A Novel Noninvasive and Inexpensive Biomarker for Diagnosing Major Depressive Disorder (MDD): Using Machine Learning Model in silico and Drosophila melanogaster Model in vivo

Addanki, Anvitha (School: Canton High School)

This project identified a noninvasive and inexpensive biomarker which could supplement the patient health questionnaire to accurately diagnose Major Depressive Disorder (MDD) using a machine learning model and corroborated the results with a Drosophila melanogaster model. In this novel study, Region of Interest and statistical analysis was performed for two trials on all brain regions using fMRI data from publicly available T1 weighted fMRI dataset from nineteen never-depressed and nineteen MDD participants from University of Kansas Medical Center (Lepping et al., 2016). Statistical analysis was also performed for two trials on the RNFL and GCL-IPL thickness in both eyes using internal SD-OCT scans from 22 never-depressed and 22 MDD participants from KNR University. RNFL thickness was measured in vivo for multiple sets of depressed Drosophila melanogaster. MDD showed a statistically significant effect for all combined occipital region measures and the RNFL and GCL-IPL thicknesses in both eyes. MDD showed a statistically significant effect for retinal thickness in Drosophila eyes. A machine learning ensemble model, created with Decision Tree, KNN, and RFC, provided an accuracy of 0.9730 for fMRI data and 0.9444 for OCT data using Bagging Random Forest. Results from this novel study suggest that examining the optic nerve and the innermost layers of the RNFL and GCL-IPL, MDD can accurately be diagnosed by using a noninvasive and inexpensive routine OCT procedure. Results of this study will allow for early diagnosis and treatment of MDD in humans and can improve their overall health and quality of life.