASD affected individuals(children). As a result, the goal of this initiative is to serve as a link between ASD affected children and their guardians. The technology offers two options 1) improving the speaking skills through reading and 2) improves concentration through making them listen to. Core aim of our system is to provide treatment to the affected child, but through our system we also offer detection of autism by using training data set. Algorithm used to achieve the system is Efficient Net B3**

***Index Terms*—neurodevelopmental, diagnosed, expression, interact.**

INTRODUCTION

Speaking and listening skill is arguably essential to human interaction and has been around since the dawn of human civilization. It is the medium people use to express themselves and communicate to understand their thoughts about the real world. Unfortunately, in our rapidly changing society, the autism affected people are usually forgotten and left behind. They have trouble arguing their ideas, voicing their opinions, and expressing themselves to people who are different from them. So, the communication gap has been widened between the ASD affected and non affected ones. Here comes theuse of our system “Shaping future autism”. “Shaping future autism” is a web application we are designing aimed to improve the speaking a For working out this system we took a base paper for reference called”. "An Immersive Human-Robot Interactive Game Framework Based on Deep Learning for Kids' Concentration Training" If you require any further clarification or details about this paper, please let me know. To summarize, the paper presents an immersive human-robot interactive game framework that employs deep learning for children's concentration training. The framework comprises four functional modules: video data gathering, image recognition modelling, YOLOV5 deep learning method, and information feedback. The aim is to address challenges such as the shortage of qualified teachers, low effectiveness in concentration training, and lack of attention during training processes by creating interactive games based on gesture recognition.. First, they employed the YOLOv5 method to construct a gesture detection model that contained 10,000 images of kid- related gestures. The recognition training's typical accuracy was 98.7.But in this paper we have found many disadvantages so that we prepare our system. In the paper it is seen that the main focus of the paper is to identifying the gestureby using HRI game experiment and only aim to improve the concentration training of the affected children. But through oursystem we not only aim to detect and improve concentration training but also provide different training to improve thecharacter development of children. First part of our systemis detection of ASD affected children this is done by using training dataset of the existing base paper. After this phaseof detection we provide training for the affected children. In this training phase we are improving the speaking skills of the children through improving their reading skills this is done by making them read a paragraph or more in our application soby that the children with the disability can improve their skillsby continuous reading. Also through our system we provide listening skills so by improving the listening skill of a childit can in turn improve the concentration.

RELATED WORKS

In [1],According to Fengkai Ke, and Donna M Rizo, “Analysis of Autism Spectrum Disorders' Classification and Biomarkers Utilising deep learning to achieve accurate disease classification is now common practise and is based on the "Recurrent Attention Model." It is challenging for clinicians to believe their diagnosis outcomes and to derive more valuable information from these models due to their opaque learning and diagnosing mechanisms. The article proposes a classification system for Autism Spectrum Disorders (ASD) using brain structural magnetic resonance imaging (SMRI) data from individuals with autism, utilizing a Recurrent Attention Model.In [2],According to Yu Han, and John P Hanley,” Using machine learning to identify neuroanatomical and behavioural characteristics for the diagnosis of autism spectrum disorder in children,” The article suggests using brain structural magnetic resonance imaging (SMRI) data to create a classification system for Autism Spectrum Disorders (ASD) through the use of a Recurrent Attention Model. The goal is to identify neuroanatomical and behavioral features that can aid in the diagnosis of ASD in children. The current diagnostic process is complex, and the development of ASD-associated biomarkers and features can help automate diagnostics and create predictive models. The study utilizes the conjunctive clause evolutionary algorithm (CCEA) to select significant features that distinguish individuals with and without ASD, even when working with datasets that have a small number of samples with a large number of feature measurements. The findings suggest that machine learning tools can improve diagnostic and predictive models for ASD. In [3],According to Barbara Szymona, Anthropomorphic and zoomorphic robot experimentation standards and types. Examining the Research," The article proposes the use of brain structural magnetic resonance imaging (SMRI) data and a Recurrent Attention Model to develop a classification system for Autism Spectrum Disorders (ASD) in children. This can aid in automating diagnostics and creating predictive models, as the current

diagnostic process is complex. The study utilizes the conjunctive clause evolutionary algorithm (CCEA) to select significant features that distinguish individuals with and without ASD, even when working with small datasets. The findings suggest that machine learning tools can improve diagnostic and predictive models for ASD. Additionally, behavioural training using computer technology can enhance attention training techniques and reduce human influence in the training process. The Attention Continuity Performance Test (CPT) measures children's constant attention, while visual task training includes instruction reception, gaze, visual tracking, visual search, and visual memory. The vision-based approach of focus training incorporates situational dialogue and emotional expression in one-on-one or many-to-one interactions.In [4]According to Saied Nahavandi, "To improve the diagnostic and predictive models for Autism Spectrum Disorder (ASD) in children, the article suggests using brain SMRI data and a Recurrent Attention Model with the help of machine learning tools. The study uses CCEA to identify significant features that distinguish individuals with and without ASD, even with small datasets. Computer-based behavioural training can also enhance attention training techniques and reduce human influence in the training process. Currently, the diagnostic process for ASD involves lengthy evaluations at specific clinical offices, leading to long waitlists and delays in diagnosis of up to 13 months. The ADI-R and ADOS- 2 are two tests used for ASD diagnosis, but the growing demand for appointments at diagnostic centres is causing bottleneck situations. Additionally, a sizable proportion of those on the autism spectrum are thought to go undiagnosed. With more people becoming aware of ASD, there is a significant desire for a quicker and more automated ASD diagnostic technique that could lead to a more accurate diagnosis and treatment plan. In [5]According to Marjane Khodatars, and Li Liu, "Neuroimaging based Deep Learning Autism Spectrum Disorders (ASD) are defined by difficulties in both verbal and nonverbal communication, social interaction difficulties, restricted interests, and repetitive behaviors with fixed patterns. A neurodevelopmental condition with a very wide range of symptoms. The disease has a number of different aetiologies, and the neuropathological process is not yet fully understood.In [6] According to Andrea Marotta, Individuals with a high level of autistic traits may experience variations in the time it takes to interpret facial expressions, which can be influenced by gaze direction. The integration of facial expression and gaze direction plays a significant role in deciphering another person's intentions, and people with ASD have been observed to have challenges in encoding and integrating these cues effectively. Fast and precise detection of direct gaze is essential for both survival and social relations since it informs us that we (the observers) are the object of the viewer's attention. Face expression and gaze direction work together to modify the allocation of attentional resources as well as indicate to the perceiver the self-relevance of the viewed face7,8,9.In [7]According to Ewa Pisula, Greater Autism Phenotype in Siblings of Children with ASD "A Review," Reviewing the research on BAP among siblings of people with ASD, it presents an overview of the field. Both in the general population and among relatives of patients with ASD, it has been regularly used to evaluate the BAP. The information could be helpful for both people with ASD and those in the general community in identifying genetic risk factors for various forms of autism. In [8]According to Stefania d Petcu, and Ciprian Dopre, "Students with Autism Spectrum Disorders and Their First-Year College Experiences," gaining an understanding of how they feel about widespread genetic testing. 39 parents of children with ASD were questioned in Taiwan. The main issues surrounding beliefs that genetic testing has no utility are reviewed and assessed. The research was easier to interpret because ASD was categorised into various symptom levels and age groups. The majority of parents of children with ASD who were interviewed had positive opinions of the genetic testing for the disorder, which provided additional information about the development. "Estimating Autism Severity in Young Children from Speech Signals Using a Deep Neural Network," by Marina Eni, claims that. a range of prosodic, acoustic, and conversational variables were extracted from speech recordings of Hebrew- speaking kids who had taken an autism diagnosis examination. In [9]According to Yangguang Liu, Xiaomin Zhang and, Xiao-Zhi Gao, " A framework for interactive human-robot games that enhances children's concentration through deep learning. The games create an immersive experience for the children.," We have proposed an immersive human- robot interactive (HRI) game framework based on deep learning for children's concentration training and demonstrated its use through human-robot interactive games based on gesture recognition in order to address bottlenecks such as the lack of qualified teachers, inattention during training processes, and low efficacy in concentration training. A deep learning algorithm known as YOLOv5 is used for image recognition and provides information feedback and video data collecting are the four functional modules that make up the HRI game system. In the beginning, we used the YOLOv5 algorithm to create a gesture recognition model with 10,000 images of children's gestures. Recognition training had an average accuracy of98.7

PROPOSED SYSTEM

In our proposed system we aim to create a web application to diagnose and treat children with autism spectrum disorder. Our first step is to detect that is to identify if the individual (children) is affected with ASD this is done by using thetraining dataset from the existing dataset of the base paper.So we detect ASD affected by using various dataset that is already available. We are comparing the existing dataset with the dataset of the children to be diagnosed. If the result is positive that is they have ASD then we are treating the affectedone's, or else exit from the system. And in the next step weare providing training to the affected ones. This is done by providing two options reading and listening. In the reading phase we are providing a paragraph or more to the childrento read and improve their speaking vocabulary by continuous reading. In the listening phase similarly we are providing witha voice to listen to after listening to this voice they are asked with questions from the listened voice over and from theanswer we can know how was the concentration skill of the child can be improved.

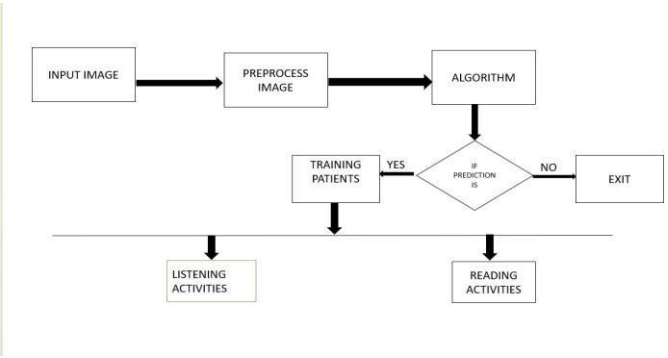

Fig 1. The Architecture

Every step needed to construct a machine learning project is included in the workflow. The following four major components make up a proper ML project:

A. Gathering data

Data collection can be done in real-time or using data gathered from a variety of sources, including files, databases, surveys, and other sources, depending on the project.

B. Data pre-processing

Usually, the acquired data contains a substantial amount of missing data, excessively high values, chaotic text data, or noisy data and cannot be used directly within the model; as a result, the data must be pre-processed before being entered into the model

C. Training and testing the model

The data is prepared for machine learning model incorporation once it is suitable for algorithm application. Before that, it's critical to have a general notion of the model that will be applied and perhaps produce a beautiful performance output. The data set is split into three main categories: the training set, the validation set, and the test set. The primary objectives are to train the data in the train set, calibrate the parameters using the "validation set," and then test the performance in the test set.

D. Evaluation

During the model creation process, evaluation is necessary to determine the model that best represents the data and predicts future performance most effectively.This is carried out once the model has been trained using various algorithms.The major objective is to complete the assessment and select the model once more appropriately

MODULES

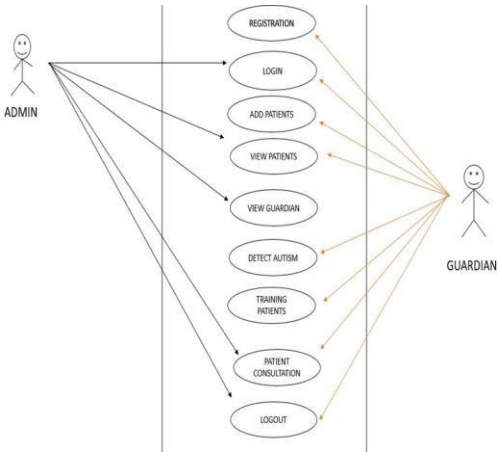

Fig. 2. Use Case diagram

The primary components of the suggested system are:

A. Admin

The login process is handled by our system administrator. Our web application's admin role has the most access levels. The administrator can access all elements in the Admin Toolbar and add material to any page. It follows that the administrator has access to options that apply to the entire app, including how our app is designed.Administrators can control a web application's configuration, settings, content, and features as well as perform oversight tasks that are essential to the operation of the business thanks to Admin.They are in charge of adding patients, viewing patients, and viewing the patient's guardian. They are also in charge of patient consultation.

B. Guardian

Since the ASD-affected youngsters are unable to complete every task on their own, the guardian serves as a liaison between the administration and the children. In addition to adding and viewing patients, the Guardian is in charge of several other tasks.They assist in the diagnosis of autism, patient education, and consultation with patients.In terms of assistance and advice, they are quite important.The use can be watched by Guardian.with healthcare providers and other experts.

CONCLUSION

A person's life can be significantly impacted by autism,a complex neurological illness.Finally, our web application is intended to support the early identification and management ofchildhood autism spectrum condition. Our programme intendsto make the process of identifying kids at risk of ASD and providing them with effective therapies easier by offering a user-friendly interface, interesting material, and focused assessments. By enhancing the effectiveness and efficiencyof the diagnostic process and putting them in touch with the resources they require to thrive ,we believe that this resource has the potential to improve outcomes for families and children with ASD. We anticipate having a significant influence with our application, and we are eager to continue developing and perfecting it.

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REFERENCES:

1. Yuan, F.; Klavon, E.; Liu, Z.; Lopez, R.P.; Zhao, X. A Systematic Review of Robotic Rehabilitation for Cognitive Training.*Front. Robot. AI* **2021**, *8*, 605715. [CrossRef]
2. Liu, W.; Anguelov, D.; Erhan, D.; Szegedy, C.; Reed, S.E.; Fu, C.; Berg, A.C. SSD: Single Shot MultiBox Detector. In Proceedingsof the Computer Vision—ECCV 2016—14th European Conference, Amsterdam, The Netherlands, 11 –14 October 2016; Part I;Leibe, B., Matas, J., Sebe, N., Welling, M., Eds.; Lecture Notes in Computer Science; Springer: Berlin/Heidelberg, Germany, 2016;Volume 9905, pp. 21–37. [CrossRef]
3. Lowe, D.G. Distinctive Image Features from Scale-Invariant Keypoints. *Int. J. Comput. Vis.* **2004**, *60*, 91–110. [CrossRef]
4. Dalal, N.; Triggs, B. Histograms of Oriented Gradients for Human Detection. In Proceedings of the 2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR 2005), San Diego, CA, USA, 20–26 June 2005; pp. 886–893. [CrossRef]
5. Krizhevsky, A.; Sutskever, I.; Hinton, G.E. ImageNet Classification with Deep Convolutional Neural Networks. In Proceedings of the Advances in Neural Information Processing Systems 25: 26th Annual Conference on Neural Information Processing Systems 2012, Lake Tahoe, NV, USA, 3–6 December 2012; Bartlett, P.L., Pereira, F.C.N., Burges, C.J.C., Bottou, L., Weinberger, K.Q., Eds.; 2012; pp. 1106–1114.
6. Deng, J.; Dong, W.; Socher, R.; Li, L.; Li, K.; Li, F.-F. ImageNet: A large-scale hierarchical image database. In Proceedings of the 2009 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR 2009), Miami, FL, USA, 20–25 June 2009; pp. 248–255. [CrossRef]
7. Simonyan, K.; Zisserman, A. Very Deep Convolutional Networks for Large-Scale Image Recognition. In Proceedings of the 3rd International Conference on Learning Representations, ICLR 2015, San Diego, CA, USA, 7–9 May 2015.
8. Szegedy, C.; Liu, W.; Jia, Y.; Sermanet, P.; Reed, S.E.; Anguelov, D.; Erhan, D.; Vanhoucke, V.; Rabinovich, A. Going deeper with convolutions. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, CVPR 2015, Boston, MA, USA, 7–12 June 2015; pp. 1–9. [CrossRef]
9. Felzenszwalb, P.F.; Girshick, R.B.; McAllester, D.A.; Ramanan, D. Object Detection with Discriminatively Trained Part-Based Models. *IEEE Trans. Pattern Anal. Mach. Intell.* **2010**, *32*, 1627–1645. [CrossRef] [PubMed]
10. Jiao, L.; Zhang, F.; Liu, F.; Yang, S.; Li, L.; Feng, Z.; Qu, R. A Survey of Deep Learning-Based Object Detection. *IEEE Access* **2019**,*7*, 128837–128868. [CrossRef]
11. Blackwell, T.; Bown, O.; Young, M. Live Algorithms: Towards Autonomous Computer Improvisers. In *Computers and Creativity*; Springer: Berlin/Heidelberg, Germany, 2012; pp. 147–174.
12. Miskam, M.A.; Shamsuddin, S.; Yussof, H.; Ariffin, I.M.; Omar, A.R. A questionnaire-based survey: Therapist's response on emotions gestures using humanoid robot for autism. In Proceedings of the 2015 International Symposium on Micro- NanoMechatronics and Human Science, MHS 2015, Nagoya, Japan, 23–25 November 2015; pp. 1–7. [CrossRef]
13. Alves-Oliveira, P.; Arriaga, P.; Paiva, A.; Hoffman, G. YOLO, a Robot for Creativity: A Co-Design Study with Children. In Proceedings of the 2017 Conference on Interaction Design and Children, Stanford, CA, USA, 27–30 June 2017; pp. 423–429. [CrossRef]
14. Ali, S.; Moroso, T.; Breazeal, C. Can Children Learn Creativity from a Social Robot? In Proceedings of the 2019 ACM SIGCHI Conference on Creativity and Cognition, C&C 2019, San Diego, CA, USA, 23–26 June 2019; pp. 359–368. [CrossRef]
15. Chen, H.; Park, H.W.; Breazeal, C. Teaching and learning with children: Impact of reciprocal peer learning with a social robot on children's learning and emotive engagement. *Comput. Educ.* **2020**, *150*, 103836. [CrossRef]
16. Cook, A.; Encarnação, P.; Adams, K. Robots: Assistive technologies for play, learning and cognitive development. *Technol. Disabil.***2010**, *22*, 127–145. [CrossRef]
17. Anzulewicz, A.; Sobota, K.; Delafield-Butt, J. Toward the Autism Motor Signature: Gesture patterns during smart tablet gameplay identify children with autism. *Sci. Rep.* **2016**, *6*, 31107. [CrossRef] [PubMed]
18. Akalin, N.; Uluer, P.; Kose-Bagci, H.; Ince, G. Humanoid robots communication with participants using sign language: An interaction based sign language game. In Proceedings of the 2013 IEEE Workshop on Advanced Robotics and Its Social Impacts,

Tokyo, Japan, 7–9 November 2013; pp. 181–186.
19. Tan, M.; Pang, R.; Le, Q.V. EfficientDet: Scalable and Efficient Object Detection. In Proceedings of the 2020 IEEE/CVF Conference on Computer Vision and Pattern Recognition, CVPR 2020, Seattle, WA, USA, 13–19 June 2020; pp. 10778–10787. [CrossRef]
20. Bochkovskiy, A.; Wang, C.; Liao, H.M. YOLOv4: Optimal Speed and Accuracy of Object Detection. *arXiv* **2020**, arXiv:2004.10934.
21. McNab, F.; Varrone, A.; Farde, L.; Jucaite, A.; Bystritsky, P.; Forssberg, H.; Klingberg, T. Changes in Cortical Dopamine D1 Receptor Binding Associated with Cognitive Training. *Science* **2009**, *323*, 800–802. [CrossRef]
22. Rahman, M.A.; Wang, Y. Optimizing Intersection-Over-Union in Deep Neural Networks for Image Segmentation. In Proceedings of the Advances in Visual Computing—12th International Symposium, ISVC 2016, Las Vegas, NV, USA, 12–14 December 2016; Proceedings, Part I; Bebis, G., Boyle, R., Parvin, B., Koracin, D., Porikli, F., Skaff, S., Entezari, A., Min, J., Iwai, D., Sadagic, A., et al.,Eds.; Lecture Notes in Computer Science; Springer: Berlin/Heidelberg, Germany, 2016; Volume 10072; pp. 234–244. [CrossRef]
23. Rezatofighi, H.; Tsoi, N.; Gwak, J.; Sadeghian, A.; Reid, I.D.; Savarese, S. Generalized Intersection Over Union: A Metric an d a Loss for Bounding Box Regression. In Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition, CVPR 2019, Long Beach, CA, USA, 16–20 June 2019; pp. 658–666. [CrossRef]
24. Zörner, S.; Arts, E.; Vasiljevic, B.; Srivastava, A.; Schmalzl, F.; Mir, G.; Bhatia, K.; Strahl, E.; Peters, A.; Alpay, T.; et al. An Immersive Investment Game to Study Human-Robot Trust. *Front. Robot. AI* **2021**, *8*, 644529. [CrossRef]
25. Logan, D.E.; Breazeal, C.; Goodwin, M.S.; Jeong, S.; O'Connell, B.; Smith-Freedman, D.; Heathers, J.; Weinstock, P. Social Robots for Hospitalized Children. *Pediatrics* **2019**, *144*, e20181511. [CrossRef]
26. Redmon, J.; Divvala, S.K.; Girshick, R.B.; Farhadi, A. You Only Look Once: Unified, Real-Time Object Detection. In Proceedings of the 2016 IEEE Conference on Computer Vision and Pattern Recognition, CVPR 2016, Las Vegas, NV, USA, 27 –30 June 2016; pp. 779–788. [CrossRef]
27. Redmon, J.; Farhadi, A. YOLOv3: An Incremental Improvement. *arXiv* **2018**, arXiv:1804.02767.
28. Redmon, J.; Farhadi, A. YOLO9000: Better, Faster, Stronger. *arXiv* **2016**, arXiv:1612.08242.
29. Nepal, U.; Eslamiat, H. Comparing YOLOv3, YOLOv4 and YOLOv5 for Autonomous Landing Spot Detection in Faulty UAVs.*Sensors* **2022**, *22*, 464. [CrossRef]
30. Bernotat, J.; Eyssel, F.; Sachse, J. The (Fe)male Robot: How Robot Body Shape Impacts First Impressions and Trust Towards Robots. *Int. J. Soc. Robot.* **2021**, *13*, 477–489. [CrossRef]
31. Clarke, A.R.; Barry, R.J.; McCarthy, R.; Selikowitz, M.; Johnstone, S.J. Effects of imipramine hydrochloride on the EEG of children with Attention-Deficit/Hyperactivity Disorder who are non-responsive to stimulants. *Int. J. Psychophysiol.* **2008**, *68*, 186–192. [CrossRef]
32. Baer, R. Assessing Mindfulness in Multiple Contexts: A Comment on Christopher, Woodrich, and Tiernan (2014). *Mindfulness* **2015**, *6*, 687–692. [CrossRef]
33. Arns, M.; Conners, C.K.; Kraemer, H.C. A decade of EEG Theta/Beta Ratio Research in ADHD: A meta-analysis. *J. Atten. Disord.* **2013**, *17*, 374–383. [CrossRef]
34. Chen, Y.; Shen, J. Core indicators of an evaluation and guidance system for quality of care in inflammatory bowel disease centers:A critical review. *eClinicalMedicine* **2022**, *46*, 101382. [CrossRef]
35. Xu, Y.; Jeong, S. The contribution of human superior intra-parietal sulcus to visual short-term memory and perception. In *Mechanisms of Sensory Working Memory: Attention and Performance XXV*; Elsevier Academic Press: Cambridge, MA, USA, 2015;pp. 33–42
36. Mitchell, D.J.; Cusack, R.; Cam-CAN. Visual short-term memory through the lifespan: Preserved benefits of context and metacognition. *Psychol. Aging* **2018**, *33*, 841–854. [CrossRef]
37. Liu, L.; Liu, Y.; Gao, X.Z. Impacts of human robot proxemics on human concentration-training games with humanoid robots.*Healthcare* **2021**, *9*, 894. [CrossRef] [PubMed]