Bachelor/Master Thesis Topic

Improving SBFL with Machine-Learning I
(Pre-Processing)

Motivation and Background
Given a faulty program, the localization of occurring faults can be very difficult and may take a long time, which, in turn, leads to higher development costs and often to frustration for the developer in charge. Automated fault localization techniques as, e.g., Spectrum Based Fault Localization (SBFL), have been developed to aide developers with this task by pointing them to program elements with a supposedly high fault probability (suspiciousness). In recent times, SBFL techniques have also been used in various automated program repair tools [2], as they provide reasonable results at a negligible cost. To rank the program elements, SBFL techniques only require the execution of a test suite to generate a program spectrum, which is a matrix in which each cell contains simple execution information (i.e., whether the program element was/was not executed by a specific test). This spectrum is then used to generate a ranking of program elements, often based on a similarity coefficient as, e.g., the Jaccard index.

Goals
The goal of this project is to develop, implement and evaluate (based on a benchmark) different pre-processing techniques (especially regarding the program spectra) to improve SBFL rankings. As another requirement, the techniques shall further be developed with regard to a special machine-learning technique.

Description of the Task
A detailed description of the task and the underlying techniques will be given personally on interest.

Research Type
Theoretical Aspects: ***
Industrial Relevance: ****
Implementation ****

Prerequisite
The student should be enrolled in the bachelor/master of software engineering or bachelor/master of computer science program, and has completed the required course modules to start a bachelor/master thesis.

Skills required
Programming skills in (preferably) Java, Understanding of, or willingness to learn, the architectural and statistical foundations needed for the project.

References

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Application
Please contact during office hours or write an email with the title: “SBFL-ML-I” to se-career@informatik.hu-berlin.de