

**Title of Project:**

***Analysis and Test Generation of Evolving Software***

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Applications are invited for a Research Fellow positions in the project “Analysis and test generation of Evolving Software”. A brief description of the project appears below. Applicants must be strong in Programming Languages or Software Engineering. Applicants should have completed PhD or close to completion. Payment is negotiable, plus other benefits such as health insurance. Starting date can be anytime in 2011 (flexible). If you are interested, email Prof. Abhik Roychoudhury [abhik@comp.nus.edu.sg](mailto:abhik@comp.nus.edu.sg) with your CV. Please include details about specific research work done, and relevant publications.

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**Section 1: Aims of the project**

The proposed project has a single important aim – making software testing and debugging methods aware of software evolution. We feel that even though research has been conducted on testing / debugging, substantial research has not been conducted on change-driven software testing / debugging (where the testing/debugging methods focus on the changes in the program with respect to the previous stable versions). Developing such testing and debugging methods is the main aim of the proposed project.

**Section 2: Significance of the project**

The project seeks to develop automated and scalable solutions to a problem faced by any software development in the field. Programmers do not write programs entirely from scratch. Over time, a program gradually evolves from one program version to another. However, as software evolves from one version to another - testing/debugging to ensure that the program continues to meet its intended functionality is difficult. Validation of such evolving programs (say, to address possible bugs introduced via program changes) remains a huge problem in software development. This adds to the cost for software maintenance, which is much larger than the initial software development cost. The cost of maintaining a software and managing its evolution is said to account for more than 90% of the total cost of a software project, prompting authors to call it the “legacy crisis”. In this project, we seek to develop testing and validation methods for evolving software to bring down such costs.

**Section 3: Innovation in the project**

The main innovation of the proposed work lies in making testing/debugging methods change-aware. A commonly used terminology in software engineering is “regression testing” where a changed program version is tested to check for possible regressions (some functionality which worked earlier but is broken due to the changes). In practice, regression testing often amounts to re-testing, or testing a selected subset of tests. However, as changes are made in the program, the test-suite should also evolve with the program – an aspect that we study in this project. Akin to regression testing, we also study regression debugging, where we root-cause the reason for any detected software regression. The innovative aspect of our proposed work in regression debugging lies in using symbolic execution based semantic analysis of the failed test case as opposed to enumerating the changes across program versions.