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Parkinsons Disease Detection Using Machine Learning Techniques

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ABSTRACT: Parkinson's disease (PD) is a neurological condition that progresses slowly over time. Actually, it is uncertain what causes Parkinson's disease to begin with. One of the greatest global public health issues is Parkinson's disease (PD). It is a well-known statistic that only about one million people in the United States have Parkinson's disease, compared to over five million people worldwide. As a result, it's critical to identify Parkinson's disease early on so that the appropriate therapy may be planned. The majority of people are familiar with the motor signs of Parkinson's disease. However, more and more research is being done to anticipate Parkinson's disease from non-motor symptoms that come before the motor ones. A patient can receive the appropriate care at the appropriate time if early and accurate prediction is possible. In this study, we attempt to model this classifier using various machine learning methods, including Support Vector Machine and Decision Tree Classifier. Compared to other classification algorithms, these algorithms will provide a more accurate prediction of the presence or absence of Parkinson's disease.

KEYWORDS: Parkinson's Diseases(PD)

I. INTRODUCTION

Parkinson's disease (PD) is a neurological condition that progresses slowly over time. Actually, it is uncertain what causes Parkinson's disease to begin with. However, studies have shown that the interaction of hereditary and environmental variables is a significant contributor to the development of Parkinson's disease (PD). For purposes of public comprehension, Parkinson's disease is regarded as a central nervous system ailment caused by the death of cells from numerous regions of the brain. These cells also contain substantia nigra cells, which generate dopamine. The coordination of movement is greatly aided by dopamine. It serves as a chemical messenger for the transfer of messages inside the brain. Patients experience a mobility disorder as a result of the loss of these cells. As a result, there are two categories for PD symptoms. that is, both motor and non-motor symptoms. Since human beings are able to visually sense motor symptoms, many people are aware of them. It is now known that the non-motor symptoms might be noticed for a specific amount of time. It should be mentioned that none of these non-motor symptoms are conclusive, but when combined with other indicators like Cerebrospinal Fluid measurement (CSF) and dopamine transporter imaging, they may aid in the prediction of Parkinson's disease (PD). Changes in the patient's voice are one of the most prevalent symptoms that can be identified by listening to their voice data. As the illness worsens, the patient's speech becomes progressively stuttering. As a technique for analysing unstructured data, such as voice and audio signals, machine learning has gained in significance. Movement is impacted by Parkinson's disease, a degenerative nervous system condition. The symptoms often begin with a scarcely perceptible tremor in just one hand and develop progressively. As your health worsens over time, you experience more symptoms of Parkinson's disease. Although there is no known cure for Parkinson's disease, certain drugs may greatly reduce your symptoms. Sometimes, a surgical procedure to control specific brain areas and alleviate your symptoms may be recommended by your doctor. The aetiology of Parkinson's disease is unknown, and there are no known effective treatments or preventative measures. Regular aerobic exercise may lower the risk of developing Parkinson's disease, according to some research. With PD, a decent to excellent quality of life is feasible. In order to properly treat symptoms with dopaminergic medicines, you must work with your doctor and adhere to any advised therapies. Due to low levels or absence of dopamine in the brain, people with PD require this medicine. All PD treatments currently available lessen symptoms without reducing or stopping the disease's progression. Parkinson's disease symptoms can sometimes be "non-motor," or unrelated to

movement, in addition to movement-related ("motor") symptoms. Non-motor symptoms of PD frequently have a greater negative impact on patients than do motor symptoms. Apathy, sadness, constipation, sleep behaviour issues, a loss of smell, and cognitive impairment are a few examples of non-motor symptoms. In most cases, symptoms appear slowly over many years. Due to the variety of the condition, the evolution of symptoms can vary a little from person to person. People with PD might go through: The exact reason is still mostly unknown. Although there is no cure, there are numerous treatment options, including both surgery and drugs. Parkinson's disease in and of itself does not have a deadly outcome, although major complications can occur.

II. EXISTING SYSTEM

Human biological voice has been employed as the primary feature in the Fuzzy C-Means Clustering and Pattern Recognition study of Parkinson's disease. The scientists have created a model to automatically determine if a person has Parkinson's disease (PD) simply listening to patient voices. On the dataset, they have achieved an accuracy of 68.04 percent using fuzzy c-means (FCM) clustering and pattern recognition techniques. It has been demonstrated that there are numerous techniques for diagnosing Parkinson's disease that are currently being used in both medical research and public health. The expert could benefit from a lot from classification methods. Classification systems can aid in boosting diagnosis' accuracy and dependability, minimising potential errors, and speeding up the process. The goal of this work is to automatically categorise patients as having Parkinson's disease (PD) or not by applying fuzzy c-means classification and pattern recognition to a medical dataset about PD. The clustering centres of features have been located to enable these procedures. Then, each data's distance from these centres was determined, increasing the class differentiation in the categorization of PD datasets. After categorization, one of the two recognised patterns is applied to the test data. Sensitivity, specificity, positive and negative predictive values measurements were utilised to evaluate the performance of the classification accuracy.

Disadvantage

- Existing produces less accuracy
- Feature loss occurs on Rapid eye movement sleep Behaviour Disorder Screening Questionnaire.

III. PROPOSED SYSTEM

In this work Machine Learning Algorithms such as Support Vector Machine and Decision Tree Classifier has been used for analysis purpose. If early and reliable prediction is possible then a patient can get a proper treatment at the right time. In this project we try to model this classifier using different machine learning models like Decision Tree Classifier and Support Vector Machine. These algorithms will give more accuracy than the other classification algorithms. This work takes into consideration the non-motor symptoms. In this work we follow a similar approach, however we try to use different machine learning algorithms that can help in improving the performance of model and also play a vital role in making in early prediction of PD which in turn will help us to initiate neuro protective therapies at the right time. Parkinson's disease that causes the patients' motor abilities to degrade over time due to the damage caused to the dopamine-generating brain cells. Shaking, trouble moving, behavioural disorders, dementia, and depression are some of the results of this disorder. One of the most common symptoms that can be recognized by studying the patients' voice data is changes in their voice. The patient's speech stutters and becomes increasingly impacted as the disease progresses. Thus by implementing it is found that Support Vector Machine has highest prediction compared to Decision Tree Classifier

Advantages

- Prediction accuracy is more compared to existing methods.
- Less feature loss occurs due to better training models which proposed..

IV. METHODOLOGIES

The proposed system has been developed with the aim to classify people with Parkinson's disease and healthy people. In the system designing machine learning predictive classifiers such as SVM and decision tree were used to classify PD

and healthy people. The PD dataset which is online available at UCI machine learning repository was used to test the proposed system. The methodology of the proposed classification system organized into these steps pre-processing of dataset, data partition, machine learning and classifiers performance evaluation.

4.1 Data pre-processing

The pre-processing of data is a very necessary step for good representation of data and machine-learning classifier should be trained and tested with it effectively. Pre-processing techniques such as removing of missing values, standard scalar, Min-Max scalar have been applied to the dataset for effective used in classifiers. In standard Scalar ensures that every feature has the mean 0 and variance 1, bringing all features to the same coefficient. Similarly, in Min-Max Scalar shifts the data such that all features are between 0 and 1. Machine learning classifiers. In this study the following classifiers were used for PD and healthy people classification.

4.2 Data Partition

In this procedure, the independent (X) and dependent variables will be defined (Y). By using the given variables, we will divide the data into a training set and a testing set, which will be utilised for modelling and evaluation. The Python "train test split" technique makes it simple to divide the data.

4.3 Classification

On the basis of a training set of data that includes observations whose category membership is known, classification in machine learning is the problem of determining which of a set of categories a new observation belongs to. It is a technique where we categorize data into a given number of classes. A Classification model tries to draw some conclusion from the input values. It will predict the class labels or categories for the new data. For classification and prediction we use decision tree classifier and SVM algorithms.

4.3.1 Classification Using Decision Tree Classification

An algorithm for supervised machine learning is a decision tree. Any tree with a leaf node or decision node at each node is known as a decision tree. For making decisions, the decision tree's methods are straightforward and simple to comprehend. Interconnected internal and external nodes made up a decision tree. The internal nodes serve as both the child node that visits the following nodes and the decision-making component. On the other hand, the leaf node is connected to a label and has no child nodes.

4.3.2 Classification Using SVM

The SVM technique for supervised machine learning is built on the idea of decision planes, which specify decision boundaries. The objects of one class are divided from the objects of another class by a decision boundary. The closest data points to the hyper-plane are known as support vectors. The kernel function transforms input into a higher dimensional space and is used to separate non-linear data. Our suggested solution makes use of a Gaussian radial basis function kernel.

4.4 Prediction

Machine learning is a technique for finding patterns in data and applying them to predict or decide automatically. Regression and classification are the two primary machine learning techniques. As a result, we can predict if a person has Parkinson's disease. Here, machine learning techniques can be used to determine whether a person has Parkinson's disease or not.

V.SYSTEM ARCHITECTURE

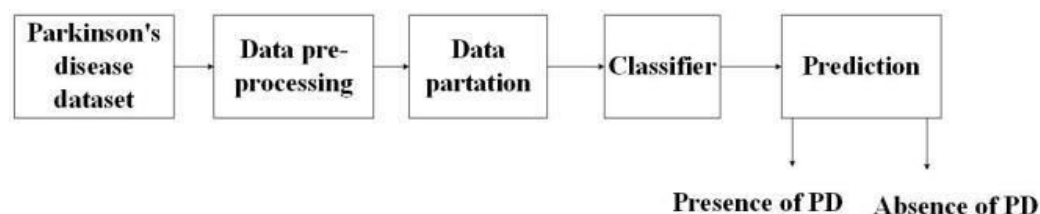


Fig.5.1 Proposed system model



VI. CONCLUSION

In this work we have modelled this classifier using different machine learning algorithms such as decision tree and support vector machine learning algorithm which gives more accuracy than the other classification algorithms. This work plays an important role in having a comparative analysis of various machine learning algorithms. In conclusion, this models can provide the nuclear experts an assistance that can aid them in better and accurate decision making and clinical diagnosis. It is also found that the proposed method is fully automated and provides improved performance and hence can be recommended for real life applications. This work was done to detect the severity of Parkinson's disease using a single model for each purpose. The study can be further extended by using other models and comparing the results to find the most optimized and efficient models for detection of disease and to determine the severity of the disease in the patients.

VI. FUTURE WORK

The quantitative data produced by the computer simulations have been analysed. Additionally, they perform in a very competitive manner with minor differences. In order to reach a more general conclusion on the relative effectiveness of the classifiers, additional tests on various datasets must be taken into account. With the aid of less datasets, using a genetic algorithm for prediction can be completed quickly.

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