Project Title: Comparing the Efficiency of Novel Point of Care Approaches to Identifying Specific Stages of Diabetic Retinopathy Through the Use of Low-Cost Neural Networks and Novel Deep Learning Solutions

Category:
Pick one only--
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School, City, State: Fort Myers High School, Fort Myers, Florida

Diabetic retinopathy is a complication, caused by a history of diabetes, that slowly deteriorates a person's vision and severely impacts those in low-income areas due to a lack of available testing. The preventable nature of these complications led to the researchers' study of the accuracy of convolutional neural network algorithms compared to k-nearest neighbors algorithm, over different training sample sizes, in identifying specific stages of DR in retinal images. To study such differences, the investigators developed these two closed algorithms through TensorFlow API to serve as an accessible web utility. After preliminary setup, the researchers began training the algorithm with samples at increments and testing their accuracy via their developed online/public platform. The experimentation produced accuracies categorized by DR severity and NN algorithm. In both algorithms, there was a general increase in accuracy as the training sample size increased. The CNN algorithm produced greater accuracy across higher training sample sizes ($n \geq 375$) compared to KNN, which produced greater accuracy across lower training sample sizes ($n \leq 250$), supporting the investigators' hypothesis. For each training sample size, a two-way ANOVA generated p-values less than the significance level of 0.05. The null hypothesis—no statistical significance between the algorithm type and its average accuracy across training sample sizes—was rejected. Researchers concluded it was a statistically significant relationship, proving that the algorithm type played a role in its accuracy. These results coincide with the global ophthalmic community that seeks widespread testing on behalf of those in low-income areas who are most at risk for DR.

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1. As a part of this research project, the student directly handled, manipulated or interacted with (check ALL that apply):

____human subjects   ____potentially hazardous biological agents
____Vertebrate Animals   ____microorganisms   ____rDNA   ____tissue

2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and one year's work only.
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3. I/we worked or used equipment in a regulated research institute or industrial setting ____Yes __X__No

4. This project is a continuation of previous research __X__Yes ____No

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I/We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I/We also attest that the above properly reflects my/our own work.

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