

Predictors for Parkinson's Disease

A Study of Voice Recordings for Predictive Markers

Christine Hathaway

Bellevue University

Intro/Background of the Problem

Figure 1. Stages of Parkinson's disease

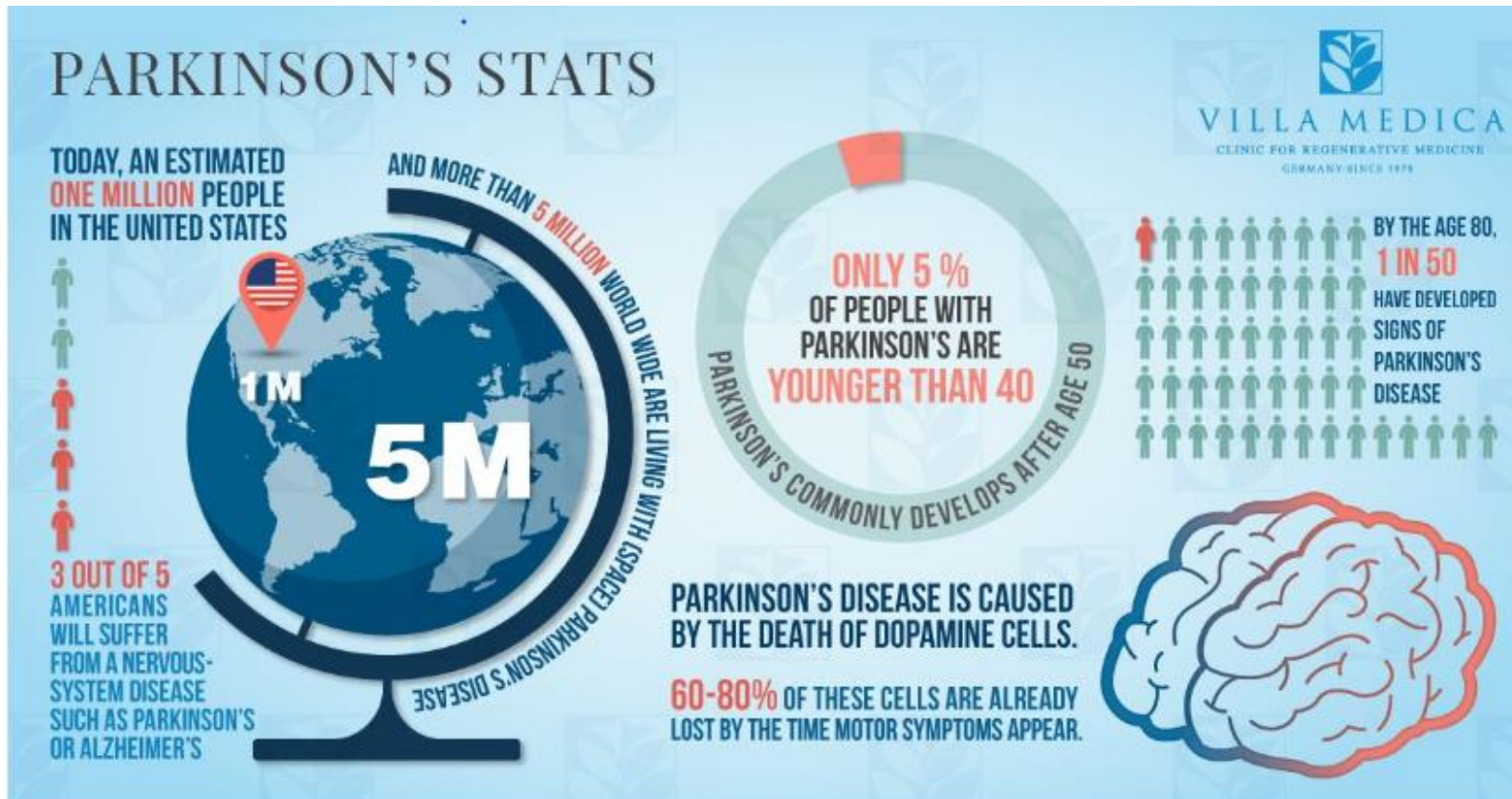
	Early PD		Mid-stage PD	Advanced PD	
Stage of Parkinson's Disease	1	2	3	4	5
Severity of Symptoms	MILD Symptoms of PD are mild and only seen on one side of the body (unilateral involvement)	MILD Symptoms of PD on both sides of the body (bilateral involvement) or at the midline	MODERATE Symptoms of PD are characterized by loss of balance and slowness of movement	SEVERE Symptoms of PD are severely disabling	SEVERE Symptoms of PD are severe and are characterized by an inability to rise
	SYMPTOMS Tremor of one hand Rigidity Clumsy Leg One side of the face may be affected, impacting the expression	SYMPTOMS Loss of facial expression on both sides Decreased blinking Speech abnormalities Rigidity of the muscles in the trunk	SYMPTOMS Balance is compromised Inability to make the rapid, automatic and involuntary adjustments All other symptoms of PD are present	SYMPTOMS Patients may be able to walk and stand unassisted, but they are noticeably incapacitated Patient is unable to live an independent life and needs assistance	SYMPTOMS Patients fall when standing or turning May freeze or stumble when walking Hallucinations or delusions.

Source: ParkinsonsDisease.net <https://parkinsonsdisease.net/basics/stages/>



Parkinson's Statistics

Figure 2



Source: Villa Medica <https://villa-medica.com/cell-therapy-for-parkinsons/>



Business Question

- No test for Parkinson's disease
- Clinical diagnosis
- Speech patterns
- Early detection

Business Question:

- Are some speech indicators better than others at predicting PD?

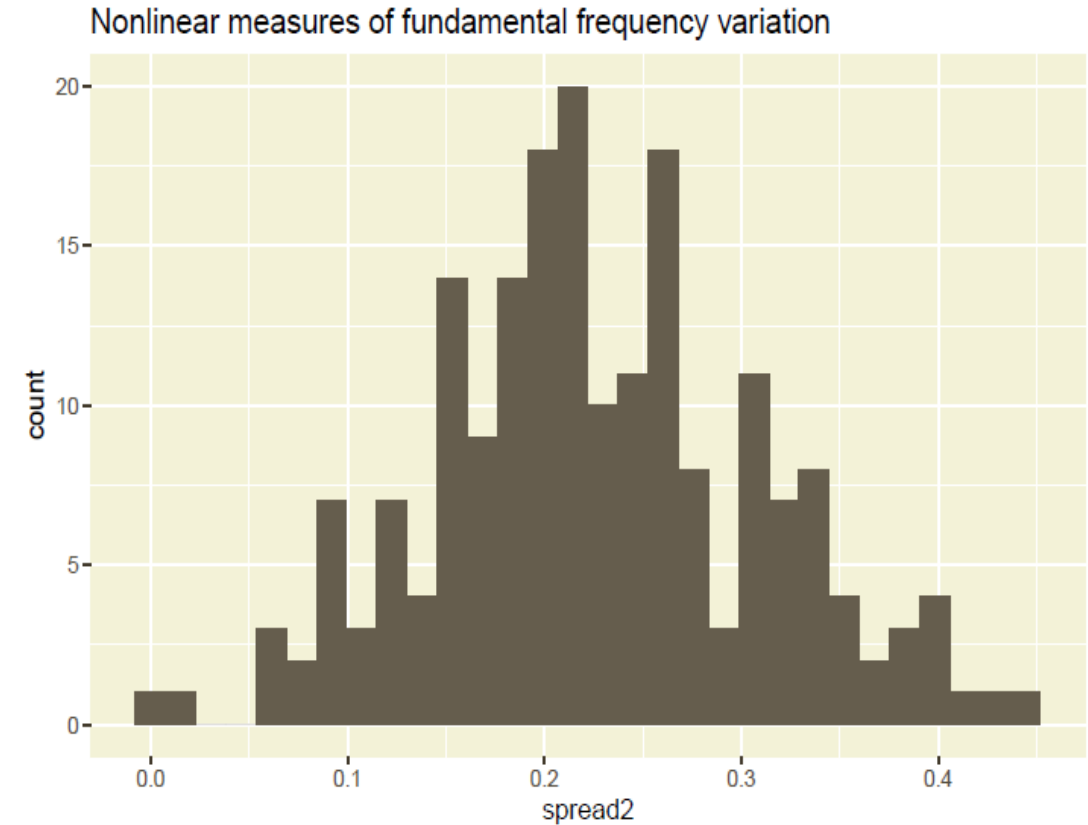
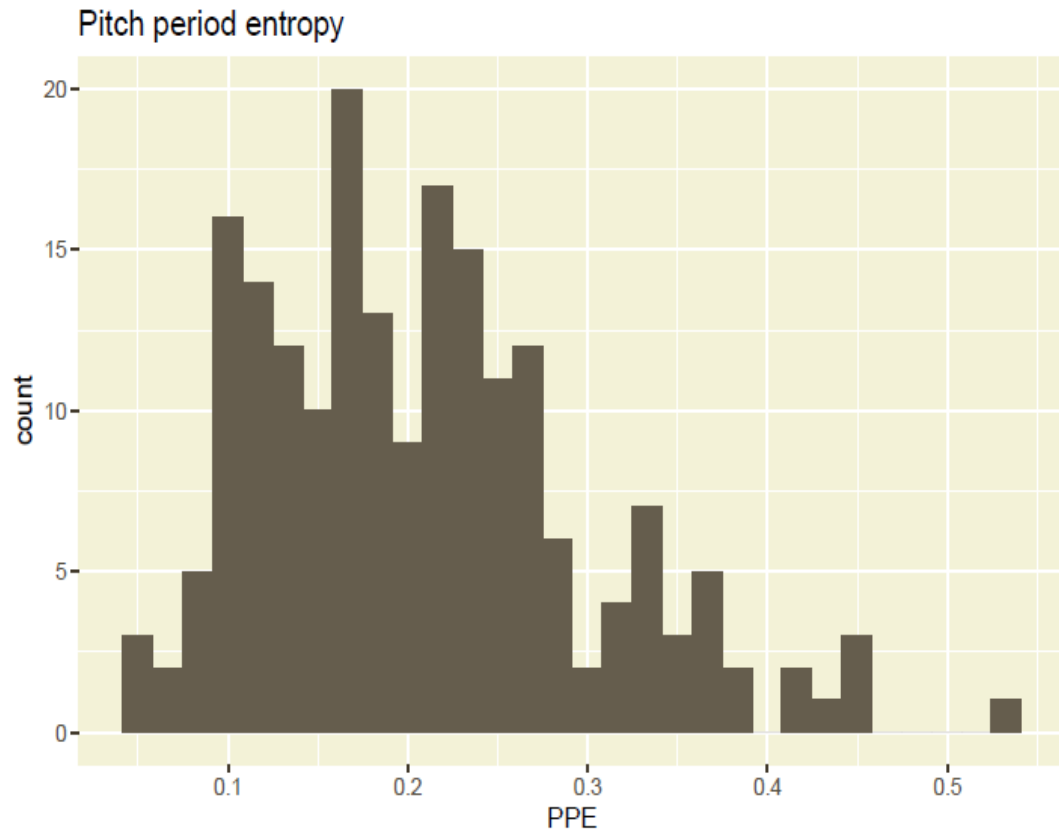


Understanding the Data

- 31 participants
- 23 diagnosed with Parkinson's disease
- Variables represent various measures of speech
- Dataset created by Max Little at University of Oxford
- Speech signals recorded at National Centre for Voice and Speech in Denver, Colorado



Exploratory Data Analysis (EDA)

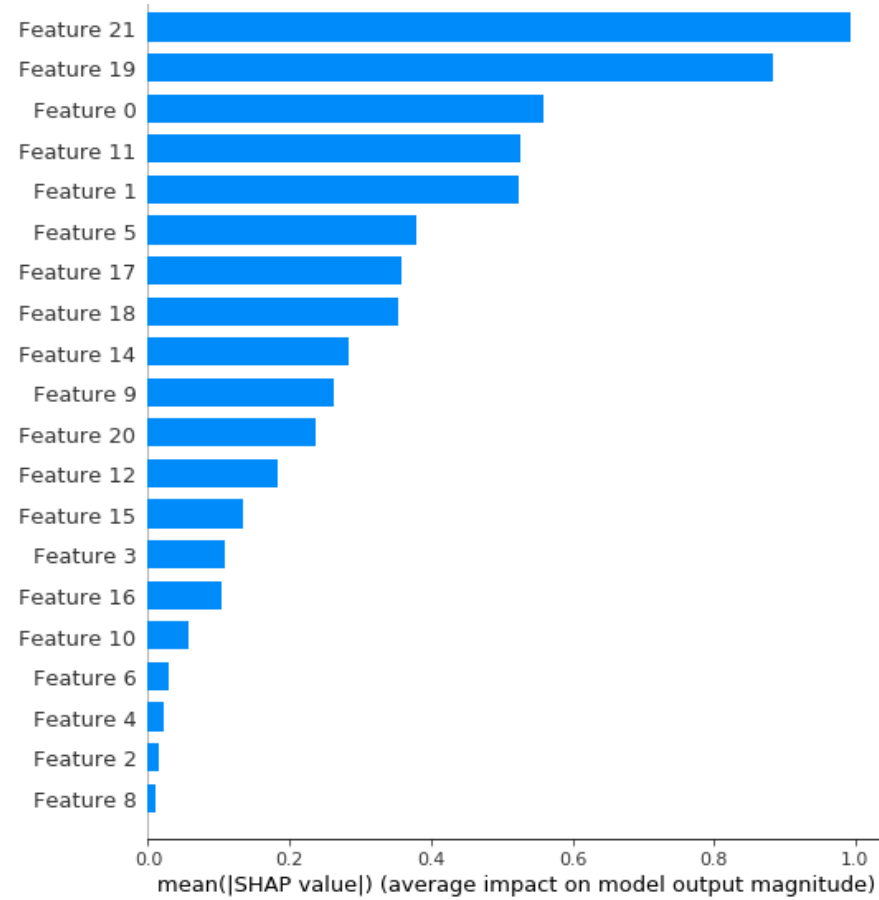


Modeling

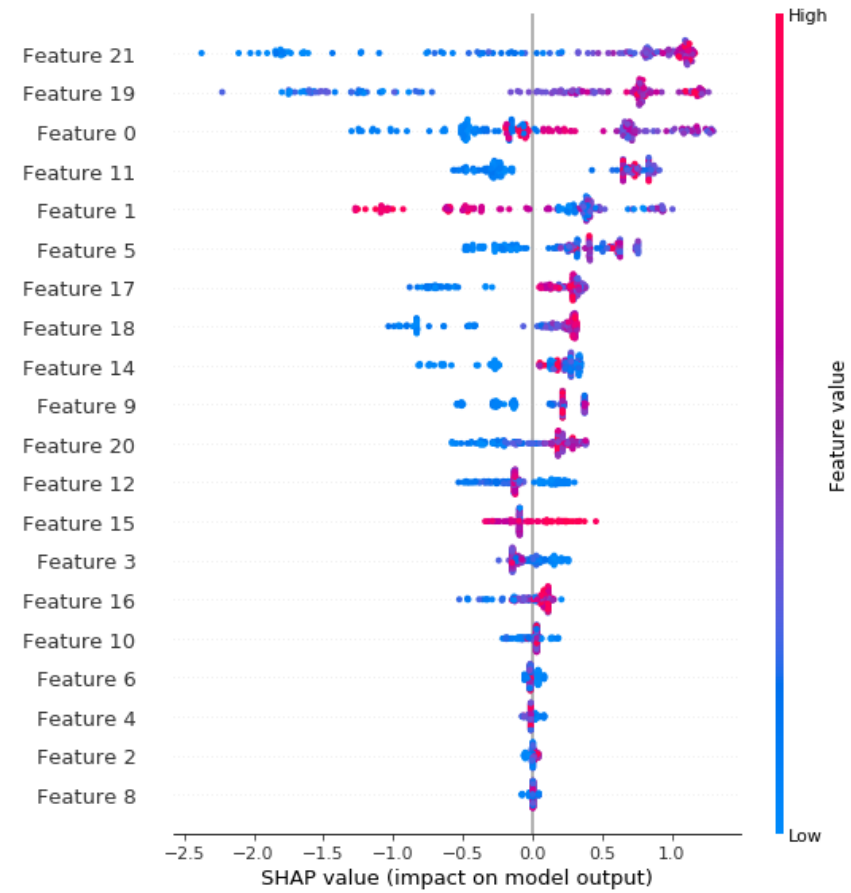
- Regression modeling in R did not produce significant results
- Small data set responds better to gradient boosting
- Xgboost in Python produced results with significant findings



Results



Results



Conclusion

- PPE measurement strongly correlated to Parkinson's disease
- Could lead to new test for Parkinson's disease
- Crucial discovery in early detection



References

- Figure 1: Joeken, H. (November, 17 2017). *Parkinson's Disease: The Golden Age Challenge*. Retrieved from Villa Medica: <https://villa-medica.com/cell-therapy-for-parkinsons/>
- Figure 2: Health Union. (February, 23 2017). *What Are the Stages of Parkinson's Disease?* Retrieved from ParkinsonsDisease.net: <https://parkinsonsdisease.net/basics/stages/>