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Fig. 6. Frontend for displaying detection result

The image represents the frontend of a Parkinson's Disease Prediction App, which allows users to input vocal biomarkers to predict the presence of Parkinson's disease. The interface is designed to be user-friendly, displaying fields for various vocal feature inputs such as MDVP
(Hz), and other relevant parameters. Once the values are entered, the machine learning model processes the data and provides a prediction, shown under the "Prediction Result" section. The result is visually distinct, alerting the user if Parkinson's disease is detected. Below the result section, there's a brief explanation about the app, emphasizing that it uses machine learning to predict the disease based on these vocal features, and reminding users to input accurate data for optimal predictions. This kind of interface exemplifies how machine learning can be applied in healthcare for non-invasive disease prediction.

IV.CONCLUSION
The classification accuracy obtained on the basis of vowel phonation data of Parkinson's disease was [accuracy], and the sensitivity of the Random Forest classifier is [sensitivity]. The results obtained from the Random Forest model are pretty robust and are based on its exceptional aptitude in the representation of complex data structures and associations. This is yet another reason for good performance, as Random Forest treats all [insert number of attributes] attributes in the MDVP (Multidimensional Voice Program) dataset equally important. In other words, it gives a fair consideration to each independent vocal attribute without showing any bias toward any feature. This is very crucial since Parkinson's disease is usually heralded by slight changes in speech; it is an expression of a set of characteristics that might possibly allow for a correct diagnosis as against any single characteristic.
Its strength and accuracy make the Random Forest classifier one of the models to predict the existence of Parkinson's disease from the vowel phonation data. The high accuracy of the model and the noninvasive aspect of voice analysis make this approach highly practical for real-world applications. This model may be integrated into long-term

health monitoring systems, ensuring that PWP are under continuous and reliable diagnosis. The integration will offer an easy, inexpensive, and accessible tool for the control of diseases, bearing a lot of benefits to patients worldwide regarding earlier detection, monitoring of disease progression, and subsequent tailoring of treatment plans.

We thus advocate that the Random Forest model be given particular capabilities and used as a transforming agent to deliver relief, on a long-term basis, thereby enhancing the quality of life for Parkinson's patients worldwide.

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Comparison of different Machine Learning
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Abstract— Parkinson's disease (PD) is a progressive neurodegenerative condition that affects millions worldwide, and early diagnosis remains critical for effective treatment. Over the past few years, multiple innovative types of machine learning approaches have been developed for PD diagnosis based on data in the form of speech patterns, handwriting samples, sensor data, and many more. However, the performance of these algorithms varies significantly with the choice of data and features used.
In this paper, authors have compared the performance of a number of machine learning algorithms to diagnose Parkinson's disease. The dataset for this study was acquired from Oxford UCI Machine repository. We obtained the dataset for the study from the Oxford UCI Machine repository. After preprocessing the data and extracting relevant features, we applied various algorithms, including logistic regression, support vector machines, random forests to classify individuals as either PD patients or healthy controls.
The performance evaluation parameters, including accuracy, precision, recall, F1 score, and Precision-Recall curve (PR curve), were used to compare the algorithms. Our findings revealed that random forests achieved the highest accuracy and other performance metric scores, while logistic regression and support vector machines offered greater interpretability. Overall, our research underscores the potential of machine learning in early PD detection and emphasizes the importance of comprehensive datasets and effective feature selection. The long-term goal of this work is to increase the sensitivity and specificity diagnostic methods and potentially improve the quality of life for individuals with Parkinson's disease along with better patient outcomes.
Comparison of the classification results of Logistic Regression, Decision Tree, Random Forest, Support Vector Machine, KNN, Gaussian Naive Bayes, and Bernoulli Naive Bayes led to the conclusion of Random Forest as an ideal machine learning (ML) technique for the detection of Parkinson's Disease. The detection accuracy of the Random Forest model is 98.3051%
Keywords — Classification Algorithms, Data Analysis, Machine Learning, Parkinson's Disease.

I.INTRODUCTION

Parkinson's disease has destroyed the lives of 10 million people around the world and is the second most deadly neurodegenerative disease after Alzheimer's disease. The symptoms include: "frozen" facial expression, bradykinesia or slowness of movement, akinesia or impairment of voluntary

movement, tremor, and impairment of the voice. By the time a diagnosis is made, typically 60% of nigrostriatal neurons have degenerated, as does 80% of striatal dopamine.
There is no single test in which this condition can be diagnosed. Doctors must perform careful clinical analysis of the patient's medical history. However, this result was inaccurate. According to the National Institute of Neurological Disorders, early diagnosis (with symptoms for ≤ 5 years) is only 53% accurate. This is hardly much better than expected, but early diagnosis makes all the differences in the world for effective treatment.
These problems motivated us to investigate a machine learning approach to accurately diagnose Parkinson's, using a **dataset of various speech features (a non-invasive yet** characteristic tool) from the University of Oxford.
The purpose of this project is to discover a machine learning technique that can be effectively used for the prediction of Parkinson's disease using relevant data. This study will conduct a comparative analysis of feature selection and representation techniques to identify the most relevant and enlightening features from the available data useful in the treatment of patients.

II.METHODOLOGY

➢ Dataset

We have collected the required Parkinson's disease dataset, created by the University of Oxford, called the Oxford Parkinson's Disease Detection dataset, containing 197 recordings and 23 features, created by Max Little from the University of Oxford, along with the National Centre for **Voice and Speech, Denver, Colorado, who recorded the** speech signals.
The data contains biomedical voice recordings from 31 individuals, 23 of whom had Parkinson's disease (PD). Each column in the table is a voice measurement, and each row corresponds to one of the 195 voices recorded by that individual ("name row"). For patients with Parkinson's disease, the "Status" column is set to 0 for healthy patients and 1 for Parkinson's disease. The file is in ASCII CSV format.
The rows of the CSV file contain examples for a recording. There are approximately six entries for each patient, and the patient's name is identified in the first row.

TABLE I. OVERVIEW OF VOCAL ANALYSIS ATTRIBUTES AND THEIR PURPOSES

Attribute Purpose
Name Data is stored in ASCII CSV format where patient name and recording number is stored
MDVP:
Fo (Hz)

Fundamental frequency of pitch period
MDVP:
Fhi (Hz)
Upper limit of fundamental frequency or maximum
threshold of voice modulation
MDVP:
Flo (Hz)
Lower limit or minimal vocal fundamental frequency
MDVP:
Jitter,
Abs,
RAP,
PPQ,
DDP
Various measures from Kay Pentax's multi-dimensional
voice program (MDVP), assessing frequency of vibrations
in vocal folds at pitch periods
Jitter
and
Shimmer
Measures of absolute difference between frequencies of
each cycle, after normalizing the average
NHR and
HNR
Signal to noise and tonal ratio measures that indicate
robustness of the environment to noise
Status 0 indicates healthy person while 1 indicates person with
Parkinson's disease (PWP)
D2 Correlation dimension used to identify dysphonia in speech
using fractal objects; a nonlinear, dynamic attribute
RPDE Recurrence Period Density Entropy quantifies the extent to
which the signal is periodic
DFA Detrended Fluctuation Analysis measures the extent of
stochastic self-similarity of noise in speech signals
PPE Pitch Period Entropy is used to assess abnormal variations
in speech on a logarithmic scale
Spread1,
Spread2
Analysis of extent or range of variations in speech with
respect to MDVP: Fo (Hz)

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The dataset was created by Max Little ✔ of the University of Oxford, in collaboration with the National Centre for Voice and Speech, Denver, Colorado, who recorded the speech signals. The original study published the feature extraction methods for general voice disorders.

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WEB · RPDE Recurrence Period Density Entropy quantifies the extent to which signal is periodic DFA Detrended Fluctuation Analysis or DFA measures the extent of ...

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