PROJECT SUMMARY (See instructions):
Identification of a robust biomarker of Parkinson disease is of paramount importance to facilitate research into treatments or cures. One factor making neuroprotection research difficult is that clinical outcomes are measured imprecisely using clinical rating scales (such as the UPDRS) requiring a large number of patients and a large effect size to meet endpoints. We have shown that gait and balance, as measured by the APDM Mobility Lab, discriminates PD subjects from controls and correlates with disease progression, and thus could potentially serve as a clinical biomarker of PD progression. For this project, we aim to develop a different analytical method using machine learning techniques and complexity measures which takes raw sensor data from APDM walking and balance tests and generates a “fingerprint” which can be used to compare PD subjects with controls and evaluate disease progression in PD subjects. The study consists of big data analysis of existing sensor data captured on 180 patients and 25 controls who are participating in the NINDS Parkinson Disease Biomarker Program (PDBP) at UT Southwestern Medical Center. This existing sensor data will be used to refine the analysis algorithm to develop a fingerprint describing gait and balance which can successfully 1) differentiate PD subjects from controls, 2) correlate with disease severity in PD, and 3) reflect disease progression in a cohort of PD subjects. Our method for developing a fingerprint from the raw sensor data involves extracting an extensive set of time domain and frequency domain features from raw data (accelerometers, gyroscopes and magnetometers) to convert the sensor readings into a set of alphabets called motion transcripts. These motion transcripts can then be used in aggregate to define a fingerprint representing the gait and balance of subjects.

RELEVANCE (See instructions):
The relevance of this project to the understanding of human disease is that by identifying a robust clinical biomarker of PD clinical progression, it is expected that we will be able to accelerate research into new disease modifying treatments for Parkinson’s disease.