**Title:** Probabilistic Mapping of Deep Brain Stimulation for Parkinson’s Disease

**Faculty mentor:**

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**Research Project Description:** Parkinson’s disease (PD) is a neurodegenerative syndrome that primarily affecting the neural circuitry of the basal ganglia that commonly manifests in movement-related symptoms (resting tremor, a soft voice, micrographia, rigidity, bradykinesia, shuffling steps, balance difficulties). Other symptoms of PD can include mood, sleep, cognition, and autonomic disruptions. Typical treatment involve administration of levodopa and dopamine agonists. Over time, the effectiveness of medication therapy may lessen, and the medications can result in complications, including dyskinesia. Deep-brain stimulation (DBS) is a surgical technique where one or more electrodes are implanted in specific regions of the brain (most commonly the subthalamic nucleus and the internal segment of the globus pallidus) and this therapy can be used to modulate neural signaling in the basal ganglia. The precise therapeutic mechanism of DBS has not yet been deduced however DBS has been known to influence multiple thalamocortical circuits, downstream pathways, and other brain structures.

This project will involve a retrospective study using patient-specific computational models in combination with motor and non-motor outcome data derived from PD patients who have undergone DBS. The initial goal of this study will be to identify anatomical regions where stimulation may be correlated to changes in therapeutic effects and also to side effects. In the future, data from this study will be integrated into a probabilistic stimulation atlas that, if successful, can be used in future studies and used as a DBS programming tool. The overarching goal will be to develop a tool to guide the clinician on the best stimulation target that is based on a patient's symptom profile (personalized medicine).

The medical student will be engaged in all aspects of this research project. This will include: patient interactions in the clinic, shadowing in the operating theater, data collection/analysis, and authoring a paper for peer reviewed publication.

**References:**
