A-EYE: Utilizing Multistage Neural Networks and Landmark Localization for Fundus Image Disease Detection

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Affordably Examining Your Eyes [A-EYE] is a multistage artificial intelligence platform that detects eye conditions through retinal fundus images. Unlike previous attempts of deep learning disease detection in fundus images, A-EYE utilizes object detection to locate anomalies and landmarks to diagnose a patient. Approximately 250 high-quality fundus images were labeled to train the modified YOLOv3 quadrant-based neural network architecture. Additionally, the detected landmarks are then segmented using the novel M-Net++ neural network to calculate the cup to disc ratio. A-EYE has an 85% true-positive rate and 2% false-positive rate in diagnosing diabetic retinopathy; 87.5% true-positive rate and 10% false-positive rate in diagnosing glaucoma; and a 95% true-positive rate and an 8% false-positive rate in diagnosing age-related macular degeneration. With only 250 labeled images, A-EYE can maintain performance similar to a model trained with a large dataset. Additionally, A-EYE is the first-ever attempt at using object detection in fundus image disease detection. Due to the increased efficiency of the network, A-EYE does not require intensive hardware making it the perfect solution for assisting medical professionals in eye screening.

Awards Won:
Fourth Award of $500