NATIONAL UNIVERSITY OF SINGAPORE

School of Computing

PH.D DEFENCE - PUBLIC SEMINAR

Title: **Symbolic Execution for Advanced Program Reasoning**

Speaker: Mr. Vijayaraghavan Murali

Date/Time: 12 August 2014, Tuesday, 10:00 AM to 11:30 AM

Venue: SR2, COM1-02-04

Supervisor : Dr Joxan Jaffar, Professor, School of Computing

Abstract:

This thesis aims to address a number of program reasoning problems faced every day by programmers, using the technique of symbolic execution. Symbolic execution has the advantage of avoiding "infeasible" paths in the program (paths that cannot be exercised for any input), exploring which could provide spurious information about the program and mislead the programmer. However, as symbolic execution considers the feasibility of individual paths, the number of which could be exponential in general, it suffers from path explosion. To tackle this, we make use of the technique of "interpolation".

Using this, we make significant contributions to the areas of program slicing, verification, concolic testing and trace comprehension. Our breakthroughs in the area of slicing include formulating the most precise slicing algorithm and the novel notion of "tree slicing". We introduce the concept of "speculation" which, for the first time, brings the exponential benefits of interpolation to concolic testing and improves the performance of interpolation-based verifiers. We also make strides in the understanding and explanation of execution traces using interpolants and loop invariant discovery.