Development of a Low-Cost Machine Learning Diagnostic Device and Medical IoT Application as a Novel Approach to Combating Retinal Diseases

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Caused by the high blood sugar from diabetes, diabetic retinopathy is a disease that damages the blood vessels of the retina. This can lead to blindness and other vision complications. 79% of diabetic adults live in developing nations and experience a major risk of joining the estimated 93 million people worldwide suffering from diabetic retinopathy. Early treatments include blood glucose management and laser surgery, but when left untreated, the effects of diabetic retinopathy worsen. Without significant medical testing, which can often prove to be expensive, developing nations are at a high risk of blindness and suffering the consequences of vision impairment. The investigator's development of low-cost machine learning algorithms, paired with a novel device and application, have the potential to mitigate diabetic retinopathy. To elaborate, the investigator's k-nearest neighbors were more accurate in lower training sample sizes and his convolutional neural networks were more accurate in higher training sample sizes, indicating that an efficient approach for the device would be incorporating a KNN algorithm to recognize the retina when in-view and a CNN algorithm to discern between that sample's particular stage of DR. Once a patient is diagnosed, the testing results are exported via a NFC transmitter placed under the device's charging port. This technology allows users to hover their phones over the labeled NFC area and receive trial results over the app. With this project and future projects, the researcher aspires to not only bridge the gap between technology and preventable retinal diseases, but also offer a lasting improvement.

Awards Won:
Third Award of $1,000