Early Biomarkers for Morbus Parkinson
Analysis of the data from Jan Hlavnicka et al. (2017)
Kilian Sennrich / 18.07.2021

This is the report for the project "Early Biomarkers for Morbus Parkinson" that I have conducted to introduce myself to the python data-science libraries. The data stems from a research paper on automatic speech processing from Hlavnicka et al. (2017) The data was collected between 2014 ans 2016 in the Czech Republic. The study included 30 recently diagnosed and untreated Morbus Parkinson patients, idiopathic RBD (which is a strong predictor of Morbus Parkinson) and 50 healthy controls. All probands participated in two speeking tasks (reading, monologue). The goal of the study was to automate the analysis of recordings of the patients, which worked out very well. Hlavnicka et al. (2017) published the dataset within their appendix and it was reposted on Kaggle. The research paper and the kaggle dataset can be accessed via the following links:

-https://www.nature.com/articles/s41598-017-00047-5
-https://www.kaggle.com/ruslankl/early-biomarkers-of-parkinsons-disease

Table of Contents

Introduction

From Kaggle: The dataset includes 30 patients with early untreated Parkinson's disease (PD), 50 patients with REM sleep behavior disorder (RBD), which are at high risk developing Parkinson's disease or other synucleinopathies; and 50 healthy controls (HC). All patients were scored clinically by a well-trained professional neurologist with experience in movement disorders. All subjects were examined during a single session with a speech specialist. All subjects performed reading of standardized, phonetically- balanced text of 80 words and monologue about their interests, job, family or current activities for approximately 90 seconds.
Inspiration: Predict a pattern of neurodegeneration in the dataset of speech features obtained from patients with early untreated Parkinson's disease and patients at high risk developing Parkinson's disease.

Hoehn-and-Yahr Scale - A Measure for Morbus Parkinson

The state of the Morbus Parkinson disease can be examined with different clinical assessments:The Hoehn-and-Yahr scale is used to classify the severity of PD based on symptoms. It is an easy-to-perform clinical instrument to assess the underlying movement disorders. The Hoehn and Yahr scale was developed in 1967. It divides the disease into 5 stages. So-called modified stages according to Hoehn and Yahr (1987) are also frequently used (https://flexikon.doccheck.com/de/Hoehn-und-Yahr-Skala). The 5 states are:

1)   Unilateral symptomatology
1.5)   Unilateral symptoms and axial involvement
2)   Bilateral symptoms; no postural instability
2.5)   Mild bilateral symptoms; patient can regain balance on pull test (compensates on pull test)
3)   Mild to moderate bilateral symptomatology; mild postural instability; independence maintained
4)   Severe disability, but patient can still walk and stand without assistance
5)   Patient is wheelchair bound or bedridden without assistance from others

UPDRS III total - A More General Measure

The UPDRS III total scale is a more general scale to measure the state of the Morbus Parkinson disearse. The Hoehn-and-Yahr Scale is integrated into the UPDRS III total, as a sub-examination. The UPDRS scale refers to Unified Parkinson Disease Rating Scale, and it is a rating tool used to gauge the course of Parkinson's disease in patients. The UPDRS scale has been modified over the years by several medical organizations, and continues to be one of the bases of treatment and research in PD clinics. The UPDRS scale includes series of ratings for typical Parkinson's symptoms that cover all of the movement hindrances of Parkinson's disease. The UPDRS scale consists of the following five segments:
1) Mentation, Behavior, and Mood, 2) ADL, 3) Motor sections, 4) Modified Hoehn and Yahr Scale, and 5) Schwab and England ADL scale.
Each answer to the scale is evaluated by a medical professional that specializes in Parkinson's disease during patient interviews. Some sections of the UPDRS scale require multiple grades assigned to each extremity with a possible maximum of 199 points. A score of 199 on the UPDRS scale represents the worst (total disability) with a score of zero representing (no disability).
(Copied from: https://www.theracycle.com/resources/links-and-additional-resources/updrs-scale/)