NN-based regression for predicting the clinician's Parkinson's disease symptom score on the UPDRS scale

1 Description

The Unified Parkinson's Disease Rating Scale (UPDRS) is a measure that serves to evaluate the progression of Parkinson disease in a patient. Estimating the value of UPDRS using data different types of tests is a relevant application area of machine learning algorithms [1, 2, 3].

This project will use a database of collected speech signals, collected using a telemonitoring device for remote symptom progression monitoring [4]. The dataset is composed of a range of biomedical voice measurements from 42 people with early-stage Parkinson's disease. There are around 200 recordings per patient

The dataset is available from[1]. The original publication [1] provides details of the dataset.

2 Objectives

The goal of the project is the application Neural Networks for: I) Doing regression of the motor and total UPDRS scores (motor_UPDRS and total_UPDRS) from the 16 voice measures. II) Implement a multi-layer perceptron for this problem and compare it to one or more classifiers not based on NNs.

The student should: 1) Implement the solution of the regression problem (the two regression problems simultaneously). 2) Evaluate and discuss the results of the regressor:

As in other projects, a report should describe the characteristics of the design, implementation, and results. A Jupyter notebook should include calls to the implemented function that illustrate the way it works. The report should explain the feature engineering approach, describe the validation process, and show tables or figures with the accuracy of the classifiers.

3 Suggestions

- The use of tensorflow or keras is recommended.
- Be aware that this is a regression problem.
- Implementations can use any other Python library.

References

[1] M Isenkul, B Sakar, and O Kursun. Improved spiral test using digitized graphics tablet for monitoring parkinsons disease. In *Proceedings of the International Conference on e-Health and Telemedicine*, pages 171–175, 2014.

[1] `http://archive.ics.uci.edu/ml/datasets/Parkinsons+Telemonitoring`

[2] Roberto Santana, Alexander Mendiburu, and Jose A Lozano. Multi-view classification of psychiatric conditions based on saccades. *Applied Soft Computing*, 31:308–316, 2015.

[3] Abdulwahab Sahyoun, Karim Chehab, Osama Al-Madani, Fadi Aloul, and Assim Sagahyroon. Parknosis: Diagnosing parkinson's disease using mobile phones. In *e-Health Networking, Applications and Services (Healthcom), 2016 IEEE 18th International Conference on*, pages 1–6. IEEE, 2016.

[4] Athanasios Tsanas, Max A Little, Patrick E McSharry, and Lorraine O Ramig. Accurate telemonitoring of Parkinsons disease progression by noninvasive speech tests. *IEEE transactions on Biomedical Engineering*, 57(4):884–893, 2010.