

DETECTING PARKINSON'S DISEASE USING MACHINE LEARNING

- Literature Survey

1. Early Detection of Parkinson's disease using Deep Learning and Machine Learning

Authors: Wu Wang, Junho Lee, Fouzi Harro, Ying Sun
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Accurately detecting Parkinson's disease (PD) 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 PD should be carefully monitored. An innovative deep-learning technique is introduced to early uncover whether an individual is affected with PD or not based on premotor features. Specifically, to uncover PD 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 the proposed deep learning model and twelve machine learning and ensemble learning methods based on relatively small data including 183 healthy individuals and 401 early PD patients shows the superior detection performance of the designed model, which achieves the highest accuracy, 96.45% on average. Besides detecting the PD, we also provide the feature importance on the PD detection process based on the Boosting method.

2. Machine Learning Approaches for Detection and Diagnosis of Parkinson's Disease - A Review

Authors: Iqra Nissar, Waseem Ahmad Mir, Izharuddin, Tawseef Ayoub Shaikh

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Parkinson's disease (PD) is a disabling disease that affects the quality of life. It begins due to the death of cells that produce dopamine in the substantia nigra part of the central nervous system (CNS) which affects the human body. People who have Parkinson's disease feel difficulty in doing activities like speaking, writing, and walking. In the recent past, speech, gait and EEG signals have been investigated for the detection of PD. However, speech analysis is the most considered technique to be used. Researches have shown that 90% of the people who suffer from Parkinson's disease have speech disorders. With the increase in the severity of the disease, the patient's voice gets more and more deteriorated. The non-invasive treatments for voice analysis are available that help in ameliorating the life quality of a patient. Thus, for building the telemonitoring and telediagnosis models for prediction, the speech analysis has been tremendously increased. The proper interpretation of speech signals is one of the important classification problems for Parkinson's disease diagnosis. The main purpose of this paper is to contemplate the survey work of the machine learning techniques and deep learning procedures used for Parkinson's disease classification. Deep learning and machine learning techniques have been used as a part of the discovery for the efficient classification of PD. The various classification models like support vector machines, naive Bayes, deep neural networks, decision tree and random forest are effectively employed for classification purposes. The analysis of results of different research works showed that both machine learning and deep learning algorithms have shown promising future and therefore paving a better way for the detection of Parkinson's disease at its earlier stages. The classification accuracy achieved by the machine learning classifier. Among deep learning approaches, the deep neural network has achieved the best accuracy of 99.49%. The results obtained from different works suggest that artificial intelligence is becoming a powerful learning tool that has much to offer to data scientists as well as neurologists. In general the learning methods are adding value to decision-making problems especially in the field of medical diagnosis.

3. A Deep Learning Based Method for Parkinson's Disease Detection Using Dynamic Features of Speech

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Detection of voice changes in Parkinson's Disease (PD) patients would make it possible for early detection and intervention before the onset of disabling physical symptoms. This study explores static and dynamic speech features relating to PD detection. A comparative analysis of the articulation transition characteristics shows that the number of articulation transitions and the trend of the fundamental frequency curve are significantly different between HC speakers and PD patients. Motivated by this observation, we propose to apply Bidirectional long-short term memory (LSTM) model to capture time-series dynamic features of a speech signal for detecting PD. The dynamic speech features are measured based on computing the energy content in the transition from unvoiced to voiced segments (onset), and in the transition from voiced to unvoiced segments (offset). Under the two evaluation methods of 10-fold cross validation (CV) and splitting the dataset without samples overlap of one individual, the experimental results show that the proposed method remarkably improves the accuracy of PD detection over traditional machine learning models using static features.

4. Early Detection of Parkinson's Disease using Machine Learning & Image Processing

Authors: M Nithya, V Lalitha, K Paveethraa, S Kumari

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Parkinson Disease (PD) is a brain disorder which affects the central nervous system such as shaking, stiffness, and difficulty with walking, balance, and coordination. Since PD is closely associated to other neurological symptoms, it is generally difficult to accurately predict the disease. Further the close association of PD symptoms with other neurological symptoms results in more than 25% of wrong detection of PD. Therefore, the proposed system focuses on developing an automated diagnosis system based on Machine learning (ML) which can exactly predict the PD & healthy control (HC). Weighted Magnetic Resonance Imaging (MRI) for PD and HC are provided by Parkinson's Progression Markers Initiative (PPMI). Image registration technique is used to align midbrain slices. Damaged brain pixel is detected using hybrid technique (SVM and Random forest) algorithm. The results conclude Machine Learning (ML) offers better accuracy and specificity.

5. Diagnosis of Parkinson's Disease Using Deep Neural Network Model

Authors: M Anila, G Pradeepini

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Parkinson's disease is a neuro-degenerative disorder that effects central nervous system and is observed in many people worldwide. PD diagnosis is complex for the clinicians as it requires meticulous analysis of the patient. Though there are many characteristics and symptoms that indicate the disease, voice characteristics play a major role among the predictive characteristics. Person with PD experiences several vocal degradations like shaky and low speech. Voice analysis offers the additional benefit of being non-invasive, low cost and simple to diagnose. Many enthusiastic and great researchers have created new models and improved existing models in this area, and there is a vast amount of research in this field all over the world. We created an optimized Deep neural network (which is referred as Opt-DNN in rest of the paper) model and compared it to various algorithms such as random forests, SVM, XG Boost, and KNN in this paper. Among all the algorithms used, the proposed model turned up to be the best algorithm with accuracy 95.14.