COMP 598
FINAL PROJECT

Classification Analysis of Parkinson Speech Dataset

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Problem definition

- Parkinson disease diagnosis from speech impairments

- Need for remote monitoring of patients
  - Substantial opportunities for lowering the inconvenience and cost of physical visits

- Need for reliable clinical monitoring tools

- Approximately 90% of PWP (People with Parkinson) exhibit some form of vocal impairment
  - dysphonia (defective use of the voice),
  - hypophonia (reduced volume)
  - monotone (reduced pitch range)
  - dysarthia (difficulty with articulation of sounds or syllables)

Data

- 26 voice samples from each subject
  - vowels, numbers, words, and short sentences

- Train data:
  - 20 PWP (6 female, 14 male)
  - 20 healthy individuals (10 female, 10 male)

- Test data:
  - 28 PWP
  - Sustained vowels ("a" and "o")

Data

TIME-FREQUENCY-BASED FEATURES EXTRACTED FROM VOICE SAMPLES

Features	Group
Jitter (local) Jitter (local, absolute) Jitter (rap) Jitter (ppq5) Jitter (ddp)	**Frequency parameters**
Number of pulses Number of periods Mean period Standard dev. of period	**Pulse Parameters**
Shimmer (local) Shimmer (local, dB) Shimmer (apq3) Shimmer (apq5) Shimmer (apq11) Shimmer (dda)	**Amplitude parameters**
Fraction of locally unvoiced frames Number of voice breaks Degree of voice breaks	**Voicing Parameters**
Median pitch Mean pitch Standard deviation Minimum pitch Maximum pitch	**Pitch Parameters**
Autocorrelation Noise-to-Harmonic Harmonic -to-Noise	**Harmonicity Parameters**

Related Work

Sakar, Betul Erdogdu, et al. - binary classification

- Methods:
  - SVM
  - K-NN

- *Leave-One-Subject-Out*
  - Validation: all the voice samples of one individual is left out
  - Training: the rest

- *Leave-One-Out*
  - Summarized-leave-one-out
  - Central tendency metrics:
    - Mean, median, trimmed mean
  - Dispersion metrics:
    - Standard deviation, mean absolute deviation, interquartile range

Methodology

- Replication of the results
- Methods to be applied
  - Logistic Regression
  - K-NN
  - SVM
    - Linear
    - Non-linear
- Leave-one-subject-out
- Leave-one-out
  - With summarized features
  - Regularization
    - Lasso
- If time permits
  - Testing with other datasets

Preliminary Results

- Leave-one-subject-out validation results:

	Accuracy
Logistic Regression (Stochastic gradient search)	55%
SVM	52.5%
K-NN	42.5%

References

- Sakar, Betul Erdogdu, et al. "Collection and analysis of a Parkinson speech dataset with multiple types of sound recordings." *Biomedical and Health Informatics, IEEE Journal of* 17.4 (2013): 828-834.

THANKS