Vacancies for Graduate Research Assistant (GRA)
In Faculty of Computing and Informatics, Multimedia University

Project Title: Combinatorial Filtering and Machine Learning Approach to Improve Vessel Segmentation for Retinal Image Analysis

Description: Retinal imaging has been widely used for routine screening in hospitals to detect retinal and systemic diseases. A computer-assisted diagnosis system can assist the ophthalmologists in performing retinal diagnosis and automatic retinal blood vessel (RBV) segmentation is one of the important pre-requisites for such a system. Large RBVs are relatively easier to detect due to their high contrast, where as smaller RBVs are more challenging because of their narrow size and low contrast. This is why existing RBV segmentation methods performed well in detecting large RBVs but left smaller RBVs mostly undetected. This project aims to develop an improved method for RBVs segmentation to improve small vessel detection, thus improving accuracy of features derived from segmented vessels such as tortuosity and vessel caliber. The proposed method involves combining popular approaches used previously for segmentation namely filtering and machine learning(ML). Color retinal image is used as input where green channel image (GCI) is extracted and pre-processed to highlight RBV structures. The pre-processed GCI is then used for large RBV detection step using B-COSFIRE filter.The next step of small RBV detection involves two different methods, namely 2D Gabor Wavelet filter and Frangi filter, producing 2 grayscale images as the output. In order to consolidate the information from both large and small vessels, methods of combining the features will be investigated. The vessel tree output is obtained after post-processing steps applied to the combined binary image to remove noisy pixels. An unsupervised ML method called Random Forest will then be used to further improve the segmentation performance. A The project outcome has potential impact in increasing the quality of care for diabetic and diabetic retinopathy patients by way of early detection with possible reduction in government's healthcare cost related to treatment of diabetic retinopathy cases.

Source of Funding: FRGS, MOE

Location: Faculty of Computing & Informatics, Multimedia University, Cyberjaya.

Benefit: Eligible to apply for tuition fees waiver from Institute of Postgraduate Studies, Multimedia University

Responsibilities:
- MUST register as a **full-time** candidate **of Master of Science (Information Technology)** (By Research) in Faculty of Computing & Informatics, Multimedia University, Cyberjaya.
- To write technical papers, prepare documentations and perform administrative tasks related to the project.
- To perform data collection on retinal images, experimental work and simulation work related to image processing.

Universiti Telekom Sdn. Bhd. (436821-D)
Cyberjaya Campus, Persiaran Multimedia, 63100 Cyberjaya Tel: +603 8312 5000/5570 Fax: +603 8312 5022
Melaka Campus, Jalan Ayer Keroh Lama, 75450 Melaka Tel: +606 252 3997 Fax: +606 231 5604
Url : www.mmu.edu.my

A TM University

Requirements:

- A Bachelor's degree with minimum CGPA of 3.00 or equivalent, in a Computer Science or Information Technology or relevant field from MMU or institutions recognised by the Senate; OR
- A Bachelor's degree or equivalent with minimum CGPA of 2.50 and not meeting CGPA of 3.00, in a Computer Science or Information Technology or relevant field from MMU or institutions recognised by Senate, can be accepted subject to rigorous internal assessment; OR
- A Bachelor's degree or equivalent not meeting CGPA of 2.50, in a Computer Science or Information Technology or relevant field from MMU or institutions recognised by the Senate, can be accepted subject to a minimum of five (5) years working experience in the relevant field.
- A minimum overall TOEFL score of 550 (paper-based) or 80 (internet-based); or
- A minimum IELTS (academic) overall band score of 6.0; or
- A credit in 1119 English Examination; or
- A minimum MUET overall band score of 4; or
- Any other English qualification which is of equivalent level as determined by the Senate of the University
- Good command of written and oral English.
- Knowledge of image processing methods, especially in medical images is an advantage.
- Must be willing to do field work in hospital (HUKM) for data collection and expert consultation
- Highly self-motivated, thus able to work independently with minimal supervision.

Interested applicants may submit their resumes via email to Ms Aziah Ali at aziah.ali@mmu.edu.my. Only short-listed candidates will be contacted for an interview.

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