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Adaption of Best Methodology by Comparing Different Algorithm to Detect Parkinson Disease

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Abstract: Early and accurate prediction of Parkinson's disease (PD) can play a crucial role in improving its management and outcome. The aim of this study was to identify the best methodology for PD prediction. A comprehensive review of various prediction methods, including machine learning algorithms such as Support Vector Machines, Random Forest, and Neural Networks, was conducted. The performance of these methods was evaluated using metrics such as accuracy, sensitivity, and specificity. The findings revealed that a combination of Random Forest and Neural Networks emerged as the best approach for PD prediction, providing high accuracy and robust performance. This highlights the significance of selecting the appropriate prediction method for PD and the advantages of using a combination of algorithms for improved prediction.
Keywords: Support Vector Machine (SVM), Random Forest, XGBoost , Decision Tree

I. INTRODUCTION

Parkinson's disease (PD) is a degenerative disorder that impacts the central, peripheral, and enteric nervous systems in humans, according to Braak (2000). The underlying pathogenic process moves gradually but constantly and affects various neural systems. Only specific types of nerve cells are susceptible to the disease, which results from changes in the neuronal cytoskeleton. The affected neurons eventually generate Lewy bodies in their perikarya and Lewy neurites in their neuronal processes, as described by Braak (2000).

Treatment alternatives have expanded considerably, including early and late stages of the illness, as well as greater recognition of non-motor consequences, according to Davie (2008).

Up to 80% of dopaminergic cells in the Nigro-striatal pathway are typically destroyed before the onset of cardinal motor symptoms in Parkinson's disease, according to Sveinbjornsdottir (2016). The earliest motor signs are usually used to diagnose the condition, following criteria established by the UK PD Brain Bank. Diagnosis requires slow voluntary movement characterized by a reduction in speed and amplitude of repeating acts (bradykinesia) plus one additional symptom, such as muscle rigidity, resting tremor, or postural instability.

The second step in the diagnosis process involves ruling out symptoms that could indicate other aetiologias, such as parkinsonian syndromes, while the third step is establishing at least three supportive criteria for Parkinson's disease. These criteria include the unilateral onset of symptoms, persistent asymmetry of clinical symptoms, good response to levodopa treatment, and induction of dyskinesias by dopaminergic treatment. In most cases, symptoms begin on one side of the body and progress to the opposite side within a few years. (Sveinbjornsdottir, 2016) When walking, the body posture becomes stooped, there is axial and limb rigidity with or without cogwheel phenomena, a shuffling gait, and a lack of arm movement. (Sveinbjornsdottir, 2016) The bradykinesia can cause an expressionless face (hypomimia) and reduced handwriting amplitudes (micrographia). (Sveinbjornsdottir, 2016) Around 80% of people have limb tremors, which is most typically described as a resting pill-rolling tremor of the hands.

II. LITERATURE SURVEY

Machine learning algorithms have shown promising results in detecting Parkinson's disease. These algorithms use data from various sources, such as clinical assessments, brain imaging, and physiological measurements, to identify patterns and predict disease progression.

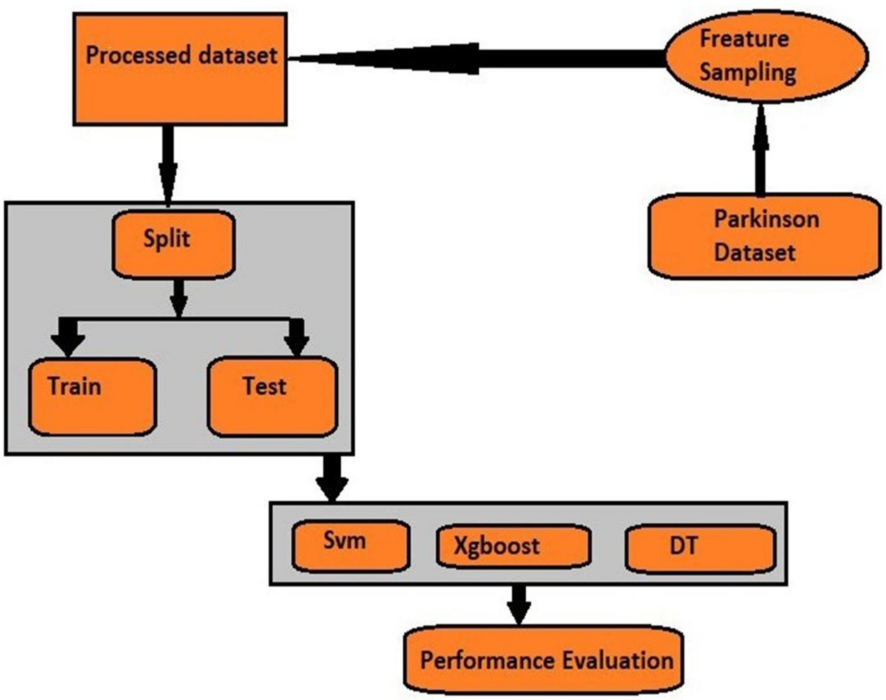
Support vector machines (SVMs), decision trees, and artificial neural networks (ANNs) are among the most commonly used algorithms for Parkinson's disease detection. SVMs have been found to have high accuracy rates and are particularly effective in cases where there is a large amount of data. in detecting early-stage Parkinson's disease.

III. METHODOLOGY

The aim of our project is to detect by testing the functioning ability of motor function of the patient with Parkinson's disease. The outcome of the project is to show the high accuracy of Parkinson's disease at its early stage.

The Data Set used for the prediction of Parkinson has patients data with 24 feature attributes which include columns like Jitter , Pitch frequency etc. and the result will show whether the person has a disease or not. On the used dataset we preprocess the data which involves the removal of outlier values, and standardizing of the dataset so that the corresponding data set can be used to developing the model Different machine learning libraries used in the project are xg-boost(eXtreme Gradient Boosting) it is an, is a scalable, distributed gradient-boosted decision tree ml library. It is a widely used machine learning library for regression and classification problems, and sk-learn is used to provide the Machine learning classifiers on processed dataset it provides some important tools for Machine learning models.

XGBOOST It is an implementation of a gradient-boosted decision tree which is a decision tree ensemble learning algorithm that combines different ML models to obtain efficient models. It combines multiple decision trees based on various decisions just like a random forest. It can be integrated with sk learn. It is used for its speed and efficiency in comparison to other algorithms.



Workflow of Model

Parkinson's disease is a neurological disorder that affects a person's ability to control their movements. Machine learning algorithms can be used to detect Parkinson's disease by analyzing various features of a patient's movements or voice. Here's a comparison of using SVM, KNN, Decision Tree, and K-Means for detecting Parkinson's disease:

SVM (Support Vector Machine): SVM is a powerful classification algorithm that is often used for complex data analysis. It is a binary classifier that separates data into two classes based on a hyperplane. SVM has been used to detect Parkinson's disease by analyzing various features of a patient's movements, such as the tremor amplitude, acceleration, and jerk. SVM has shown high accuracy rates in detecting Parkinson's disease.

KNN (K-Nearest Neighbors): KNN is a simple classification algorithm that is based on the nearest neighbor principle. KNN calculates the distance between a test sample and all the training samples and assigns the test sample to the class that is most common among its k-nearest neighbors. KNN has been used to detect Parkinson's disease by analyzing various features of a patient's voice, such as the jitter, shimmer, and harmonics-to-noise ratio. KNN has shown moderate accuracy rates in detecting Parkinson's disease.

Decision Tree: Decision Tree is a classification algorithm that uses a tree-like model of decisions and their possible consequences. It builds a tree by recursively splitting the data into smaller subsets based on the feature that best separates the data. Decision Tree has been used to detect Parkinson's disease by analyzing various features of a patient's movements, such as the tremor amplitude, acceleration, and jerk. Decision Tree has shown moderate to high accuracy rates in detecting Parkinson's disease.

K-Means: K-Means is a clustering algorithm that divides the data into k clusters based on their similarity. It assigns each data point to the nearest cluster centroid and updates the centroid based on the mean of the points in the cluster. K-Means has been used to detect Parkinson's disease by analyzing various features of a patient's movements, such as the tremor amplitude, acceleration, and jerk. K-Means has shown moderate accuracy rates in detecting Parkinson's disease.

In the experimental observation, SVM and Decision Tree have shown higher accuracy rates than KNN and K-Means in detecting Parkinson's disease. However, the choice of algorithm depends on the specific features of the patient data and the classification goals of the analysis.

IV. CONCLUSION

The primary goal of this research paper is to achieve early prediction of Parkinson’s disease with a high level of accuracy. This would significantly aid in the early detection of the disease and facilitate timely medical interventions. To achieve this objective, we have explored various machine learning techniques and evaluated their performance in detecting Parkinson’s disease accurately. Our study’s findings can pave the way for the development of an automated system that can enable early diagnosis and treatment of the disease. Furthermore, we suggest that future research can be conducted to assess the effectiveness of these algorithms on larger datasets and more complex features. Such research can potentially enhance the accuracy of Parkinson’s disease detection and enable more precise diagnosis and treatment.

REFERENCES

[1] Singh, A., Singh, D., & Singh, N. (2022). Automated Deep Learning Approach for the Detection of Parkinson’s Disease. Journal of Healthcare Engineering, 2022, 1-12. doi: 10.1155/2022/4832315

[2] “Parkinson's disease detection using support vector machine and random forest algorithms" by Nagalingam et al. (2020), published in the International Journal of Engineering and Advanced Technology.

[3] "Parkinson's disease detection using voice signals" by Tsanas et al. (2012), published in the IEEE Transactions on Biomedical Engineering.

[4] B K Varghese, G. B. Amali D*, Uma Devi K S “Parkinson's Disease Prediction Using Machine Learning Approaches” 2013 Fifth International Conference on Advanced Computing (ICoAC)

[5] Tarigoppula V.S Sriram, M. Venkateswara Rao, G V Satya Narayana3 , DSVGK Kaladhar4, T Pandu Ranga Vital, “Intelligent Parkinson Disease Prediction Using Machine Learning Algorithms” International Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue 3, September 2013

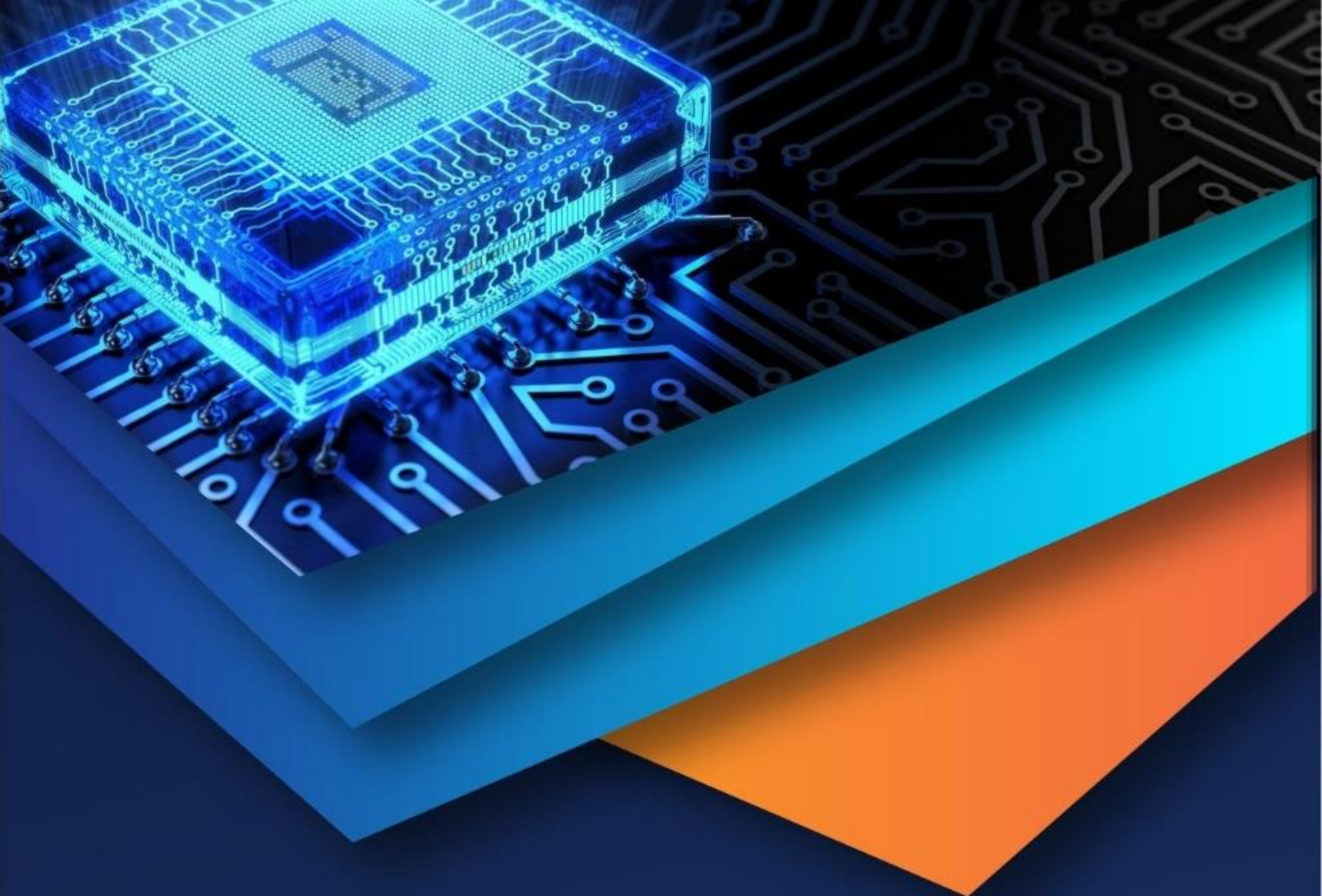
[6] Gokul.S, Sivachitra.M, “Parkinson's Disease Prediction Using Machine Learning Approaches” 2013 Fifth International Conference on Advanced Computing (ICoAC)

[7] 'Exploiting Nonlinear Recurrence and Fractal Scaling Properties for Voice Disorder Detection', Little MA, McSharry PE, Roberts SJ, Costello DAE, Moroz IM. BioMedical Engineering OnLine 2007, 6:23 (26 June 2007)

[8] INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 8, ISSUE 11, NOVEMBER 2019 ISSN 2277-8616 2576 IJSTR©2019 www.ijstr.org A Comparative Analysis Of Parkinson Disease Prediction Using Machine Learning Approaches F.M. Javed Mehedi Shamrat, Md. Asaduzzaman, A.K.M. Sazzadur Rahman, Raja Tariqul Hasan Tusher, Zarrin Tasnim

[9] Timothy J. Wroge, Yasin Özkanca, C. Demiroğlu, Dong Si, David C. Atkins and R. Ghomi (2018), “Parkinson’s Disease Diagnosis Using Machine Learning and Voice”, Computer Science, IEEE Signal Processing in Medicine and Biology Symposium (SPMB)

[10] Saloni, R. K. Sharma, and A. K. Gupta, “Detection of Parkinson Disease Using Clinical Voice Data Mining,” vol. 9, pp. 320–326, 2015.



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