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DETECTION OF NEUROLOGICAL DISORDER

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ABSTRACT:

Accurately detecting neurological disorder (ND) at an early stage is certainly indispensable for slowing down its progress and providing patients the possibility of accessing to disease modifying therapy. Towards this end, the premotor stage in ND should be carefully monitored. An innovative machine learning technique is introduced to early uncover whether an individual is affected with ND or not based on premotor features. Specifically, to uncover ND at an early stage, several indicators have been considered in this study, including Rapid Eye Movement and olfactory loss, Cerebrospinal fluid data, and dopaminergic imaging markers. A comparison between twelve machine learning and ensemble learning methods based on relatively small data including 183 healthy individuals and 401 early ND patients shows the superior detection performance of the designed model, which achieves the highest accuracy, 96.45% on average. This is mainly due to the desirable characteristics of the machine learning model in learning linear and nonlinear features from ND data without the need for hand-crafted features extraction. Besides detecting the ND, we also provide the feature importance on the ND detection process based on the Boosting method. Accordingly, the outcome of this work can be viewed as a promising first step towards the application of f cutting-edge research for early disease detection.

Keywords: Support Vector Machine, voice data, machine learning.

1. INTRODUCTION:

The recent report of the World Health Organization shows a visible increase in the number and health burden of neurological disorder patients increases rapidly. Classification algorithms are mainly used in the medical field for classifying data into different categories according to the number of characteristics. Neurological disorder is the second most dangerous disease that can lead to shaking, shivering, stiffness, and difficulty walking and balance. It caused mainly due by the breaking down of cells in the nervous system. Neurological disorder can have both motor and non-motor symptoms. The motor symptoms include slowness of movement, rigidity, balance problems, and tremors. If this disease continues, the patients may have difficulty walking and talking. The non-motor symptoms include anxiety, breathing problems, depression, loss of smell, and change in speech. If the above-mentioned symptoms are present in the person, then the details are stored in the records. In this

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paper, the author considers the speech features of the patient, and this data is used for predicting whether the patient has Neurological disorder or not. Neurodegenerative disorders are the results of progressive tearing and neuron loss in different areas of the nervous system. Neurons are functional units of the brain. They are contiguous rather than continuous. A good healthy-looking neuron as shown in fig1 has extensions called dendrites or axons, a cell body, and a nucleus that contains our DNA. DNA is our genome and a hundred billion neurons contain our entire genome which is packaged into it. When a neuron gets sick, it loses its extension and hence its ability to communicate which is not good for it and its metabolism becomes low so it starts to accumulate junk and it tries to contain the junk in the little packages in little pockets. When things become worse and if the neuronis a cell culture it completely loses its extension, becomes round and full of vacuoles.

PROBLEM STATEMENT

The main aim is to predict the prediction efficiency that would be beneficial for the patients who are suffering from Parkinson and the percentage of the disease will be reduced. Generally, in the first stage, Neurological disorder can be cured by the proper treatment. So it's important to identify the PD at the early stage for the betterment of the patients. The main purpose of this research work is to find the best prediction model i.e.the best machine learning technique which will distinguish the Neurological disorder patient from the healthy person. The techniques used in this problem are KNN, Naïve Bayes, and Logistic Regression. The experimental study is performed on the voice dataset of Neurological disorder patients which is downloaded from the Kaggle. The prediction is evaluated using evaluation metrics like confusion matrix, precision, recall accuracy, and f1- score. The author used feature selection where the important features are taken into consideration to detect Neurological disorder.

2. LITERATURE SURVEY:

Speech or voice data is assumed to be 90% helpful to diagnose a person for identifying the presence of disease. It is one of the most important problems that have to be detected in the early stages so that the progression rate of the disease is reduced. Many of the researchers work on different datasets to predict the disease more efficiently. In general, Persons with PD suffer from speech problems, which can be categorized into two: hypophonia and dysarthria. Hypophonia indicates a very soft and weak voice from a person and dysarthria indicates slow speech or voice, that can hardly be understood at one time and this causes damage to the central nervous system. So, most of the clinicians who treat PD patients observe dysarthria and check out to rehabilitate with specific treatments to improvise vocal intensity. Lots of researchers did work on the pre- processing data and feature selection in the past. Anila M and Dr G Pradeepini proposed the paper titled "Diagnosis of Neurological disorder using Artificial Neural network" [2]. The main objective of this paper is that the detection of the disease is performed by using the voice analysis ofthe people affected with Neurological disorder. For this purpose, various machine learning techniques like ANN, Random Forest, KNN, SVM, XG Boost are used to classify the best model, error rates are calculated, and the

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performance metrics are evaluated for all the models used. The main drawback of this paper is that it is limited to ANN with only two hidden layers. And this type of neural networks with two hidden layers are sufficient and efficient for simple datasets. They used only one technique for feature selection which reduces the number of features. Arvind Kumar Tiwari Proposed the paper titled "Machine Learning-based Approaches for Prediction of Neurological disorder" [3]. Inthis paper, minimumredundancy maximumrelevance feature selection algorithms were used to select the most important feature among all the features to predict Parkinson diseases. Here, it was observed that the random forest with 20 number of features selected by minimum redundancy maximum relevance feature selection algorithms provide the overall accuracy 90.3%, precision 90.2%, Mathews 12 correlation coefficient values of 0.73 and ROC values 0.96 which is better in comparison to all other machine learning based approaches such as bagging, boosting, random forest, rotation forest, random subspace, support vector machine, multilayer perceptron, and decision tree based methods.

EXISTING SYSTEM:

In existing system, Neurological disorder is detected at the secondary stage only (Dopamine deficiency), which leads to medical challenges. Thus, the mental disorders are been poorly characterized and have many health complications. This type of disorder is generally diagnosed with the following clinical methods as: MRI or CT scan - Conventional MRI cannot detect early signs of Neurological disorder disease PET scan - is used to assess activity and function of brain regions involved in movement SPECT scan - can reveal changes in brain chemistry, such as a decrease in dopamine. This results in a high misdiagnosis rate (up to 25% by non-specialists) and many years before diagnosis, people can have the disease. Thus, existing system is not effective in early prediction and accurate medicinal diagnosis to the affected people.

PROPOSED SYSTEM:

By using machine learning techniques, the problem can be solved with minimal error rate. The voice dataset of Neurological disorder disease from a dataset is used as input. Also, our proposed system provides accurate results by integrating voice detection inputs of normal and the disease affected patients. Thus, by these results, the doctor can conclude normality or abnormality and prescribe the medicine based on the affected stage. The algorithm will be trained on 80% of the entries in the data set, while the remaining 20% will be used to test its accuracy. 10 Furthermore, severalsteps will be taken to improve the accuracy of the algorithms by optimizing them. Cleaning the dataset and preprocessing the data are two of these stages.

3. METHODOLOGY

Importing all the required libraries and packages needed and it Contains libraries like numpy, Pandas, Sklearn.

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```
import numpy as np
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler
from sklearn import svm
from sklearn.metrics import accuracy_score
```

Collecting dataset from Kaggle and Dataset is based on voice frequencies having 24 features based on that the analysis is made.

```
# loading the data from csv file to a Pandas DataFrame
pd_data = pd.read_excel('mini_dataset.xlsx')
```

```
# printing the first 5 rows of the dataframe
pd_data.head()
```

ut[112]:

	name	MDVP:Fo(Hz)	MDVP:Fhi(Hz)	MDVP:Flo(Hz)	MDVP:Jitter(%)	MDVP:Jitter(Abs)	MDVP:RAP	MDVP:PPQ	Jitter:DDP	MDVP:Shimmer	...	Shim
0	phon_R01_S01_1	119.992	157.302	74.997	0.00784	0.00007	0.00370	0.00554	0.01109	0.04374	...	
1	phon_R01_S01_2	122.400	148.650	113.819	0.00968	0.00008	0.00465	0.00696	0.01394	0.06134	...	
2	phon_R01_S01_3	116.682	131.111	111.555	0.01050	0.00009	0.00544	0.00781	0.01633	0.05233	...	
3	phon_R01_S01_4	116.676	137.871	111.366	0.00997	0.00009	0.00502	0.00698	0.01505	0.05492	...	
4	phon_R01_S01_5	116.014	141.781	110.655	0.01284	0.00011	0.00655	0.00908	0.01966	0.06425	...	

5 rows × 24 columns

Separating features and target variable and here status is Target variable. Separating the features & Target.

```
input_data = (197.07600,206.89600,192.05500,0.00289,0.00001,0.00166,0.0
0168,0.00498,0.01098,0.09700,0.00563,0.00680,0.00802,0.01689,0.00339,26
.77500,0.422229,0.741367,-7.348300,0.177551,1.743867,0.085569)

# changing input data to a numpy array
input_data_as_numpy_array = np.asarray(input_data)

# reshape the numpy array
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)

# standardize the data
std_data = scaler.transform(input_data_reshaped)

prediction = model.predict(std_data)
print(prediction)


if (prediction[0] == 0):
  print("The Person does not have neurological disorder")

else:
  print("The Person has neurological disorder")
```

CONCLUSION

The diagnosis of Neurological disorder is not directed which means that one particular test like blood testor ECG cannot determine whether a person is suffering from PD or not. Doctors go through the medical history of a patient, followed by a thorough neurological examination. They find out at least two cardinal symptoms among the subjects and then predict whether the subject is suffering from PD. The misdiagnosis rate of PD is significant due to a no definitive test. In such case it will be helpful for us to aid the doctor by providing a machine learning model. The prediction models are developed using machine learning techniques of boosted logistic regression, classification trees, Bayes Net and multilayer perceptron based on these significant features. It is observed that the performance is better. It is demonstrated that Boosted Logistic Regression produce superior results. These results encourage us to try other ensemble learning techniques. The present work employs different machine learning algorithms which are not used in [3]. This study plays an important role in having a comparative analysis of various machine learning algorithms. In conclusion, this model 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.

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