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Autism Spectrum Disorder Prediction by Bio-inspired Algorithm with Blockchain based Database

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Abstract

Autism Spectrum disorder can be diagnosed easily when it is identified earlier. In order to identify earlier, Machine learning algorithms and Bio-inspired algorithms are used. The characteristics of an individual is applied on Machine Learning to build the best accuracy models. In this proposed work the machine learning algorithm shows moderate accuracy level. In order to improve the accuracy level one of the Bio inspired algorithm are used. This proposed work shows the better accuracy level as 99.8% and the database are secured by using the Block chain Technology.

1. Introduction

Artificial Intelligence is one of the growing computer technology in the world. Artificial intelligence in health care is defined as the replica of human intelligence which are processed by machines or computer system especially to perform several tasks. Artificial intelligence are both weak and strong. (Xu et al., "A Comprehensive Survey of Image Augmentation Techniques for Deep Learning") Strong AI does not need any human interference for example self-driving car but in weak AI it does not work without human interaction. AI consist of different types of technology some of them are Automation, Machine Learning, Machine Vision, Natural Language Processing and Robotics. This paper focuses on the machine learning technology for getting better accuracy level in predicting Autism Spectrum Disorder. (Hosseinzadeh et al., "A review on diagnostic autism spectrum disorder approaches based on the Internet of Things and Machine Learning")

Machine Learning is a sub-domain of Artificial Intelligence. There are various types of Machine Learning algorithm they are K- Nearest Neighbour, Decision Tree, Naïve Bayes, Support Vector Machine and Random Forest. (Xu et al., "A Comprehensive Survey of Image Augmentation Techniques for Deep Learning") One of the Bio-inspired algorithm is combined with machine learning algorithm to perform better prediction. There are several bio inspired algorithms some of them are Ant Colony algorithm, Bee algorithm, Bat algorithm, Grasshopper Algorithm and Grey Wolf algorithm. In this proposed work, Grey Wolf Algorithm is combined with various machine learning algorithms. (Sanjay, Shelke, et al.)

Autism Spectrum Disorder is one of the Neurological Disorder in which the patient feels discomfort while interacting with others. The major symptoms of autism are lack of eye contact, lack of speech, plays in fixed ordered, feels irritated when the schedule changes, avoid crowded area etc. There are several types of autism among that major types of autism are Asperger's syndrome, Rette syndrome, Kanner's syndrome. Autism can be cured by giving

frequent therapies and training through early intervention schools. (Hosseinzadeh et al., "A review on diagnostic autism spectrum disorder approaches based on the Internet of Things and Machine Learning") Autism can be diagnosed easily when it is predicted earlier. In order to predict the Autism spectrum disorder earlier this proposed work are developed.

Block chain Technology is one of the booming technology. Block chain Technology is defined as the distributed ledger where the information which are stored are transferred across the entire network. By implementing the Block chain technology in database it is very difficult to hack. In order to provide the security, Block Chain Technology were implemented in this proposed work.

In this proposed work two types of dataset are used one is live dataset which is collected from the early intervention center as well as in clinics and the other data is collected from the University of California Machine Learning Repository which is publicly available in online (Dua et al.).

2. Literature Review

Panagoita Anagnostopoulou et.al, have presented that how Artificial intelligence plays an important role in predicting the autism in an early stage in order to help the clinicians (Anagnostopoulou et al.).

Suman Raj et.al, has used the machine learning techniques for detecting the Autism Spectrum disorder. They proposed that Convolution Neural Network shows the better accuracy in prediction when compared to other (Raj, Masood, et al.).

Anestis Fotoglou et.al, experimented and proposed an IOT applications in order to help the people who are suffering from autism (Fotoglou et al.).

M.S.Mythili et.al, have made a study on autism spectrum disorder by using the classification techniques. The main goal of their paper is to identify the autism levels as well as problem (Mythili, Shanavas, et al.).

Dylan Yaga et.al, have presented a paper on overview of blockchain technology. Their purpose of this paperwork is inorder to help the unkown to know about the Block Chain Technology even better (Yaga et al.).

Farman Ullah et.al, have experimented and proposed a wearable sensor IOT device in order to get the time series data of a children who suffers from autism spectrum disorder (F. Ullah et al.).

These are the literature review which helped to implement this proposed work.

3. Methodology

Data are pre-processed is nothing but the meaningful data are extracted from the raw data. Then the processed data are taken as input for the feature extraction as shown in the Figure 3.1(proposed workflow for predicting autism spectrum disorder).
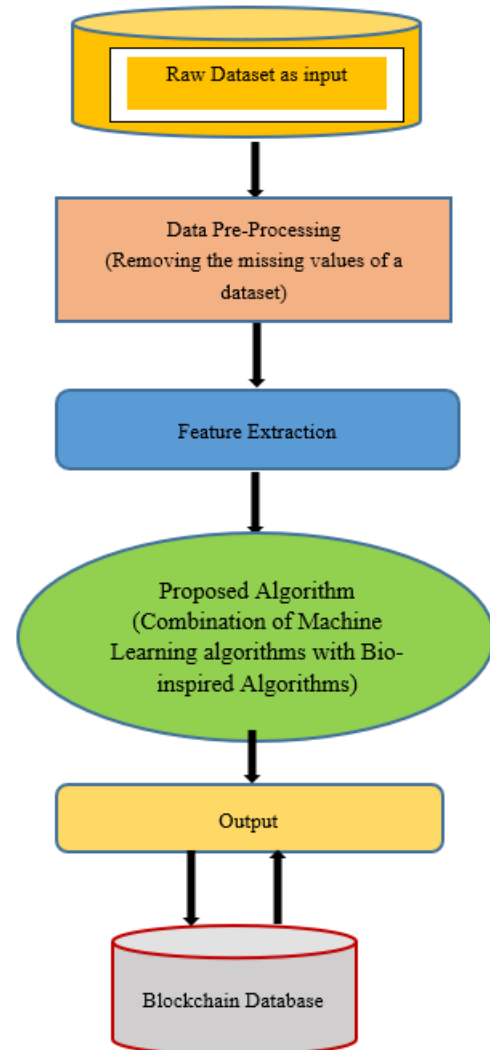

FIGURE 1. Represents the Proposed workflow for predicting Autism Spectrum Disorder

3.1. Proposed Algorithm

The machine learning algorithms are applied on feature extraction to predict the disease. Naïve Bayes is one of the supervised algorithm where it calculates the probability for a given dataset and it shows less time for training the dataset. K-Nearest Neighbour is one simplest algorithm when compared to

other.in order to reduce the error rate it should be selected carefully. Support vector machine is one of the linear supervised learning algorithm it shows the better accuracy level when compared to all the three as shown in Table 1.

This machine learning algorithm shows the less accuracy level for predicting the disease in order to overcome the issue the machine learning is combined with the Grey Wolf algorithm as shown in Table 2.

3.2. Support Vector Machine

Support Vector Machine is one of the supervised machine learning algorithm which is used for classification as well as regression. It is used to solve the pattern recognition problem. It does not create any problem of overfitting. This model separates the class based on decision boundary. This model shows the best results when compared to the other machine learning algorithm but it shows the moderate results as overall comparision for classifying the Autism syndrome. In order to overcome this issue one of the bio-inspired algorithm is combined to produce the better results.

3.3. Grey Wolf Algorithm

Grey Wolf Algorithm is one of the types of Bio-inspired Algorithm. It is one of the recent algorithm which is quite differen from the other bio inspired algorithm it works based on the wolf hunting factor where it consist of four types they are a_α , b_β , c_δ and d_Ω . Among these four the a_α wolf is responsible taking the decision, b_β acts as helping agent for making decision and c_δ wolf dominates the d_Ω ..It is one of the new algorithm and it shows the better prediction rate while combining with the Support vector machine learning algorithm. The outcome of this proposed are verified by using the confusion matrix as mentioned below.

4. Result and Discussion

Thus the below Table 1 and Table 2 shows that the support vector machine algorithm along with the Grey Wolf algorithm produce a better results when compared to the other algorithm. The results are tested by using the confusion matrix, Accuracy, Precision and Recall.

4.1. Accuracy

Accuracy is calculated to measure an overall effectiveness of the proposed method. It can be calculated using the mathematical representation as follows in the equation 1.

$$Accuracy = (TN + TP)/ \atop (TN + TP + FP + FN) \qquad (1)$$

Where, TN=True Negative, TP=True Positive, FP=False Positive, FN=False Negative.

4.2. Precision

Precision is calculated to the measure the performance level in classifying the positive data in the proposed method. It can be calculated using the mathematical representation as follows in the equation 2.

$$Precision = (TP)/(TP + FN) \qquad (2)$$

Where,TP=True Positive, FN=False Negative.

4.3. Recall

The Recall is one of the measure which is used to calculate the effectiveness and ability to detect of the positive one. It can be calculated using the mathematical representation as follows in the equation 3.
Where, TP=True Positive, FN=False Negative.

$$Recall = (TP)/(FN + TP) \qquad (3)$$

TABLE 1. **Performance matrices based on machine learning algorithm**

| Algorithms	Accuracy (%)	Precision (%)	Recall (%)
KNN	87.21	85.2	85.3
DT	94.6	96.2	95.2
NB	94.58	94.0	92.1
SVM	96.2	96	95.4

Table 1 shows the Performance matrices based on machine learning algorithm.

Table 2 shows the Performance matrices based on machine learning algorithm with Grey Wolf Algorithm.

This graphical representation shows the performance matrices based on machine learning algorithm as shown in Graph 1 and Graph 2 shows the Performance matrices based on combination of machine learning algorithm along with the Bio-inspired algorithm.
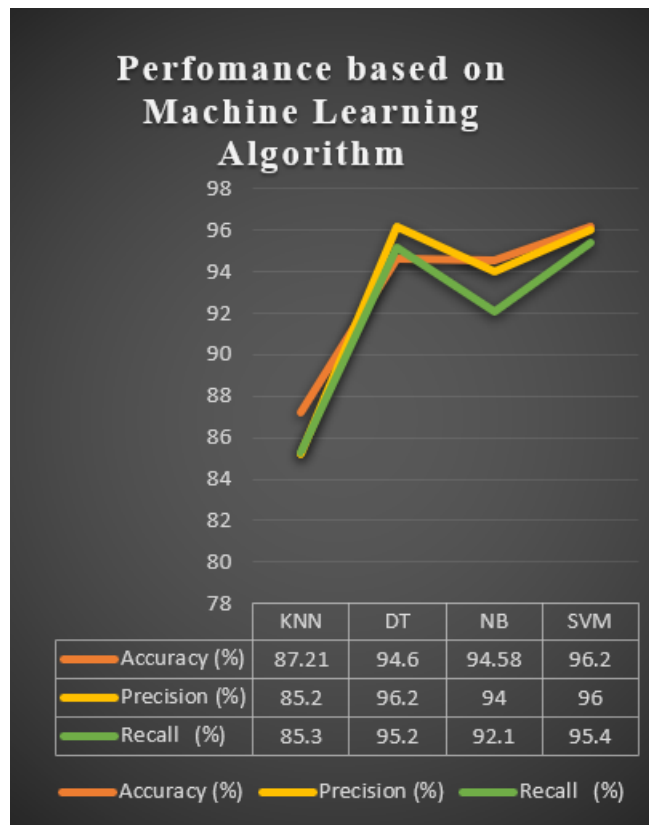
Graph 1: Graphical representation of performance metrices based on Machine learning Algorithm.
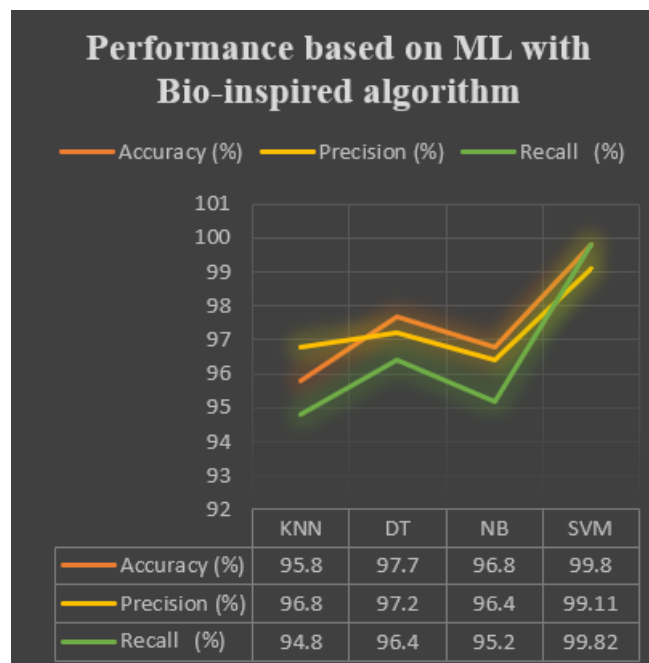
Graph 2: Graphical representation of performance metrices based on proposed algorithm.

5. Conclusion

In this proposed work the machine learning algorithm shows moderate accuracy level. In order to improve the accuracy SVM along with the Grey wolf algorithm are used. Grey wolf algorithm works based on hunting factor. By using the machine learning algorithm along with Grey Wolf Algorithm shows the better accuracy level as 99.8% and the database are secured by using the Block chain Technology.

TABLE 2. **Performance matrices based on machine learning algorithm with Grey Wolf Algorithm**

Machine Learning with Grey Wolf algorithm	Accuracy (%)	Precision (%)	Recall (%)
KNN	95.8	96.8	94.8
DT	97.7	97.2	96.4
NB	96.8	96.4	95.2
SVM	99.8	99.11	99.82

References

Anagnostopoulou, Panagiota, et al. "Artificial Intelligence in Autism Assessment". *International Journal of Emerging Technologies in Learning (iJET)* 15.06 (2020): 95–95.

Fotoglou, Anestis, et al. "IoT Applications help people with Autism". *Technium Social Sciences Journal* 31 (2022): 115–130.

Hosseinzadeh, Mehdi, et al. "A review on diagnostic autism spectrum disorder approaches based on the Internet of Things and Machine Learning". *The Journal of Supercomputing* 77.3 (2021): 2590–2608.

——."A review on diagnostic autism spectrum disorder approaches based on the Internet of Things and Machine Learning". *The Journal of Supercomputing* 77.3 (2021): 2590–2608.

Mythili, M, Ar Mohamamed Shanavas, et al. "A Study on Autism Spectrum Disorders using Classification Techniques"". *International Journal of Soft Computing and Engineering (IJSCE)* 4 (2014): 88–91.

Raj, Suman, Sarfaraz Masood, et al. "Analysis and Detection of Autism Spectrum Disorder Using Machine Learning Techniques". *Procedia Computer Science* 167 (2020): 994–1004.

Sanjay, M, Shelke, et al. "A survey on automated brain tumor detection and segmentation from MRI"". *International Research Journal of Engineering and Technology (IRJET)* 5 (2018).

Ullah, Farman, et al. "Fusion-Based Body-Worn IoT Sensor Platform for Gesture Recognition of Autism Spectrum Disorder Children". *Sensors* 23.3 (2023): 1672–1672.

Xu, Mingle, et al. "A Comprehensive Survey of Image Augmentation Techniques for Deep Learning". *Pattern Recognition* 137 (2023): 109347–109347.

——."A Comprehensive Survey of Image Augmentation Techniques for Deep Learning". *Pattern Recognition* 137 (2023): 109347–109347.

Yaga, Dylan, et al. "Blockchain technology overview". (2019).