



Senior Design Project

Digital Retinal Images for Vessel Extraction Using Deep Learning Approach

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DECLARATION

This is to certify that this Project is my original work. No part of this work has been submitted elsewhere partially or fully for the award of any other degree or diploma. Any material reproduced in this project has been properly acknowledged.

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APPROVAL

The capstone project entitled “**Digital Retinal Images for Vessel Extraction Using Deep Learning Approach’s**” by Md. Fahad Mojumder (ID#1712145642), Adnan Ahmed Saif (ID#1620611042), Rafid Masrur Khan (ID#1520862642), is approved in partial fulfillment of the requirement of the Degree of Bachelor of Science in Computer Science and Engineering on May and has been accepted as satisfactory.

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ACKNOWLEDGMENT

First of all, I wish to express our gratitude to the Almighty for giving me the strength to perform our responsibilities and complete the report.

The capstone project program is very helpful to bridge the gap between theoretical knowledge and real-life experience as part of the Bachelor of Science (BSc) program. This report has been designed to have a practical experience through theoretical understanding.

I also acknowledge our profound sense of gratitude to all the teachers who have been instrumental in providing us with the technical knowledge and moral support to complete the project with full understanding.

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We thank our course instructor **Aimon Rahman** who helped us in our project.

ABSTRACT

Retinal vessel extraction using retina image is a deep learning based semantic segmentation process by which we will train machine using retina images and extract the vessels from it. U-net model is best for this semantic segmentation and we use this model which help machine to learn from the images in order to provide better accuracy. Retinal vessel extraction is a process by which a physician can detect the anomaly in retina and this can prevent blindness if found early stage. In this research we have tried to implement U-net model on different types of datasets and tried to achieve better accuracy. We have used different techniques like data preprocessing, data augmentation, image slicer, and contour to achieve better result. Data preprocessing is used for proper feature selection and feature extraction. We have removed extra noise from the input images in order to achieve better result. Selecting important portion and removing irrelevant portion of input features is the main aim of data preprocessing. Data augmentation is needed to increase the number of input features. We have used data augmentation by modifying input pictures and increase the number of images. This increase number of slightly modified data helps the model to learn better in learning stage. Then image slicing is used to slice one image in multiple segments. These multiple segments help to highlight important features of the image. Thus, the architecture gets better and more concentrated features for learning stage. At last, the contour is used to remove irrelevant features like the black background of our input pictures and make the boundary continuous with the outline of the relevant features. Thus, we have tried to find out how our model works on publicly available three datasets DRIVE, STARE and CHASE_DB1 and achieve better result in our project. We tried to do semantic segmentation using these datasets and tried to overcome the obstacles we found during this process.