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Segmenting Retinal Blood Vessels with Deep Neural Networks : A Review

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Abstract: *The condition of the vascular network of human eye is an important diagnostic factor in ophthalmology. Its segmentation in fundus imaging is a nontrivial task due to variable size of vessels, relatively low contrast, and potential presence of pathologies like microaneurysms and hemorrhages. Many algorithms, both unsupervised and supervised, have been proposed for this purpose in the past. We propose a supervised segmentation technique that uses a deep neural network trained on a large (up to 400; 000) sample of examples preprocessed with global contrast normalization, zero-phase whitening, and augmented using geometric transformations and gamma corrections. Several variants of the method are considered, including structured prediction, where a network classifies multiple pixels simultaneously. When applied to standard benchmarks of fundus imaging, the DRIVE, STARE, and CHASE databases, the networks significantly outperform the previous algorithms on the area under ROC curve measure (up to > 0:99) and accuracy of classification (up to > 0:97). The method is also resistant to the phenomenon of central vessel reflex, sensitive in detection of fine vessels (sensitivity > 0:87), and fares well on pathological cases.*

Keywords: Fundus, STARE, DRIVE, CHASE, Retinal Image etc..

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