NATIONAL UNIVERSITY OF SINGAPORE

School of Computing

PH.D DEFENCE - PUBLIC SEMINAR

Title: **Automated Methods for Retinopathy and Glaucoma Screening**

Speaker: Mr Lim Yong San, Gilbert

Date/Time: 23 November 2015, Monday, 10:00 AM to 11:30 AM

Venue: Executive Classroom, COM2-04-02

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Abstract:

There is predicted to be a rising demand for systems that can efficiently process photographs of the retina, due to the increase in prevalence of age and diabetes-related eye diseases. Such diseases include diabetic retinopathy, which involves the appearance of retinal lesions, and glaucoma, which is characterized by the progressive degeneration of optic nerve fibers. Both these diseases can lead to blindness if left undiagnosed, but can be effectively treated if detected in their early stages. With hundreds of millions of people affected by these diseases worldwide, it is desirable to develop a screening method that relies on the relatively widely-available and low-cost modality of retinal fundus photography.

In this thesis, we survey the existing literature and discuss well-known approaches to the problem of automated diagnosis of diabetic retinopathy and glaucoma. We propose a new lesion detection framework utilizing the Constrained-Maximally Stable Extremal Region (C-MSER) blob detector, which has properties that make it especially suited to the task. We next introduce a novel representational transform on the C-MSER output, which bypasses the scale selection problem that has limited the utility of deep convolutional neural networks (CNN) in retinal lesion classification. Finally, we introduce feature exaggeration preprocessing on optic disc close-ups, followed by structural segmentation using CNN probability maps. Experiments on multiple retinal datasets suggest that this is a viable approach for the detection of retinopathy and glaucoma in retinal fundus images.