

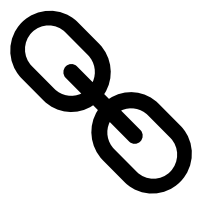
Introduction



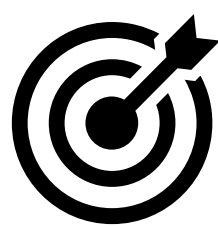
**Parkinson’s Disease (PD):**  
Progressive neurodegenerative disease with impairment of the motor system



**Depressive Disorders (DD):**  
Common comorbidity in PD that significantly reduces quality of life [1], [2]

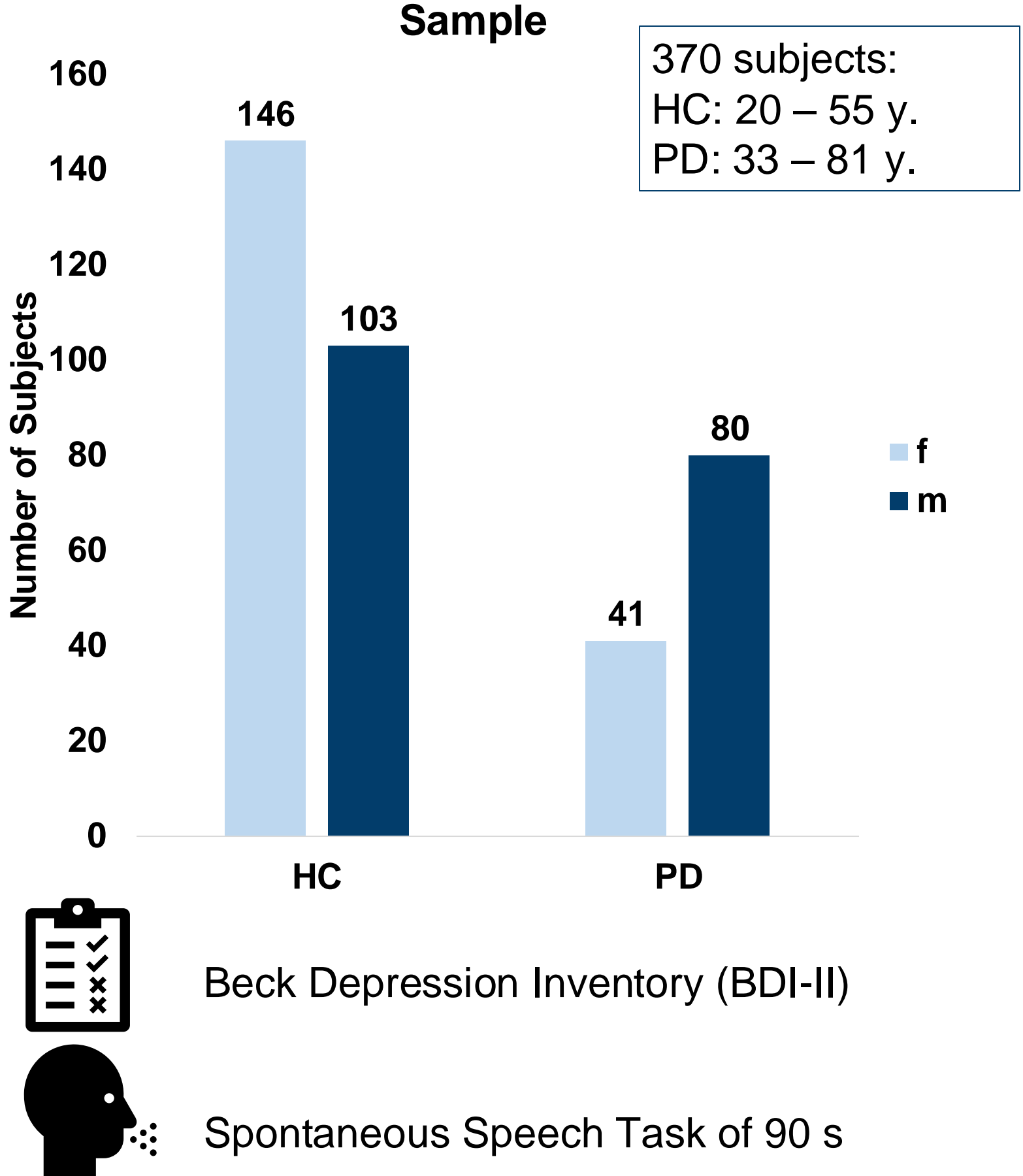


**Link:**  
Prosodic impairment & DD [3]  
→ Speech parameters potential biomarkers for depression in PD [1]



**Aim:**  
Identifying standardised, reliable prosodic features for the prediction of DD in PD

Methods



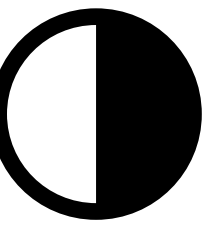
Feature Extraction

- 88 prosodic features extracted with the toolbox OpenSMILE [4]
- Categories: frequency, energy, spectral & temporal related variables



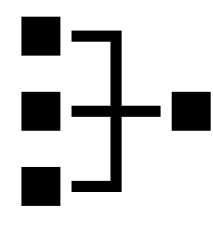
Classification

- Prediction of group (HC / PD) by prosodic speech features
- RepeatedKFold cross-validation with 5 repetitions of 5 folds, model Random Forest, performed in JuLearn [5]



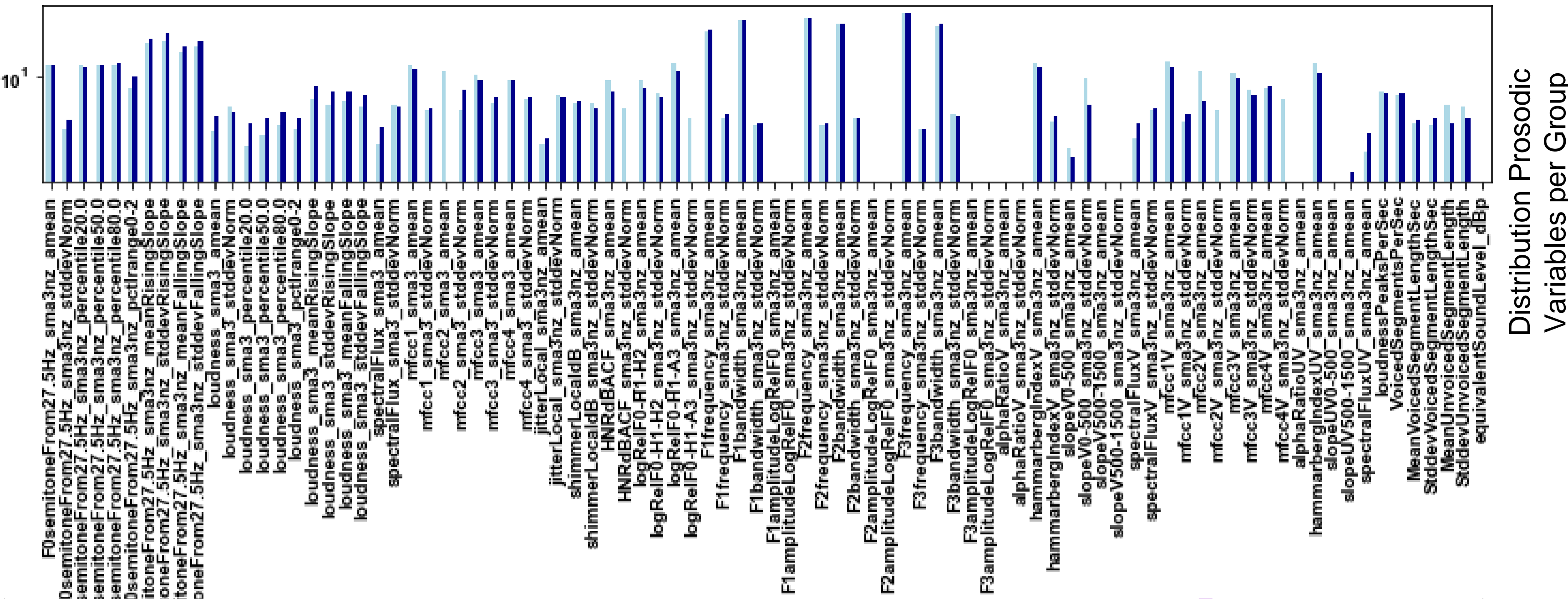
Regression

- Prediction of individual BDI-II scores
- RepeatedKFold cross-validation with 5 repetitions of 5 folds, model Random Forest, performed in JuLearn [5]

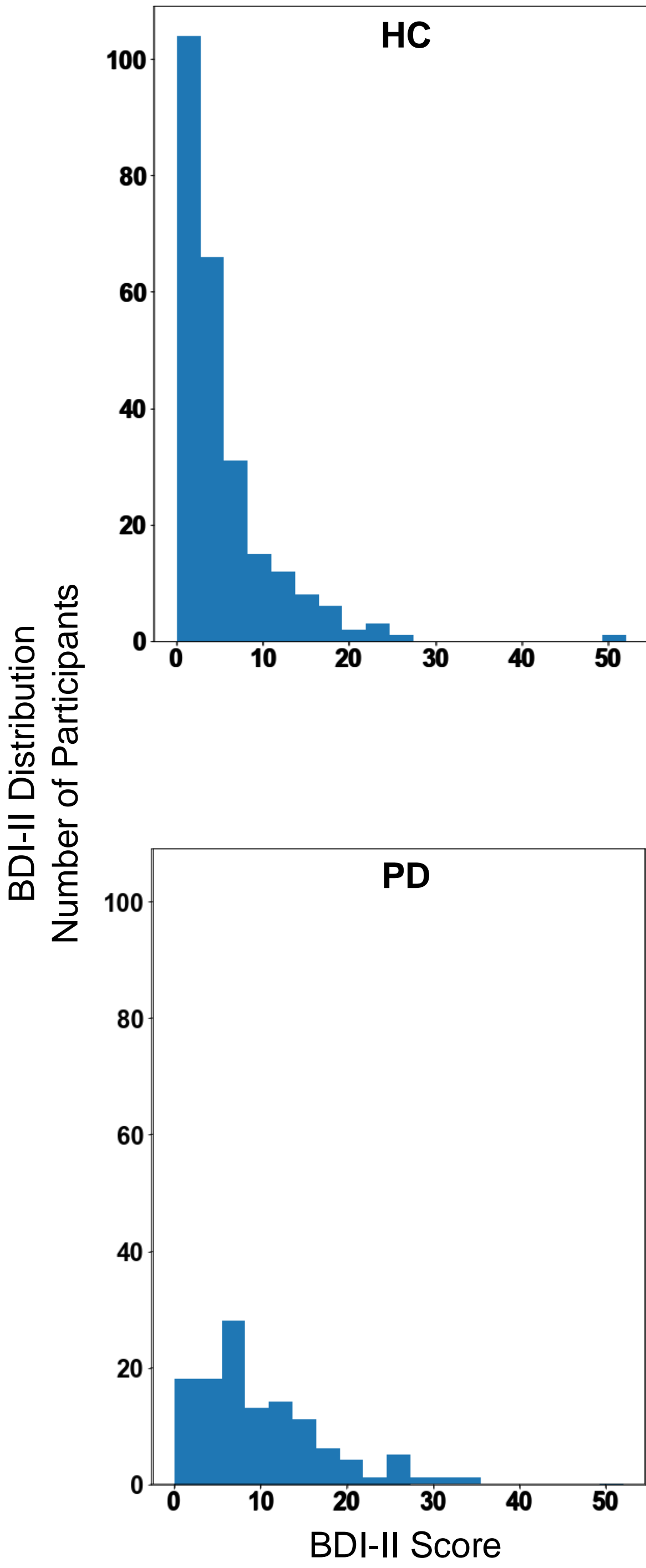


Results

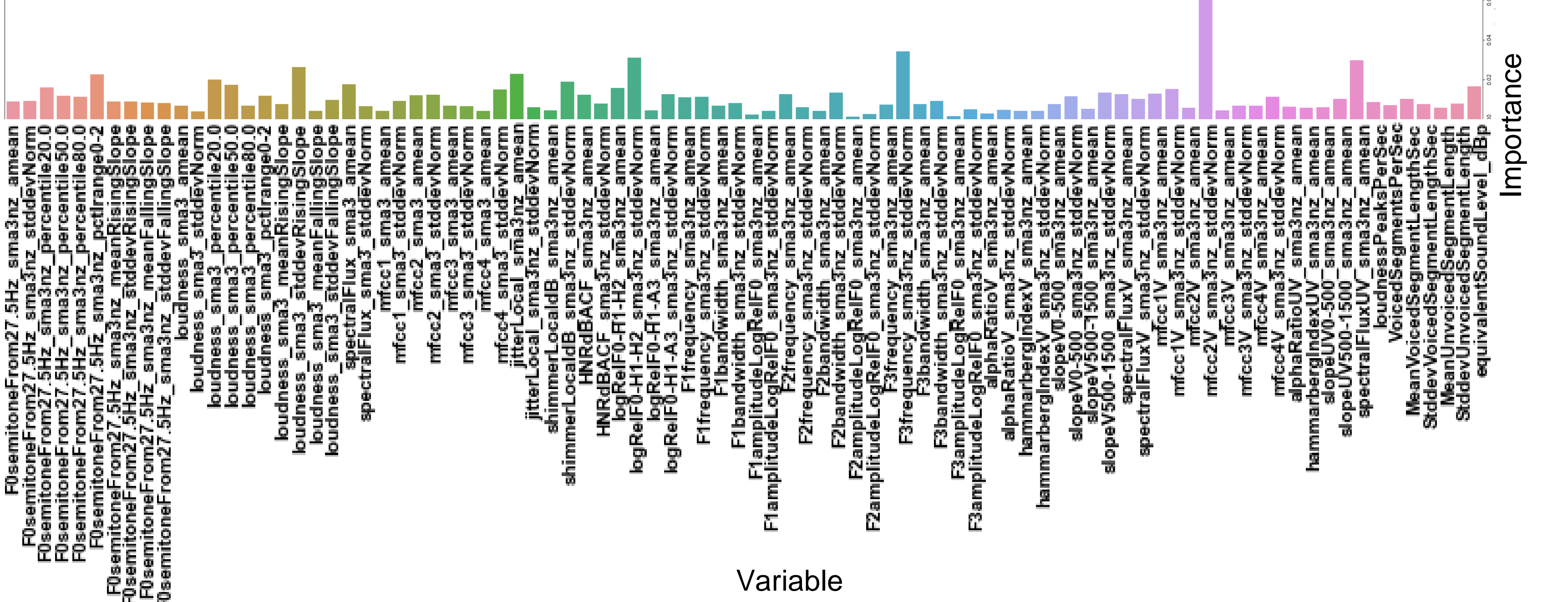
**Classification**  
Accuracy Test Score = 0.997



**Regression**  
 $R^2 = 0.024$



Feature Importance



Discussion

Prediction

- Classification: The model effectively distinguishes between healthy individuals and those with PD
- Regression: Low accuracy for depressive disorder predictions highlights the complexity of using prosodic features in smaller samples

Limitations

- Larger, more diverse samples are essential to validate findings
- Results support the development of standardised methodologies for extracting speech-related biomarkers in PD

Outlook

- Speech biomarkers are particularly valuable due to their simple and inexpensive acquisition and non-invasive nature
- These biomarkers could improve the detection, understanding and treatment of DD in Parkinson's disease

References:

- [1] Pérez-Toro PA et al. Speech Commun. (2022) 145:10-20.
- [2] Balestrino R & Martinez-Martin P J. Neurol. Sci. (2017) 374: 3-8.
- [3] Vélez Feijó A et al. Neuro. Dis. Treat. (2008) 4:669-674.
- [4] Eyben F et al. ACM Multimedia (2010) 18:1459-1462.
- [5] Hamdan S et al. Gigabyte (2024).

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Current Project → SpExNeuro:



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