DETECTING PARKINSONS DISEASE USING MACHINE LEARNING

INTRODUCTION

Parkinson disease mainly effects central nervous system and is observed to be affected on many people globally. Most of the people suffering with PD are observed to be physically and emotionally draining. They even feel depressed, trouble concentrating on things, painful spasms etc. PD has a large spectrum of clinical features ranging from motor to nonmotor symptoms. Some of the motor symptoms are hypophonic speech, rigidity, resting tremor. Non-motor symptoms are as hallucinations, depression, constipation, sleeping disorders, cognitive impairment, and impulse control disorders. Non motor symptoms show sickness than motor symptoms. Most of the cases, physicians find it difficult to envisage whether a given patient is already affected by the disease or is expected to develop the Parkinson's disease. To conquer this, development of some computing model must be done that evaluates and summarizes the data of a given patient and predicts with adequate accuracy where he/she will have development of PD. Most of the PD patients are observed with symptoms called voice impairment which is known as dysphonia. There are several measures related to dysphonia, out of which voice related problem can be used to assess the patients at various stages.

This paper is a survey of prediction of PD using Machine learning and Deep learning techniques that generated good models and potency of those algorithms in terms of accuracies achieved, also about different methodologies applied.

LITERATURE REVIEW

Indira R. et al. (2014) have proposed an automatically machine learning approach and detected the Parkinson disease on behalf of speech/voice of the person. The author used fuzzy C-means clustering and pattern recognition based approach for the discrimination between healthy and Parkinson disease affected people. The authors of this paper have achieved 68.04% accuracy, 75.34% sensitivity and 45.83% specificity. Indira R. et al. (2014) have proposed a back propagation based approach for the discrimination between healthy and Parkinson diseases affected peoples with the help of artificial neural network. Boosting was used by filtering technique, and for data reduction principle component analysis was used.

Revett et al. (2009) proposed jitter, shimmer, fundamental frequency, harmonics/noise ratios, descriptive statistics, and correlational factors (non-linear dynamic analysis) using all 22 features, and a binary decision class ('0'is healthy and '1' is IPD decision class). The testing and training set are classified and an ROC and confusion matrix was generated to examine the accuracy of theclassification process. Predict of accuracy shows 100%.

Shahabi et al. (2014) presented that a Genetic Algorithm (GA) and SVM were used for classification between healthy and people with Parkinson. Voice signals that 14 features were based on F0 (fundamentafrequency or pitch), jitter, shimmer and noise to harmonics ratio, which are main factors in voice signal. Results show that classification accuracy 94.50, 93.66 and 94.22 per 4, 7 and 9 optimized features respectively.

R. Das et al. (2010) have proposed neural networks, Data Mining Neural analysis, and regression analysis and decision trees made a comparative study on Parkinson disease data set with regard to with the Presented results of classification accuracy of 92.9%, 84.3%, 88.6% and 84.3% respectively. To the classification method was diagnosis Parkinson disease based on the SAS software. Ene M. et al. (2008) proposed a probabilistic neural network (PNN) variant to discriminate between healthy people and people with Parkinson's disease. Three PNN types are used in this classification process, related to the smoothing factor search: incremental search (IS) Monte Carlo search (MCS) and hybrid search (HS). The accuracies reaching run between 79% and 81% for new, undiagnosed patients.

Salvatore et al. (2014) proposed a supervised machinelearning algorithm based on Principal Components

Analysis as feature extraction technique and Support Vector Machines to predict of individual differential diagnosis of Parkinson’s disease (PD) and Progressive

Supranuclear Palsy (PSP) for Magnetic Resonance Images

(MRI dataset). Predict of the Parkinson disease (PD) versus Controls, Progressive Supranuclear Palsy (PSP) versus Controls and Progressive Supranuclear Palsy (PSP)

versus Parkinson disease (PD) the Overall Accuracy (Specificity/Sensitivity) were 83.2 (81.9/85.4), 86.2 (92.1/82.9) and 84.7 (87.5/83.8) % for binary labelled groups, respectively

REFERENCE

- L.C. Afonso *et al.* **A recurrence plot-based approach for Parkinson's disease identification** Future Gener. Compute. Syst. (2019)

- L. Moro-Velazquez *et al.* **A forced Gaussians based methodology for the differential evaluation of Parkinson's disease by means of speech processing**Biomed. Signal Process. Control (2018)

- D. Gupta *et al.* **Optimized cuttlefish algorithm for diagnosis of Parkinson's disease** Cognit. Syst. Res. (2018)

- L. Parisi *et al.* **Feature-driven machine learning to improve early diagnosis of Parkinson's disease** Expert Syst. Appl. (2018)

- P. Sharma *et al.* **Diagnosis of Parkinson's disease using modified grey wolf optimization** Cognit. Syst. Res. (2019)

- D. Montaña *et al.* **A diadochokinesis-based expert system considering articulatory features of plosive consonants for early detection of Prkinson's disease** Compute. Methods Programs Biomed. (2018)

- C.R. Pereira *et al.* **Handwritten dynamics assessment through convolutional neural networks: an application to parkinson's disease identification** Arif. Intell. Med. (2018)

- D. Gupta *et al.* **Improved diagnosis of Parkinson's disease using optimized crow search algorithm** Compute. Elector. Eng. (2018)

- J. Vásquez-Correa *et al.* **Towards an automatic evaluation of the dysarthria level of patients with Parkinson's disease** J. Commun. Discord. (2018)

- M. Cernak *et al.* **Characterisation of voice quality of Parkinson's disease using differential phonological posterior features** Compute. Speech Lang. (2017)

- Virika's *et al.* **Data dependent random forest applied to screening for laryngea disorders through analysis of sustained phonation: acoustic versuscontact microphone** Med. Eng. Phys. (2015)

- B. Harel *et al.* **Variability in fundamental frequency during speech in prodromal and incipient parkinson's disease: alongitudinal case study** Brain Cognit. (2004)

- C.R. Pereira *et al.* **A new computer vision-based approach to aid the diagnosis of Parkinson's disease** Compute. Methods Programs Biomed. (2016)

- J. Parkinson **An essay on the shaking palsy** J. Neuropsychiatry Clin Neurosci. (2002)

- Allam, M. N., Garg, A., Munia, T. T. K., Fazel-Rezai, R., and Tavakolian, K. (2017). Vertical ground reaction force marker for Parkinson's disease. *Ploss ONE* 12: e0175951. Doi: 10.1371/journal.pone.0175951

- Alaska, H., and Hussain, A. (2018). “Prediction of Parkinson disease using gait signals,” in *2018 11th International Conference on Developments in systems Engineering (Deise)* (Cambridge), 23–26. Doi: 10.1109/Deise.2018.00011