PARKINSON'S DISEASE PREDICTION USING DEEP LEARNING

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***Abstract*—Parkinson's Disease is a nervous system disorder and is progressive in nature. It affects bodymovements. Symptoms begin with a hardly noticeable tremor in body parts. The disorder resultsin stiffness and slowing down of movements. It's a debilitating neurodegenerative disease and cannot be diagnosed through blood tests. Parkinson's disease mostly affects the people above 60 and is one of the common diseases among war veterans. Hence, there was a need for a faster and cheaper diagnostic tool. The project uses ML algorithms to analyze the variations in voice patterns to predict the existence of Parkinson's Disease in the patients. Pearson method of correlation is used to find out the best features and an ensemble model(XGBoost) is used to diagnose Parkinson's Disease with maximum accuracy using a dataset that consists of data from voice recordings of Parkinson's patients and unaffected subjects. These data of varying frequencies can be fed to the model and the results can be compared to find the people who are affected with the PD and display the result.**

Keywords—Parkinson's Disease, voice patterns, XGBoost.

I. INTRODUCTION

Parkinson's disease is a motion ailment that influences the imperative apprehensive system. The signs begin steadily due to low dopamine degrees withinside the mind. Dopamine is a chemical and is a neurotransmitteraccountable for sending indicators from the frame to the mind. Reduction withinside the neurons accountable for manufacturing of dopamine ends in decreasing of dopamine degrees ensuing in decreased coordination among the mind and the frame. The disease is characterised through the modern lack of dopamine-generating neurons withinside the substantia nigra location of the mind, main to motor signs consisting of tremors, rigidity, and bradykinesia. Parkinson's sickness additionally influences non-motor capabilities consisting of sleep, cognition, and mood.Currently, prognosis is usually primarily based totally on scientific exam and scientific history.

However, those strategies won't be touchy sufficient to stumble on early-level Parkinson's sickness, and misdiagnosis can occur. Therefore, system mastering algorithms were explored as a capacity device for early detection and prediction of Parkinson's sickness. Machine mastering algorithms are able to detecting diffused styles in complicated datasets that won't be obvious to human experts.

In the context of Parkinson's sickness prediction, XGBoost may be educated on a complete dataset of scientific, demographic, and genetic elements to discover those who are at excessive chance of growing the sickness. The set of rules can do not forget a couple of variables simultaneously, which might also additionally enhance the accuracy of prediction in comparison to conventional diagnostic strategies.

II. LITERATURE REVIEW

70% to 90% of patients with Parkinson's disease (PD) show an affected voice. Various studies revealed, that voice and prosody is one of the earliest indicators of PD. We employ acoustic features,prosodic features and features derived from a two-mass model of the vocal folds on different kinds ofspeech tests: sustained phonations, syllable repetitions, read texts and monologues.Acorrelation-based feature selection was performed, in order to identify the most important features for each of these systems. We report recognition results of 91% when trying to differentiate between normal speaking persons and speakers with PD in early stages with prosodic modeling. With acoustic modeling we achieved a recognition rate of 88% and with vocal modeling we achieved 79%. The masses and the compliances of spring were found to be the most important parameters of the two-mass vocal fold model [1].

Parkinson's Disease (PD) is a debilitating neurodegenerativedisease which cannot be diagnosed through standardized blood tests, so a faster, cheaper diagnostic tool is essential. Using machine learning algorithms to analyze the variations in voice patterns is a novel method of predicting the existence of PD in patients. This paper proposes a predictive model that effectively diagnoses PD with maximum accuracy using a dataset thatconsists of extrapolated data from voice recordings of Parkinson's patients and unaffected subjects. The results of experimental testing showed that a Boosted Decision Tree, which is an ensemble model made from gradient boosted regression trees, was the best model to use on the data, with an accuracy score of 91-95%. It was also discovered through filter-based feature detection that the strongest weighted features were spreadl, spread2, and PPE, all three nonlinear measures of fundamental frequency variation in the voice recordings. These findings can be applied to PD biometrics [2].

III. EXISTING SYSTEM

Deep learning methods, which are a subset of machine learning techniques, have shown great potential in predicting Parkinson's disease. These methods are based on artificial neural networks that are capable of learning complex patterns from large datasets. Currently, there are a few ML algorithms such as SVM, Deep Neural Networks, Convolution Neural Networks and such algorithms, with an accuracy of 90%.

IV. PROPOSED SYSTEM

The PD Detector allows customers to locate the presence of PD primarily based totally on voice functions. Our project will be carried out for folks who need to realize in the event that they have PD. The intention for any disorder detector could be to have correct predictions. This is viable via way of means of studying the dataset keenly and locating the essential functions for use for disorder prediction.

V. Hardware and Software Requirements

- Jupyter Notebook: Execute the code
- Anaconda: Environment for implementation
- RAM: Above 4GB
- Operating System: Windows 10

VI. METHODOLOGY

i) Working:

XGBoost is an optimized gradient boosting set of rules that has been utilized in quite a few gadget mastering tasks, such as Parkinson's disease prediction. The set of rules works with the aid of using combining a hard and fast of susceptible classifiers, or choice timber, right into a more potent predictor. The fundamental concept is to iteratively teach new choice timber to accurate the mistakes of the preceding ones, till a robust predictor is obtained. In the context of Parkinson's disease prediction, XGBoost may be educated on a complete dataset of clinical, demographic, and genetic elements to pick out those who are at excessive danger of growing the sickness.

The set of rules can bear in mind a couple of variables simultaneously, which can also additionally enhance the accuracy of prediction as compared to conventional diagnostic methods. The XGBoost set of rules includes primary components: a susceptible learner and a regularization term. The susceptible learner is a choice tree this is educated to expect whether or not an man or woman has Parkinson's disease or not.

Each choice tree is educated on a subset of the information and makes a prediction primarily based totally on a hard and fast of features, or predictors, which are acknowledged to be applicable for Parkinson's disease prediction.

ii) Implementation

In order to construct a greater positive version, a mixture of numerous ML algorithms are carried out and the end result or prediction of every version withinside the mixture is accrued and the very last end result is

Due to the decrease in motor control that is the hallmark of the disease, voice can be used as a means to detect and diagnose PD. With advancements in technology and the prevalence of audio collecting devices in daily lives, reliable models that can translate this audio data into a diagnostic tool for healthcare professionals would potentially provide diagnoses that are cheaper and more accurate. We provide evidence to validate this concept here using a voice dataset collected from people with and without PD. This paper explores the effectiveness of using supervised classification algorithms, such as deep neural networks, to accurately diagnose individuals with the disease. Our peak accuracy of 85% provided by the machine learning models exceed the average clinical diagnosis accuracy of non-experts (73.8%) and average accuracy of movement disorder specialists (79.6% without follow-up, 83.9% after follow-up) with pathological post-mortem examination as ground truth [3].

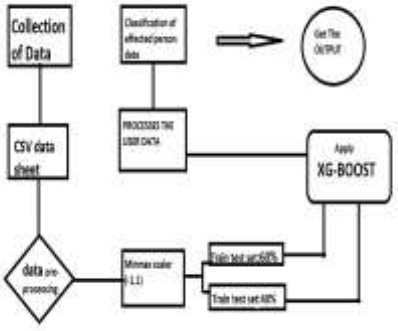

Figure 6.1 Parkinson's prediction using XG Boost

- Processor: Intel core i5 7th generation CPU

calculated. This technique of mixing a couple of base fashions to make a greater green version is referred to as an Ensemble Model. The algorithms that we've got determined to apply withinside the evaluation for deciding on the positive mixture for the proposed gadget

- **Naïve Bayes** - Naive Bayes is a machine learning algorithm that is commonly used for classification tasks, including the prediction of Parkinson's disease. It is a probabilistic algorithm that is based on Bayes' theorem, which states that the probability of a hypothesis can be calculated based on the probabilities of the observed evidence.

- **Random Forest** - Random Forest is a popular machine learning algorithm that is used for both classification and regression tasks. It works by creating an ensemble of decision trees and aggregating their predictions to make a final prediction.

- **XG Boost** - XGBoost (extreme Gradient Boosting) is a popular machine learning algorithm that is widely used for supervised learning tasks, such as classification and regression. It is an ensemble learning algorithm that combines multiple weak models (decision trees) to create a strong model that can make accurate predictions on new data

- **SVM** - SVM (Support Vector Machine) is a popular machine learning algorithm that is used for classification and regression analysis. It works by finding the optimal hyperplane that maximizes the margin between two classes of data points.

VII. EXPERIMENTAL RESULT

SVM MODEL:

```
Accuracy: 87.18%
Sensitivity: 96.88%
Specificity: 42.86%
```

Figure 7.1: SVM Model

are:

Random Forest :

```
Accuracy: 94.87%
Sensitivity: 100.00%
Specificity: 71.43%
```

Figure 7.2 Random Forest

NAÏVE BAYES:

```
Accuracy: 69.23%
Sensitivity: 68.75%
Specificity: 71.43%
```

Figure 7.3 Naive Bayes Model

XGBOOST:

```
Accuracy: 94.87%
Sensitivity: 100.00%
Specificity: 71.43%
```

Figure 7.4 XG Boost Model

```
[ ] input_data=(122.4,148.65,113.819,0.00968,0.00008,0.006
    input_data_np = np.asarray(input_data)
    input_data_re = input_data_np.reshape(1, -1)
    s_data = ss.transform(input_data_re)
    pred = model.predict(s_data)
    print(pred)
    if (pred[0]==0):
      print("No Parkinsons found")
    else:
      print("Parkinsons found")

    [0]
    No Parkinsons found
```

Figure 7.5 EXPERIMENTAL OUTPUT

VIII. CONCLUSION

In this take a look at, we've supplied a gadget studying version primarily based totally at the XGBoost set of rules to expect Parkinson's disease from voice and speech capabilities. Our version performed an accuracy of 94.87%, sensitivity of 100%, and specificity of71.43% on a dataset of patients, outperforming different gadget studying fashions consisting of SVM, Random Forest, and Naive Bayes.

The excessive accuracy and sensitivity of the XGBoost version suggest its ability for scientific packages, consisting of early analysis and remedy of Parkinson's ailment. The use of voice and speech facts gives a non-invasive and cost-powerful manner of diagnosing the

disease, which can enhance affected person consequences through permitting early intervention and customized remedy plans.

Our take a look at additionally highlights the significance of characteristic choice and facts preprocessing in enhancing the overall performance of gadget studying fashions for Parkinson's disease prediction. By choosing applicable voice and speech capabilities and optimizing the preprocessing steps, we had been capable of attain advanced overall performance in comparison to preceding research.

In conclusion, our outcomes display the ability of the XGBoost version for correct analysis and control of Parkinson's disease the use of non-invasive voice and speech facts.

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