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# EARLY DETECTION OF PARKINSON'S DISEASE BY APPLING LSTM

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**Abstract:** Parkinson's disease is a progressive and chronic neurodegenerative disorder.That affects about 1 million people in the united states, with approximately 60,000 new clinical diagnoses made each year. Due to motor symptoms, it affects the normal life of a person. There is a severe need to identify PD in its early stage to avoid it getting worse and to control its symptoms easily. As the dopamine generating neurons in parts of the brain become damaged or die, people begin to experience difficulty in speaking, writing, walking, or completing other simple tasks. Therefore it is difficult for doctors it in initial stage. A new methodology is proposed in this project for the prediction of Parkinson's disease severity using Long Short-Term Memory (LSTM) architecture for Parkinson's disease diagnosis. 'keras and TensorFlow' library is used for the implementation of our neural network to predict the severity.The accuracy values obtained by our method are better as compared to the
accuracy obtained in previous research work.

**Keywords:** Parkinson"s disease, Deep Neural Network, LSTM, Keras and Tensor Flow, Chronic Neuro Disorder.

## I. INTRODUCTION

Parkinson's disease is a long-term (chronic) neurological condition that affects around 8,000 people in Ireland. It is named after Dr James Parkinson, who first identified it in 1817. Parkinson's disease affects the way the brain co-ordinates body movements, including walking, talking and writing. Parkinson's disease affects men and women, although men are statistically slightly more likely to develop it than women. The risk of getting Parkinson's disease increases with age. Symptoms usually appear in people who are over the age of 50. However, younger people can also be diagnosed with Parkinson's disease. When the symptoms of Parkinson's disease occur in a person between 21 and 40 years of age, it is known as young-onset Parkinson's disease. If a person is diagnosed with Parkinson's disease before the age of 18, it is known as juvenile Parkinson's disease. This is very rare.

The symptoms of the Parkinson disease broadly divided into two categories.

- Motor symptoms
- Non-motor symptoms

## II. PROBLEM DEFINITION

There are many research works going on Parkinson Disease (PD) which seemed to be the second most common disease in the world and it still more increasing now every day's.This situation leads to build a decision support system for PD. Speech pathologists have been trying to get their patients with Parkinson's disease to raise their voices for years. Although the condition is primarily characterized by tremors and difficulty in walking, most patients also suffer from speech problems, particularly slurring and what's known in the field as weak voice. While 89% of people with PD experience some type of speech problems. So if the classification percentage of Parkinson disease is high then it's possible to predict Parkinson in early stage. Typically, the diagnosis is based on medical summary and neurological examination conducted by interviewing and observing the patient in person using the Unified Parkinson's Disease Rating Scale (UPDRS). It is very difficult to predict PD based on UDPRS in early stages, only 75% of clinical diagnoses of PD are confirmed to be idiopathic PD at autopsy. Thus, automatic techniques based on Artificial Intelligence are needed to increase the diagnosis is accuracy and to help doctors to make better decisions.

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## III. EXISTING SYSTEM

Prediction of Parkinson disorder is one of the most important problem that has to be detected in the early phases of the commencement of the disease so as to reduce the disease progression rate among the individuals. Various researches have been made to find the basic cause and some have reached to the heights by proposing a system which

  

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differentiates the healthy people from those with any ND'S using various machine learning techniques. Lots of pre-processing feature selection and classification techniques have been implemented and developed in the past decades.

**DISADVANTAGE**

- Hardware dependence
- Unexplained functioning of the network
- Assurance of proper network structure

## IV. PROPOSED SYSTEM

The main focus of this paper is the classification of different features of datasets that can be performed to determine if a person in Parkinson is **affected or not.** My work is an attempt to introduce a regression approach making prediction using Long-Short-Term-Memory (LSTM) regression networks are well-suited to classifying, processing and making predictions based on time series data, since there can be lags of unknown duration between important events in a time series. The main motivation for this work is that Parkinson affects majority of the people in the world and it's a hard disease to diagnosis. However, in problems like speech recognition, such network was observed not to perform well. Hence alternate solution as Recurrent neural network (RNN) was proposed by Williams and Zipser so as to increase the performance on such problems, RNN memorizes the previous information to calculate the current output. However, the problems that are associated with the RNN is the vanishing gradient and limited long-term memory. Both of these problems are addressed by the use of LSTM.

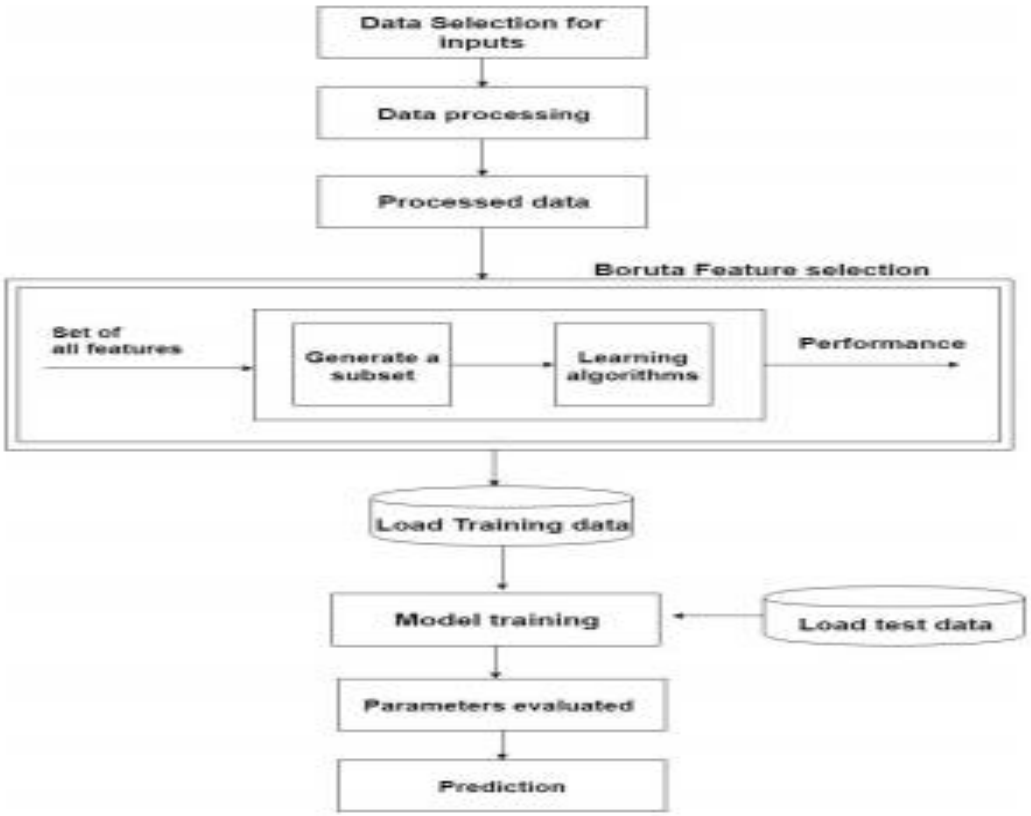
**ADVANTAGE**

Long Short Term Memory (LSTM)

- LSTM's provide us with large range of parameters such as learning rates and input & output biases.
- The complexity to update each weight is reduced to O(1) with LSTMs, similar to that of Back Propagation Through Time (BPTT),which is an advantage.

## V. SYSTEM DESIGN

It shows complete flow of system architecture of implementation.



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## VI. IMPLEMENTATION

- Data Gathering
- Data processing
- Model selection
- Training
- Evaluation
- Prediction

## VII. CONLUSION

A various prediction models for Parkinson's disease detection. For this purpose seven machine learning techniques i.e. are used such as adaptive boosting, bagging, neural networks, random forest, decision tree, SVM and linear regression. To obtain the desired results, error rates are calculated i.e AAE and ARE as well as four performance metrics are evaluated. These four metrics are accuracy, sensitivity, ROC, specificity. From the results, Random forest outstands from all the other ML techniques with the accuracy of 87%, Precision 85.0%, ROC 96.4%. After that, we tried to selected the most important and minimum number of features from the speech articulation data of 31 people where we have 23 features as explained in chapter 4 in dataset description. For that we have used Boruta feature selection whose working is shown in fig 12 by changing the number of features selected in multiples of 5 i.e firstly we check over 20 features than 15 features, 10 features and lastly 5 features. From all the experiments random forest with 20 features selection outstands from all the other ML techniques as it is giving the overall accuracy 96.6%, ROC value 93.6 and precision of 88.7 which is better in comparison to all other machine learning techniques when compared with 5,10 and 15 feature's performance metrics.

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