



Title: Identification of Neurological disorders from speech/audio signals

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Purpose of study

Develop a real-time application that can identify people with Parkinson's Disease (PD), Alzheimer's Disease (AD), Multiple Sclerosis (MS), and healthy controls using their smartphones. This is done by collecting speech/audio recordings from participants with PD, AD, MS, and healthy controls with smartphones to analyze features using various decomposition methods such as Empirical Mode Decomposition (EMD), Variational Mode Decomposition (VMD), Empirical Wavelet Transform (EWT), etc. and deep learning models.

Participant Selection Criteria

Inclusion criteria:

- 1) Age Group: 18 – 70 years.
- 2) Clinical diagnosis of AD, PD, MS based on established medical criteria like MRIs, CSF, etc.
- 3) Cognitive ability to understand and follow instructions
- 4) Ability to articulate words clearly and understandably, without excessive disruption or incompleteness.
- 5) Healthy controls with no neurological disorders.
- 6) 50-50 division for male and female patients
- 7) Moderately uniform distribution of data across all ages.

Exclusion criteria:

- 1) Co-morbid conditions affecting speech (severe hearing loss, throat cancer, etc).
- 2) Inability to articulate words clearly and understandably.

Data Collection Environment

- 1) A quiet room with minimal background noise
- 2) Avoid rooms with excessive echo or reverb
- 3) Participants should sit in a comfortable position to relax their speech without unnecessary strain.
- 4) A fixed microphone (smartphone) position to help ensure consistency.
- 5) Participants should use smartphones capable of recording at least 44.1 kHz audio quality (16-bit) or as close to this standard as possible.
- 6) Participants should speak naturally.

Data Collection Procedure

- 1) Pronounce the vowel sound “aaaaaaa” continuously for 5 seconds. This must be done naturally without any strain. If pauses are encountered, let it be.
- 2) Pronounce the consonant sound “mmmmmmmm” continuously for 5 seconds. This must be done naturally without any strain. If pauses are encountered, let it be.
- 3) Then utter the statement “I find it difficult to perform daily tasks due to memory issues.”
- 4) The data collected can be from multiple smartphones in order to add diversity in the data collected.
- 5) Collect the age and gender of the patient at the time of recording the audios.

Data Storage Procedure

- 1) Store the data by creating a folder for each patient named “participant_XXXXX” where XXXXX represents the patient number/id (a 5-digit id which starts from 00001 and goes all the way up to the number of patients)
- 2) Inside each folder, store the recording of those 3 sounds separately as record_1.wav , record_2.wav, record_3.wav (or in any other file format) respectively for the vowel sound “aaaaaaa”, consonant sound “mmmmmmmm” and the sentence respectively.
- 3) Have a excel/csv file for storing the metadata related to each patient which includes their age, gender and the neurological disorder they are suffering from.