



**INFORMATICS
INSTITUTE OF
TECHNOLOGY**

INFORMATICS INSTITUTE OF TECHNOLOGY

In Collaboration with

UNIVERSITY OF WESTMINSTER

A regression test selection tool for distributed microservices

A Dissertation by

Ms. Dilhasha Nazeer

20211258 / w1898867

Supervised by

Mr. Deependra Ariyadewa

Submitted in partial fulfilment of the requirements for the MSc in Advanced Software
Engineering degree at the University of Westminster.

August 2023

Abstract

The Regression Test Selection (RTS) tool presented in this document addresses the challenge of efficiently selecting and executing regression tests in microservices environments. Traditional regression testing approaches can be time-consuming and resource-intensive, leading to longer test cycles and hindering the agility of microservices-based applications.

The RTS tool addresses the problem by employing intelligent techniques to identify and select the precise subset of tests that are impacted by system changes. It achieves this by utilizing a blend of static and dynamic analysis techniques to extract mappings between tests and services utilizing both source artifacts from source repositories and distributed traces from observability tools.

In an experimental setup on Google Cloud when executed against a hipster shop microservice deployment the tool performed with 82.55% testing time cost savings rate indicating the efficiency in terms of execution time. On average, the F measure indicating overall efficiency of the RTS tool recorded to be 62.16%. With the test and evaluation results, the RTS tool demonstrated its capability to streamline regression testing workflows, significantly decrease testing effort and time, and expedite feedback cycles in modern, agile organizations.

Keywords:

Regression Test Selection, Microservices, Software Testing, Static Analysis, Dynamic Analysis, Service Dependencies

Subject descriptors:

- Software and its engineering → Software creation and management → Software verification and validation → Software defect analysis → Software testing and debugging
- Computer systems organization → Architectures → Distributed architectures → Cloud computing
- Software and its engineering → Software creation and management → Software post-development issues → Software evolution