# Position statement includes presentations and conclusion of 2024 (waiting for book permission)

## Clinical report

## till now

## Technical report

Parkinson's disease (+ other neurological disorders, Alberto's presentation)

| Parameters | Total |
|---|---|
| No Patient (cases) | 7561 (23 without no.) |
| Prospective | 25 |
| Randomized | 5 |
| (Case) Controls | 1513 (58 without no.) |
| Retrospective | 6 |
| **HNR** | **23** |
| SNR | 8 |
| **F0 (+stnd. dv.)** | **40** |
| **Intensity** | **24** |
| MPT | 14 |
| **JITTER APS/%** | **29** |
| **SHIMMER APS/%** | **23** |
| Spekt LTAS | 9 |
| CEPSTRUM | 5 |
| VRP | 4 |
| Telephone | 3 |
| Praat | 13 |
| **VHI** | **25** |
| GRBAS | 10 |
| Deep Brain.s | 7 |
| **AI** | **24** |
| Deep Learning | 9 |
| Laryngoscopy | 6 |

| Parameters | Total |
|---|---|
| No Patient (cases) | 6488 |
| (Case) Controls | 531 (6 well-defined) |
| Features | 2-453 (6-453 well defined) |
| Vector Machines | 9 |
| Praat | 6 |
| Telephones | 3 |
| Accuracy | 68-91% |

LITERATURE SEARCH I

**"Vocal Biomarkers and Artificial Intelligence - all to 2023"**

The Royal Society of Medicine Library for

Dr M Pedersen, 2 March 2023

332 papers here of 54 papers with included Parkinson's disease

LITERATURE SEARCH II

**"Voice Parameters in Parkinson's Disease from 2013 to 2023"**

The Royal Society of Medicine Library for

Dr M Pedersen 22 August 2023

98 papers

Authors
journal
Model
Validation
Testing
Training
Data description
Parameter features

Sneha Das has made an excel sheet
The information from the papers varies.
The data description is mostly extern
(Voice is not articulation, think of singing)
Inverse filtering:
N. P. Narendra, B. Schuller and P. Alku,
"The Detection of Parkinson's Disease
From Speech Using Voice Source Information,
" in *IEEE/ACM Transactions on Audio,Speech,
and Language Processing*, vol. 29, pp. 1925-1936,
2021, doi: 10.1109/TASLP.2021.3078364.

# N. P. Narendra, B. Schuller and P. Alku, The Detection of Parkinson's Disease From Speech Using Voice Source Information

**Abstract:**
Developing automatic methods to detect Parkinson's disease (PD) from speech has attracted increasing interest as these techniques can potentially be used in telemonitoring health applications. This article studies the utilization of voice source information in the detection of PD using two classifier architectures: traditional pipeline approach and end-to-end approach. The former consists of feature extraction and classifier stages. In feature extraction, the baseline acoustic features-consisting of articulation, phonation, and prosody features-were computed and voice source information was extracted using glottal features that were estimated by iterative adaptive inverse filtering (IAIF) and quasi-closed phase (QCP) glottal inverse filtering methods. Support vector machine classifiers were developed utilizing the baseline and glottal features extracted from every speech utterance and the corresponding healthy/PD labels. The end-to-end approach uses deep learning models which were trained using both raw speech waveforms and raw voice source waveforms. In the latter, two glottal inverse filtering methods (IAIF and QCP) and zero frequency filtering method were utilized. The deep learning architecture consists of a combination of convolutional layers followed by a multilayer perceptron. Experiments were performed using PC-GITA speech database. From the traditional pipeline systems, the highest classification accuracy (67.93%) was given by combination of baseline and QCP-based glottal features. From the end-to-end-systems, the highest accuracy (68.56%) was given by the system trained using QCP-based glottal flow signals. Even though classification accuracies were modest for all systems, the study is encouraging as the extraction of voice source information was found to be most effective in both approaches.

## Comments to Ramon

1 Do you propose that your model
Should be tested by group two?

5 is sensitivity and specificity of 90/95% enough?

8 are we only working with Parkinson’s disease?

10 good question

11 What about the huge amount of parameters that engineers use?

13 Should we include stroboscopies always?

17 I have made a paper on how to measure interarytenoid distance

20 Discuss exclusion criteria

28 Is it a good idea to use a, u, m?

29 You can use Ultrasounds to measure the Oropharyngeal area