Automatic Detection of Intravitreal Neovascularization in Retinal Flat Mount Images Using Deep Learning Methods

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Retinopathy of prematurity (ROP) is a leading cause of childhood blindness. Recent developments have discovered that ROP can be characterized by intravitreal neovascularization (IVNV), which is when blood vessels grow abnormally and proliferate into the vitreous of the eye. IVNV growth can be seen in retinal flat mounts images, which are images of cut open retinas laid flat on a surface. Current methods of detecting IVNV are manual and inefficient, creating a need for a faster and automated system. Such a system would help progress the discovery of new diagnoses and treatments for ROP. This project utilized a fully convolutional neural network (FCNN) to automatically segment the retinal flat mount images to identify IVNV. Cross-validation and pixel accuracy were used to determine the accuracy by comparing the segmented images from the FCNN to predefined ground-truth markings. The results from this project showed that the method created has good potential to be an automatic screening tool to identify IVNV in the future and replace manual identification. Future research will include removing debris that appear to be IVNV from the images, utilizing different FCNNs, and exploring unsupervised deep learning methods to increase accuracy.

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