Literature Review On Deep Learning Models For Early Detection Of Autism Spectrum Disorder

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Abstract

Autism Spectrum Disorder is a mental illness that can affect anyone at any age and in any setting. The primary factor contributing to the problem's escalation is, first and foremost, the way we live today. This proposed research review deals with classify and review the various exiting Deep Learning models anddiscuss the features of Autism Spectrum Disorder identify the promising direction for future research.

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1. INTRODUCTION

Autism Spectrum Disorder is a mental illness that can affect anyone at any age and in any setting. The primary factor contributing to the problem's escalation is, first and foremost, the way we live today. This disorder most likely developed as a result of both inherited and environmental factors. In reality, a person may have symptoms of this illness as early as age 3 and for the remainder of their lives. Although these symptoms cannot be entirely addressed, they can be temporarily lessened if the child is identified when they are still quite young.. This proposed research review deals with classify and review the various exiting Deep Learning models and discuss the features of Autism Spectrum Disorder identify the promising direction for future research.

ASD has a significant financial impact notwithstanding the challenges in identifying these individuals and the increased prevalence of ASD cases worldwide. Early ASD diagnosis promotes treatment as well as adequate medical care, which can reduce the long-term costs of a delayed diagnosis. Early discovery of ASD is crucial in order to successfully administer therapies and/or medications and avoid the long-term implications of a delayed diagnosis.

People with autism behave very differently from
other people. Autism has a profoundly different impact on behaviour than other personalities. A person's demeanour, capacity for learning, attitude, IQ, and the findings from an MRI can all be used to diagnose it. Several algorithms, including SVM, LR, NB, ANN, KNN, etc., were utilised in ML and DL. Recurrent Neural Networks (RNNs), CNNs, and other neural networks recognise autism using deep learning approaches. ASD has also been classified using rule-based methods like fuzzy logic and a variety of image processing techniques that extract information from images.

Researchers have looked into brain activity, voice, behaviour, and imagery. Autism has been identified using each of these characteristics. Several datasets have been created using these attributes. This data set contains fMRI scans of autistic people's anatomical, phenotypic, and functional characteristics. Businesses that exchange brain imaging data (ABIDE-I). The company Bertoncelli and Co.There are 1112 distinct instances in this dataset overall (539 ASD, 573 No ASD). The ABIDE II datasets, an upgraded version of the ABIDE I datasets, contain information on brain connections.
The dataset is made up of 1114 samples. Ten

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questions are posed to the patient and carer as part of the Autism Spectrum Quotient Test (AQ-10) to establish whether the patient has autism. The class label is one of the test's 21 attributes.

2. LITERATURE REVIEW

It is well documented that over the course of 14 years, the prevalence of ASD in children increased from 1 in 100 to 1 in 59. Best practices for evaluating, diagnosing, and treating ADHD are said to exist. ASD further advises that you follow the Diagnostic and Statistical Manual guidelines exactly (DSM). The emphasis on the symptom criterion was found to occur in a number of contexts (e.g., home, school). However, the researchers note that both the Autism Diagnostic Observation Schedule (ADOS-R) and the Autism Diagnostic Interview (ADI-R) are labor- and time-intensive. Machine learning (ML) and artificial intelligence (AI), two recent advances, have greatly advanced the area. Particularly in the fields of neurology and psychiatry, it performs better and provides better support. Artificial intelligence is a potential substitute (AI). Artificial intelligence (AI) is a subset of intelligence that imitates the biologically based cognitive functions of the human brain..

As more and more attempts are made (such as those in developing, business, education, and regular applications) to create promising results, artificial intelligence is being applied in settings that provide medical care. both you and others. Machine learning and deep learning are two of the most frequently used subfields in AI research (DL). Unsupervised ML explores unlabelled datasets by uncovering insights without prior knowledge, in contrast to supervised ML, which employs a labelled dataset to learn and produce accurate calculations. By creating intricate models that are more complex than what humans can dismantle, we can extract pertinent data from vast databases. Together with expanding our knowledge of ASDs, ML can repeat the essential concepts required for more accurate screening diagnosis. The ability to methodically extract information from high dimensional data across several neural layers has also been demonstrated by deep learning with many hidden layers, leading to considerably improved ASD classification accuracy.

3. DEEP LEARNING MODELS FOR ASD PREDICTION

Using fMRI and deep learning, numerous methods of ASD differentiation have been attempted. Koyamada et al. investigate the development of a deep neural network-based subject-transfer decoder (DNN). In the unsupervised pre-training stage, the author employed two auto encoders and a reduced-dimension version of the ABIDE data. They identified the regions of the brain that were crucial for distinguishing ASD from typical controls.Recently, DL methods such auto encoders and neural networks have gained popularity for diagnosing ASD, as have DNN, LSTM, and. Brown et al. suggested a component perceptive layer for DNNs that merged the information driven primary priors to achieve 68.7% classification exactness on 1,013 subjects made up of 539. 474 individuals, 474 without ASD.Using a large neuroimaging dataset from the ABIDE-I and DL technique, Heinsfeld et al. used deep neural networks to identify ASD patients, and they were successful in doing so with a mean classification accuracy of 70% and a range of 66% to 71%. The authors achieved mean accuracy of 65% for the SVM classifier and 63% for the RF classifier, respectively.

Aghdam et al. selected a combined informational collection of sMRI and fMRI neuroimages of ASD and TD members with an age scope of 5–10 years using the ABIDE-I and ABIDE-II dataset. The results for ASD detection came from combining three different forms of fMRI data: WM, GM, and sMRI-compatible GM and WM. As a classifier, the deep belief network (DBN), levels 2 and 3, was used. Moreover, Logistic

The DBN models for the classification job have regression as their top layer. When three separate data sample types—WM, GM, and fMRI—were pooled for categorization, the Deep Belief Network model achieved the highest accuracy rate. Zhang et alused diffusion magnetic resonance imaging to differentiate between male children with ASD and children with TD (dMRI). In this work, an SVM and 10-fold cross validation were used to analyse the entire cerebrums of 70 children with ASD and 79 typically developing controls from Philadelphia's Center for

Mental Illness Research through Children's Medical Clinic. They were able to classify participants as having ASD or TD by eliminating specific diffusion highlights from each patient's fibre bunch. The model used 4697 significant fibre groups to achieve an accuracy score of 78.33%. The sensitivity and specificity of this model were 84.81% and 72.86%, respectively.

The CNN was created by Sherkatghanad et al. to identify the ASD region in pictures. Based on functional connection characteristics, the established technique can recognise autistic patients. Less parameters were used, therefore less calculation was required. To create a model that was more reliable, more data were required. Goel et al. developed the Modified Grasshopper Optimization Algorithm with the goal of categorising the ASD region from images (MGOA). Three ASD screening datasets with a variety of age groups, including adults, kids, and teenagers, were investigated to analyse this process. Even though the computation time has decreased, the convergence speed is still unsatisfactory. Xu et al. used deep learning to categorise ASDs. In this deep learning method, models of an enhanced bagging algorithm, CNN, and Long-Short Term Memory (LSTM) were created. This method's objective was to investigate potential temporal fluctuation patterns for ASD detection. High classification accuracy was achieved. It was also crucial to be more receptive to the potential interpretations of a well-trained scheme. The Deep Learning network for ASD classification was created in by Xie et al. That was done with more accuracy. The classification was also considerably impacted by a number of pixel-based visual elements that our system discovered inside the brain images. Here, a brand-new, dynamic strategy for identifying and categorising the aberrant visual attention in ASD is provided using a two-stream deep learning approach. It was ineffective to concentrate more on the information integration process. For the classification of ASDs, Xu et al. modelled the CNN+LSTM method. This method led to a more precise classification but missed the aberrant neural patterns in the ASD-related brain areas. The support vector machine (SVM), developed in by Oh et al., is used to classify ASDs. The SVM classifier performs better in categorising kids with ASD compared to kids with average development, the researchers discovered. When the sorted feature set was used as an input to SVM polynomials for further classification, three useful and dynamic characteristics were added to construct the autism index. The methodology of cloud-based detection used in the approach proved unsuccessful. Eslami created the hybrid learning method for classifying ASD from images. Positive outcomes for the diagnosis of the ASD condition have been observed. SUMMARY

CONCLUSION

This research work deals with classify and review the various Deep Learning models and discuss the features of Autism Spectrum Disorder identify the promising direction for future research.

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