

Appendix

| Assessment / Questionnaire | Feature | Value | Gini |
|----------------------------|---|--------------|-------|
| General Questionnaire | Root Feature <i>Handwriting Problems</i> | $x \leq 0.5$ | 0.404 |
| | First Order Feature(s) <i>Energy Level</i> | $x \leq 8.5$ | 0.492 |
| PDQ - 39 | Root Feature <i>Difficulty Writing Clearly</i> | $x \leq 1.5$ | 0.404 |
| | First Order Feature(s) <i>Fear of Falling</i> | $x \leq 1.5$ | 0.059 |

Appendix Table 1. Features of Interest given Decision Tree Results for Patient Reported Outcomes - Gini Index Values of Questionnaire Responses for PD Population versus Controls.

| Assessment | Feature | Value | Gini |
|---|---|------------------|-------------|
| Finger Tapping (Fine Motor) | Root Feature | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 0.871$ | 0.375 |
| | First Order Feature(s) | | |
| | <i>Total Small Circles Tapped</i> | $x \leq 35.5$ | 0.208 |
| Grandfather Passage (Speech) | Root Feature | | |
| | <i>Number of Missed Words</i> | $x \leq 22.5$ | 0.423 |
| | First Order Feature(s) | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.001$ | 0.165 |
| | <i>Number of Additional Words</i> | $x \leq 17.5$ | 0.202 |
| Circle Tracing (Fine-Motor) | Root Feature | | |
| | <i>Maximum Drawing Speed</i> | $x \leq 388.85$ | 0.435 |
| | First Order Feature(s) | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 0.998$ | 0.32 |
| Square Tracing (Fine-Motor) | Root Feature | | |
| | <i>Maximum Drawing Speed</i> | $x \leq 454.433$ | 0.44 |
| | First Order Feature(s) | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 0.997$ | 0.387 |
| Narration (Speech) | Root Feature | | |
| | <i>Phrase Said Incorrectly</i> | $x \leq 0.5$ | 0.44 |
| | First Order Feature(s) | | |
| | <i>Time from Start to First Word Said</i> | $x \leq 2.569$ | 0.251 |
| | <i>Avg Time between Words Said</i> | $x \leq 0.324$ | 0.278 |
| Object Naming (Speech) | Root Feature | | |
| | <i>Total Incorrect</i> | $x \leq 2.5$ | 0.44 |
| | First Order Feature(s) | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 1.003$ | 0.08 |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.102$ | 0.463 |
| Card Matching (Memory) | Root Feature | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 0.953$ | 0.44 |
| | First Order Feature(s) | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.243$ | 0.301 |
| Card Matching with Cognitive Interference (Memory) | Root Feature | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.135$ | 0.44 |
| | First Order Feature(s) | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.048$ | 0.434 |

Appendix Table 2. Features of Interest given Decision Tree Results for Single Functional Tests - Gini Index Values of Functional Neurocognitive Assessment Tests for PD Population versus Controls.

| Assessment | Feature | Value | Gini |
|--|--|-------------------|-------------|
| Circle Tracing with Speech (Multit-Test) | Root Feature | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.079$ | 0.429 |
| | First Order Feature(s) | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 0.924$ | 0.444 |
| | <i>Total Distance Drawn</i> | $x \leq 25268.62$ | 0.137 |
| Square Tracing with Speech (Multit-Test) | Root Feature | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.074$ | 0.429 |
| | First Order Feature(s) | | |
| | <i>Maximum Time between Words Said</i> | $x \leq 2.897$ | 0.444 |
| | <i>Number of Outline Crossings</i> | $x \leq 19.0$ | 0.137 |
| Narration Writer (Multit-Test) | Root Feature | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 0.919$ | 0.44 |
| | First Order Feature(s) | | |
| | <i>Average Magnitude of Acceleration</i> | $x \leq 1.003$ | 0.313 |
| | <i>Total Elapsed Writing Time</i> | $x \leq 27.251$ | 0.32 |
| Stroop Word Color (Executive Function) | Root Feature | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 1.002$ | 0.44 |
| | First Order Feature(s) | | |
| | <i>Total Colors Generated</i> | $x \leq 8.5$ | 0.369 |
| Visuospatial (Executive Function) | Root Feature | | |
| | <i>Average Drawing Speed</i> | $x \leq 218.442$ | 0.458 |
| | First Order Feature(s) | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 1.002$ | 0.305 |
| | <i>Time</i> | $x \leq 8.456$ | 0.355 |
| Visuospatial with Cognitive Interference (Executive Function) | Root Feature | | |
| | <i>Average Drawing Speed</i> | $x \leq 186.201$ | 0.458 |
| | First Order Feature(s) | | |
| | <i>Average Distance to Correct Point</i> | $x \leq 10.351$ | 0.342 |
| | <i>Maximum Time Between Objects</i> | $x \leq 1.933$ | 0.426 |

Appendix Table 3. Features of Interest given Decision Tree Results for Multifunctional Tests - Gini Index Values of Functional Neurocognitive Assessment Tests for PD Population versus Controls.

| Assessment / Questionnaire | Feature | Value | Gini |
|-----------------------------------|---|----------------|-------------|
| General Questionnaire | Root Feature <i>Handwriting Problems</i> | $x \leq 0.5$ | 0.404 |
| | First Order Feature(s) <i>Energy Level</i> | $x \leq 8.5$ | 0.492 |
| PDQ - 39 | Root Feature <i>Difficulty with Leisure Activities</i> | $x \leq 2.5$ | 0.412 |
| | First Order Feature(s) <i>Felt Unable to Communicate</i> | $x \leq 0.5$ | 0.219 |
| | <i>Felt Unpleasantly Hot or Cold</i> | $x \leq 0.5$ | 0.245 |
| Berg Balance Scale | Root Feature <i>Standing With One Foot In Front</i> | $x \leq 2.5$ | 0.412 |
| | First Order Feature(s) <i>Turning to Look Behind</i> | $x \leq 3.5$ | 0.413 |
| Functional Movement Assessments | Root Feature <i>Six Minute Walk</i> | $x \leq 494.5$ | 0.412 |
| | First Order Feature(s) <i>Timed Up and Go</i> | $x \leq 9.305$ | 0.397 |

Appendix Table 4. Features of Interest given Decision Tree Results of Patient Reported Outcomes/Subjective Assessment - Gini Index Values of Functional Assessments and Questionnaire Responses for PD Populations in Early Stages (H&Y Stages 1 and 2) versus Advanced Stages (H&Y Stages 3, 4, and 5).

| Assessment | Feature | Value | Gini |
|---|--|------------------|-------------|
| Finger Tapping (Fine Motor) | Root Feature | | |
| | <i>Total Targets Tapped</i> | $x \leq 32.5$ | 0.363 |
| | First Order Feature(s) | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.1937$ | 0.198 |
| Circle Tracing (Fine-Motor) | Root Feature | | |
| | <i>First and Last Point Distance</i> | $x \leq 74.77$ | 0.363 |
| | First Order Feature(s) | | |
| | <i>Average Drawing Speed</i> | $x \leq 251.92$ | 0.208 |
| | <i>First and Last Point Distance</i> | $x \leq 182.21$ | 0.375 |
| Square Tracing (Fine-Motor) | Root Feature | | |
| | <i>Minimum Magnitude of Acceleration</i> | $x \leq 0.907$ | 0.363 |
| | First Order Feature(s) | | |
| | <i>Maximum Drawing Speed</i> | $x \leq 1327.25$ | 0.496 |
| Narration (Speech) | Root Feature | | |
| | <i>Total Elapsed Speaking Time</i> | $x \leq 5.948$ | 0.363 |
| | First Order Feature(s) | | |
| | <i>Time from Start to First Word Said</i> | $x \leq 3.689$ | 0.5 |
| Object Naming (Speech) | Root Feature | | |
| | <i>Total Correct Objects</i> | $x \leq 10.5$ | 0.363 |
| | First Order Feature(s) | | |
| | <i>Total Incorrect Objects</i> | $x \leq 1.5$ | 0.124 |
| | <i>Average Time for Correct Response</i> | $x \leq 2.52$ | 0.444 |
| Card Matching (Memory) | Root Feature | | |
| | <i>Average Time Between Non-Match Pair</i> | $x \leq 1.98$ | 0.363 |
| | First Order Feature(s) | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.372$ | 0.198 |
| Card Matching with Cognitive Interference (Memory) | Root Feature | | |
| | <i>Average Time Between Non-Match Pair</i> | $x \leq 2.377$ | 0.363 |
| | First Order Feature(s) | | |
| | <i>Average Time Between Non-Match Pair</i> | $x \leq 0.949$ | 0.198 |
| Grandfather Passage (Speech) | Root Feature | | |
| | <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.325$ | 0.423 |
| | First Order Feature(s) | | |
| | <i>Average Time between Words Said</i> | $x \leq 0.584$ | 0.32 |

Appendix Table 5. Features of Interest given Decision Tree Results for Single Functional Tests - Gini Index Values of Functional Neurocognitive Assessment Tests for PD Population versus Controls.

| Assessment | Feature | Value | Gini |
|--|---|------------------|-------------|
| Circle Tracing with Speech (Multit-Test) | Root Feature <i>Number of Missing Months</i> | $x \leq 2.5$ | 0.363 |
| | First Order Feature(s) <i>Average Distance from Shape</i> | $x \leq 8.465$ | 0.408 |
| Square Tracing with Speech (Multit-Test) | Root Feature <i>Number of Missing Months</i> | $x \leq 2.5$ | 0.363 |
| | First Order Feature(s) <i>Maximum Magnitude of Acceleration</i> | $x \leq 1.104$ | 0.469 |
| Narration Writer (Multit-Test) | Root Feature <i>Average Time Between Strokes</i> | $x \leq 0.314$ | 0.363 |
| | First Order Feature(s) <i>Time from Start to First Word Said</i> | $x \leq 7.14$ | 0.494 |
| Stroop Word Color (Executive Function) | Root Feature <i>Total Colors Generated</i> | $x \leq 6.5$ | 0.363 |
| | First Order Feature(s) <i>Average Time for Correct Response</i> | $x \leq 1.921$ | 0.124 |
| | <i>Average Time for Incorrect Response</i> | $x \leq 19.569$ | 0.444 |
| Visuospatial (Executive Function) | Root Feature <i>Total Distance Drawn</i> | $x \leq 3529.34$ | 0.375 |
| | First Order Feature(s) <i>Total Distance Drawn</i> | $x \leq 2214.88$ | 0.117 |
| Visuospatial with Cognitive Interference (Executive Function) | Root Feature <i>Average Distance from Correct Path</i> | $x \leq 13.332$ | 0.375 |
| | First Order Feature(s) <i>Time</i> | $x \leq 17.493$ | 0.278 |

Appendix Table 6. Features of Interest given Decision Tree Results for Multifunctional Tests - Gini Index Values of Functional Neurocognitive Assessment Tests for PD Population versus Controls.