

DETECTION OF PARKINSON DISEASE USING MACHINE LEARNING

INTRODUCTION:

Parkinson disease (PD), the second most common neurological disorder that causes significant disability, reduces the quality of life and has no cure. Nerve cells in this part of the brain are responsible for producing a chemical called dopamine. Dopamine acts as a message between the parts of the brain and nervous system that help control and co-ordinate body movements. As dopamine generally neurons in the parts begin to experience difficulty in speaking, writing, walking or completing other simple task. Approximately, 90% affected people with Parkinson have speech disorders. The average age of onset is about 70 years, and the incidence rises significantly with advancing age. However, a small percent of people with PD have “early-onset” disease that begins before the age of 50. More than 10 million people worldwide are living with PD. No cure for PD exists today, but research is ongoing and medications or surgery can often provide substantial improvement with motor symptoms.

LITERATURE REVIEW:

[1]. AUTHOR: Anila M and Dr G Pradeepini

proposed the paper titled “Diagnosis of Parkinson’s disease 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 of the people affected with Parkinson's disease. 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 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.

[2]. AUTHOR: Arvind Kumar Tiwari

Proposed the paper titled “Machine Learning-based Approaches for Prediction of Parkinson’s Disease”

[3]. In this paper, minimum redundancy maximum relevance 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.

[3]. AUTHOR: Mohamad Alissa

Proposed the paper titled “Parkinson’s Disease Diagnosis Using Deep Learning”

[14]. This project mainly aims to automate the PD diagnosis process using deep learning, Recursive Neural Networks (RNN) and Convolutional Neural Networks (CNN), to differentiate between healthy and PD patients. Besides that, since different datasets may capture different aspects of this disease, this project aims to explore which PD test is more effective in the discrimination process by analysing different imaging and movement datasets (notably cube and spiral pentagon datasets). In general, the main aim of this paper is to automate the PD diagnosis process in order to discover this disease as early as possible. If we discover this disease earlier, then the treatments are more likely to improve the quality of life of the patients and their families. There are some limitations to this paper namely:

- They used the validation set only to investigate the model performance during the training and this reduced the number of samples in the training set.
- RNN training is too slow and this is not flexible in practice work.
- Disconnecting and resource exhaustion: working with cloud services like Google Collaboratory causes many problems like disconnecting suddenly. And because it is shareable service by the world zones, this leads to resource exhaustion error many times.

[4]. AUTHOR: Afzal Hussain Shahid and Maheshwari Prasad Singh

proposed the paper titled “A deep learning approach for prediction of Parkinson’s disease progression”

[19]. This paper proposed a deep neural network (DNN) model using the reduced input feature space of Parkinson’s telemonitoring dataset to predict Parkinson’s disease (PD) progression and also proposed a PCA based DNN model for the prediction of Motor-UPDRS and Total-UPDRS in Parkinson's Disease progression. The DNN model was evaluated on a real-world PD dataset taken from UCI. Being a DNN model, the performance of the proposed model may 13 improve with the addition of more data points in the datasets.

[5]. AUTHOR: T. J. Wroge, Y. Özkanca, C. Demiroglu, D. Si, D. C. Atkins and R. H. Ghomi,
proposed the paper titled “Parkinson’s Disease Diagnosis Using Machine Learning and Voice”

[24] is that it explores the effectiveness of using supervised classification algorithms, such as deep neural networks, to accurately diagnose individuals with the disease. Historically, PD has been difficult to quantify and doctors have tended to focus on some symptoms while ignoring others, relying primarily on subjective rating scales. The analysis of this paper provides a comparison of the effectiveness of various machine learning classifiers in disease diagnosis with noisy and high dimensional data. Their peak accuracy of 85% provided by the machine learning models exceeds 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.

[6]. AUTHOR: Siva Sankara Reddy Donthi Reddy and Udaya Kumar Ramanadham

proposed the paper “Prediction of Parkinson’s Disease at Early Stage using Big Data Analytics”

[21]. This paper describes mainly various Big Data Analytical techniques that may be used in diagnosing of right disease in the right time. The main intention is to verify the accuracy of prediction algorithms. Their future study aims to propose an efficient method to diagnose this type of neurological disorder by some symptoms at the early stage with better accuracy using different Big Data Analytical techniques like Hadoop, Hive, R Programming, MapReduce, PIG, Zookeeper, HBase, Cassandra, Mahout etc...