**Detecting Parkinson’s Disease using Machine Learning**

Ioannis G. Tsoulos, Georgia Mitsi, Athanassios Stavrakoudis and Spyros

Papapetropoulos(2019) proposed the application of Machine Learning in a Parkinson's Disease Digital Biomarker Dataset Using Neural Network Construction Methodology Discriminates Patient Motor Status where the objective is to provide preliminary evidence that artificial intelligence systems may allow one to discriminate PD patients from and determine different features of the disease. The recently introduced Neural Network Construction technique was used here to classify data collected by a mobile application into two categories.The NNC algorithm discriminated individual PD patients from HVs with 93.11% accuracy and ON vs OFF states with 76.5% accuracy.

[Hakan Gunduz](https://ieeexplore.ieee.org/author/37086133435) proposed Deep Learning-Based Parkinson’s Disease Classification Using Vocal Feature Sets(2019) Parkinson's Disease (PD) is a progressive neurodegenerative disease with multiple motor and non-motor characteristics. PD patients commonly face vocal impairments during the early stages of the disease. So, diagnosis systems based on vocal disorders are at the forefront on recent PD detection studies. Our study proposes two frameworks based on Convolutional Neural Networks to classify Parkinson's Disease (PD) using sets of vocal (speech) features.Extracted deep features are not only successful at distinguishing PD patients from healthy individuals but also effective in boosting up the discriminative power of the classifiers.

# 

Oliver Y. Chén , Florian Lipsmeier , Huy Phan , John Prince , Kirsten I. Taylor, Christian Gossens, Michael Lindemann, and Maarten de Vos(2020) proposed a Machine-Learning Framework to Remotely Assess Parkinson's Disease Using Smartphones.Using smartphones, remote patient monitoring has the potential to obtain objective behavioral data semi-continuously, track disease fluctuations, and avoid rater dependency.Methods: Smartphones collect sensor data during various active tests and passive monitoring, including balance (postural instability), dexterity (skill in performing tasks using hands), gait (the pattern of walking), tremor (involuntary muscle contraction and relaxation), and voice. Data analysis results from 437 behavioral features obtained from 72 subjects (37 PD and 35 HC) sampled from 17 separate days during a period of up to six months suggest that this framework is potentially useful for the analysis of remotely collected smartphone sensor data in individuals with PD.

S. Sharanyaa, P N. Renjith and K. Ramesh(2020) proposed the Classification of

Parkinson's Disease using Speech Attributes with Parametric and Nonparametric Machine

Learning Techniques which evaluate the performance of state of art algorithms to detect

Parkinson's disease with higher classification accuracy. The performance is evaluated by

pre-processing the data based on speech attributes. Various performance metrics are computed for all four machine learning techniques and the results show that nonparametric models produce higher classification accuracy of 87.2% and 90.2% compared to parametric models.

Wu Wang,Junho Lee, Fouzi Harrou and Ying Sun(2020)proposed 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. 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.

# 

Julián D. Loaiza Duque,Antonio J. Sánchez Egea,Theresa Reeb,Andrés M. González-Vargas(2020) proposed Angular Velocity Analysis Boosted by Machine Learning for Helping in the Differential Diagnosis of Parkinson’s Disease and Essential Tremor.This work aims to develop Machine Learning models to improve the differential diagnosis between patients with Parkinson’s Disease and Essential Tremor. For this purpose, we use a mobile phone’s built-in gyroscope to record the angular velocity signals of two different arm positions during the patient’s follow-up, more precisely, in rest and posture positions.The models developed reached an average accuracy of 97.2 ± 3.7% (98.5% Sensitivity, 93.3% Specificity) to differentiate between Healthy and Trembling subjects and an average accuracy of 77.8 ± 9.9% (75.7% Sensitivity, 80.0% Specificity) to discriminate between Parkinson’s Disease and Essential Tremor patients.

Luigi Borzì, Ivan Mazzetta, Alessandro Zampogna, Antonio Suppa, Gabriella Olmo and

Fernanda Irrera(2021) proposed the Prediction of Freezing of Gait in Parkinson’s Disease Using Wearables and Machine Learning the aim was to propose a wearable system able to catch the typical degradation of the walking pattern preceding FOG episodes, to achieve reliable FOG prediction using machine learning algorithms and verify whether dopaminergic therapy affects the ability of our system to detect and predict FOG. The classification model was trained with data from patients on (off) and tested on patients off (on) and found 84.0% (56.6%) sensitivity, 88.3% (92.5%) specificity and 87.4% (86.3%) accuracy.

Aleksandr Talitckii, Anna Anikin,Ekaterina Kovalenko, Aleksei Shcherbak ,Oscar Mayora , Olga Zimniakova,Ekaterina Bril , Maxim Semenov , Dmitry V. Dylov, and Andrey Somo(2021)

proposed the research in the area focuses on how to detect, predict, or classify PD and similar diseases without addressing the point of what activities or exercises a subject should do to improve the performance of these tasks.we collect the data in a real clinical setting using a compact wearable wireless sensor node entailing a board gyroscope, accelerometer, and magnetometer.Application of ML methods to the collected data reveals three “most efficient” exercises to assist diagnosticians with the highest discriminating power (0.9 ROC AUC in each task). The proposed solution can be implemented as a medical decision support system for real-time PD diagnostics.

Trevor Exley(2022) proposed a prediction of UPDRS Motor Symptoms in Individuals With Parkinson’s Disease From Force Plates Using Machine Learning.Parkinson's disease (PD) is a neurodegenerative disease that affects motor abilities with increasing severity as the disease progresses. Traditional methods for diagnosing PD include a section where a trained specialist scores qualitative symptoms using the motor subscale of the Unified Parkinson's Disease Rating Scale (UPDRS-III). Quiet standing can detect body bradykinesia (AUC-ROC = 0.924) and postural stability (AUC-ROC = 0.967) with high predictability.

# 

Johann Faouzi , Samir Bekadar, Fanny Artaud , Alexis Elbaz , Graziella Mangone, Olivier Colliot, and Jean-Christophe Corvol(2022) proposed Machine Learning-Based Prediction of Impulse Control Disorders in Parkinson’s Disease From Clinical and Genetic Data.Impulse control disorders (ICDs) are frequent non-motor symptoms occurring during the course of Parkinson’s disease (PD). The objective of this study was to estimate the predictability of the future occurrence of these disorders using longitudinal data, the first study using cross-validation and replication in an independent cohort. Methods: We used data from two longitudinal PD cohorts (training set: PPMI, Parkinson’s Progression Markers Initiative; test set: DIGPD, Drug Interaction With Genes in Parkinson’s Disease).Results: The recurrent neural network (PPMI: 0.85 [0.80 – 0.90], DIGPD: 0.802 [0.78 – 0.83]) was the only model to be significantly better than the trivial model (PPMI: ROC AUC = 0.75 [0.69 – 0.81]; DIGPD: 0.78 [0.75 – 0.80]) on both cohorts.