

**Lewis University**  
**STEM Undergraduate Research Experience (S.U.R.E.) 2019**  
**Faculty Mentor – Project Application**

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**Department: Computer and Mathematical Sciences**

**Research Project Title: Detection/Prediction of Neurological Disorders Using Ratiometric and Feature-Based Retinal Nerve Fiber Layer (RNFL) Analysis**

**This work proposes a quantitative analysis on the retinal nerve fiber layer (RNFL) thickness acquired by optical coherence tomography (OCT) imaging technique. The retina has about a million retinal ganglion cells, the axons of which constitute the retinal nerve fiber layer (RNFL). Neurological disorders such as multiple sclerosis (MS) have shown their effect on the central nerve system (CNS). Since the retina is part of the CNS, the assumption that such a neurological disorder can be reflected in the subtle changes in the RNFL. Using various ratios and relevant features calculated from the subtle changes of the RNFL thicknesses, a possible early diagnosis of neurological disorders such as multiple sclerosis (MS) has been shown with promises. With minimal or non-invasive methods such as OCT, in this work, possible early diagnosis of epilepsy and Parkinson's disease is explored. For that purpose, various mathematical and image-processing tools for analyzing and determining the ratiometric and feature-based values will be utilized. Image registration and image segmentation along with statistical techniques will be adopted for a quantitative analysis of the subtle changes of the RNFL.**