UNIVERSITI TEKNOLOGI MARA

CLASSIFICATION OF DIABETIC RETINOPATHY CLINICAL FEATURES USING IMAGE ENHANCEMENT TECHNIQUE AND CONVOLUTIONAL NEURAL NETWORK

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MSc

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The screening of diabetic retinopathy (DR) affects the visual inspection of retina images taken by ophthalmologists to detect the specific signs of pathology such as exudate, haemorrhage (HEM) and microaneurysm (MA). Currently, this process is conducted manually in many hospitals. Therefore, it is time-costing and risky for humans to make mistake. An automatic and accurate system for detection DR signs can significantly help ophthalmologists to make best decision for early treatment thus reducing risk of vision loss. In general, this thesis introduces an automated machine learning algorithm for detecting diabetic retinopathy (DR) in fundus images. To improve the performance from current systems, this work has investigation on different of image pre-processing enhancement technique to support accuracy on deep learning for DR classification. For the image enhancement process, this thesis has proposed high-pass filter combined with histogram equalization and de-haze algorithm respectively to improve the visual quality of fundus images. Based on investigation different architecture and parameter, the suitable deep learning model has been presented to get optimize best result and testing time. To solving pattern classification problem, the optimization deep learning architecture and parameter by using four convolution layers is set up to classify the three pathological signs; HEM, MA and exudate. Two public online datasets of fundus image, e-Ophtha and DIARETDB1 are used to evaluate the performance of this system. The performance of the system demonstrates the effectiveness of image enhancement in term of test accuracy percentage. From training and testing results using enhanced DR images, the both pre-processing steps has proven slight improvement of deep learning in the overall accuracy by 4.3% and 3.6% supported by enhancement 1 and 2 respectively, compared to those original images with no enhancement for both datasets.

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